

THE SCIENCE WORLD



A Monthly e Magazine
ISSN:2583-2212



Visit official Website
<https://www.thescienceworld.net>

Vol.3 Issue 4

April, 2023



THE SCIENCE WORLD

A Monthly e Magazine
ISSN:2583-2212



World Veterinary Day



Nominations

Best Article/Success Story/Original Article/ Caser study

About Us

The Science World a monthly e magazine" is an open access peer reviewed e-magazine(ISSN:2583-2212) initiated in May, 2021 to provide a common platform to all the researchers, students, scholars and scientists from diverse background to share their ideas about latest innovative topics. The aim of e-magazine is to publish about latest innovations and technologies being used globally in field of agriculture, life Sciences and Natural sciences. This would help in disseminating scientific information and latest findings among the scientific and non scientific communities related to agriculture all over the globe



Skills

Originality



Content



writing skill



Drafting



+8264935364



thescienceworldmagazine@gmail.com



<https://www.thescienceworld.net/>



<https://www.linkedin.com/feed/>

Vol.3. Issue 4, April, 2023

- > De-Worming – An Ignored Boon
Pratap and Mishra
- > Dental hygiene in Dogs
Odedara and Sharma
- > Breeds of Sheep and Goat in Gujarat and Their Importance
Lokendra et al
- > Post Parturient Hypomagnesemia in Ruminants
Gadige et al

THE SCIENCE WORLD

A Monthly e Magazine

ISSN:2583-2212

Editor In Chief

Dr. R. S. Sethi

Add. Editor in Chief

Dr. Shaikh Nasrul Islam

Dr. Amit Sehgal

Dr. Vikas Jaiswal

Leading Editors

Dr. N. Rajanna

Dr. Ahlawat Anshu Rampal

Dr. V Kasthuri Thilagam

Dr. A K. Devarasetti

Dr. Mude R. Naik

Dr. Abrar Ul Haq Wani

Dr. Abhinov Verma

Sr. No	Title
1	Fungal Immunity <i>Avani R. Modi</i>
2	Strategic Role of State Agricultural Universities (SAUs) in Rural Development <i>Naaz Bano</i>
3	De-Worming - An Ignored Boon <i>Pratap and Mishra</i>
4	DNA fingerprinting and wildlife forensics <i>Sharma and Sharma</i>
5	Keeda Jadi is said to be used as a natural steroid <i>Kumar et al</i>
6	Immunosuppression and Cancer <i>Sharma and Sharma</i>
7	Khur Pakka Muh Pakka/chapka/Khurpa <i>Dr Anita Rathod</i>
8	Diagnostic Cytology in Veterinary Medicine <i>Meena et al</i>
9	Role of Plant Extracts on Growth and Development of Mulberry and Non-Mulberry Silkworms <i>Nath et al</i>
10	Summer Management of Your Furry Pets <i>Abinaya and Eazhisai</i>
11	Role of Biological Control Agents in Integrated Pest Management <i>Devi et al</i>
12	Hydroponics: Green Fodder Production without Soil <i>Dr. Lakhyajyoti Borah</i>
13	Antimicrobial resistance in Veterinary Medicine and its effects <i>Gajula et al</i>
14	Diet and Gut Microbiota: Understanding the Link for Optimal Health <i>Bansal et al</i>
15	Saprolegnia infection: a hurdle in aquaculture <i>Chanu and Thakuria</i>

THE SCIENCE WORLD

A Monthly e Magazine

ISSN:2583-2212

Editors

Dr. Santwana Palai
Dr. Deepak Sumbria
Dr. B. S. Gotyal
Dr. Anupam Soni
Dr. Tanmoy Rana
Dr. Jaya Sinha
Dr. Lalita Rana
Dr. Anil Kumar Singh
Dr. Virendra K. Singh
Dr. Devendra Saran
Dr. Himalaya Bhardwaj
Dr. Asit Jain
Dr. Rahul Choudhary
Dr. Deep Shikha
Dr. Sameer Niwas Jadhav
Dr. Anumolu Vijaya Kumar
Dr. Aarti Nirwan
Dr. Gurvinder Kaur
Dr. Prakriti Sharma
Dr. Shrishti Prashar
Dr. Parminder Kaur
Dr. Urfeya Mirza
Dr. Abhinov Verma
Dr. Maninder Singh
MS Asma Siddiqua
Dr. (Mrs.) Ritun Patra
Dr. Raut Akash Babasaheb
Dr. Rajesh Kumar
Dr. Shamik Dey
Dr. Mamta Meena
Dr. Rakhi gangil

Sr. No	Title
16	Seabuckthorn a 'Super Healthy Fruit' of Ladakh: Nutritional Value, Health Benefits and Applications Choton et al
17	Dental hygiene in Dogs Odedara and Sharma
18	Precision Livestock Farming Technologies for thermal stress management in Farm animals Rajamanickam and Visha
19	Treditional Herbs Used in Aquaculture R. Mahesh Kumar
20	Breeds of Cattle in Gujarat: Important for Improvement of Socio-Economic Status Lokendra et al
21	Breeds of Sheep and Goat in Gujarat and Their Importance Lokendra et al
22	Body Condition Score: A Tool for Health Assessment in Goat Gupta et al
23	Artificial Intelligence and Its Potential Impact on Society Vasavi et al
24	Artificial Insemination of Cattle: Current and Future Trends Dr. Bipasha Goswami
25	Physiological Importance of Magnesium in Ruminants Banothu et al
26	Post Parturient Hypomagnesemia in Ruminants Gadige et al
27	Glycerol Monostearate (GMS): An Important Agent in Food Industry Langeh et al
28	Techniques for rapid generation advancement in crops Sharma et al
29	Repeat Breeding and Its Therapeutic Management in Dairy Cow: A Review Thakur et al
30	African swine fever: A threat to Indian pigs Gurjar and Singh
31	Feeding of Livestock During Scarcity Period Abinaya and Eazhisai



THE SCIENCE WORLD



A Monthly e Magazine
ISSN:2583-2212



Visit official Website
<https://www.thescienceworld.net>

Vol.3 Issue 5

May 2023

Fungal Immunity

Avani R. Modi

M.V.Sc. Scholar, Department of Veterinary Microbiology
College of Veterinary Science & Animal Husbandry, Anand
<https://doi.org/10.5281/zenodo.7796843>

Introduction

Several species in the kingdom of fungi are linked to a variety of human and animal diseases. There are three main categories of fungus infections. The first is primary fungus infections that affect the skin or other surfaces and result in diseases like ringworm or thrush. These fungi include the *Microsporum* or *Candida* species. The second class comprises primary infections by dimorphic fungi, such as *Histoplasma capsulatum*, *Blastomyces dermatitidis*, and *Coccidioides immitis*, which primarily cause respiratory infections. The third class includes secondary infections caused by opportunistic fungi in immunocompromised animals, including *Pneumocystis* and the *Mucorales* (*Rhizopus*, *Mucor*, and *Absidia*). Globally, the great majority of mycotic disorders are infectious diseases brought on by different pathogenic skin fungi.

Immunity To Fungi

The body defends itself against primary infections through both innate and adaptive immunological responses. A specific disease that will arise after contact with the common pathogen is Figure 1 | Balancing protection and immunopathology in fungal infections largely determined by the host immune system. It has been made clear by the T HELPER 1 (TH1)/TH2 dichotomy that various effector functions are necessary for the eradication of various fungal diseases. The barrier function of the skin and the mucosal epithelial interfaces of the respiratory, gastrointestinal, and genito-urinary tracts are among the inherent mechanisms of innate defense that are present at locations of ongoing interaction with fungi. The majority of host defense mechanisms, however, are inducible after infection; as a result, their activation necessitates the detection of a set of pattern recognition receptors (PRRs), such as Toll-like receptors (TLRs), by invariant molecular



structures shared by broad groups of pathogens.

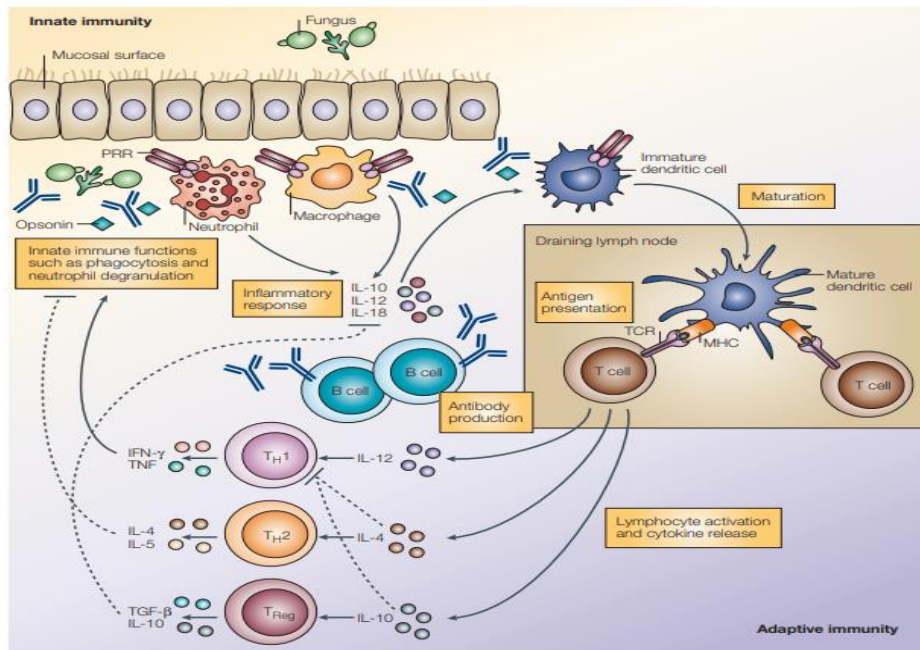


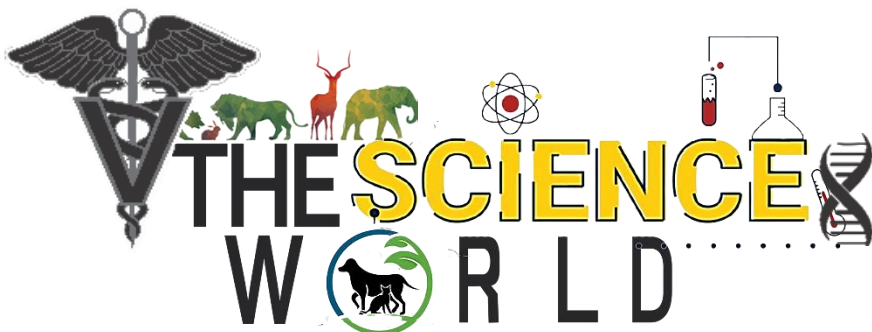
Figure 1 | Balancing protection and immunopathology in fungal infections

Neutrophils are also triggered by the IL-23/IL-17 axis during fungal infections. IL-23 production is triggered by fungus PAMPs via TLR2 or the cell surface lectin dectin-1. Th17 cells are activated by IL-23. These cells subsequently release IL-17, which stimulates neutrophils and endothelial cells and causes an initial inflammatory response.

Antibodies In Immunity to Fungi

Toxin neutralization, opsonization, adhesion prevention, and antibody-dependent cellular cytotoxicity are among the primary roles that antibodies are known to play in fungal infections. Antibodies against fungi can be both protective and non-protective, with a wide range in their proportions and relative composition. Antibodies specific for heat-shock protein 90 are associated with recovery from infections with *Candida albicans* and protection against disseminated disease in patients with AIDS, and they synergize with antifungal chemotherapy. Mice are protected against candidiasis by antibodies specific for a mannan adhesin fraction. Idiotype-specific antibodies, or even just one of their chains, are highly effective in treating experimental infections due to their wide fungicidal action.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 456-460

Monograph

Strategic Role of State Agricultural Universities (SAUs) in Rural Development

^{1*} Naaz Bano ²Juri Das, and ³Mahendra Kumar Yadav

^{1*} Assistant Professor, School of Agricultural Sciences, Jaipur National University, Jaipur

² Assistant Professor, School of Agricultural Sciences, Jaipur National University, Jaipur

³ Assistant Professor, School of Agricultural Sciences, Jaipur National University, Jaipur

Introduction

State Agricultural Universities (SAUs), in India, have adopted the U.S. land-grant model to meet its goals. They are autonomous organizations with state-wide responsibility for agricultural education, research and extension work. Through teaching, research and extension activities the 64 SAUs across 29 states of India are significantly contributing to agricultural production and productivity of their respective states directly and therefore to the rural development. Strategies adopted by SAUs for rural development includes technologies and innovations, extension and human resource development. Regional Agricultural Research Stations in various agro-climatic zones have strengthened research-extension-farmer (REF) linkages. KVKs under administrative control of SAUs serve as farm science centers of their respective districts. The green revolution, with its remarkable social and economic impact, witnessed significant contributions from the SAUs, both in terms of trained, scientific work force and the generation of new technologies. However, most of the agricultural universities in India continue to be dominated by top-down, monolithic structures that follow a limited extension mandate.

In India, the first SAU was established in 1960 at Pantnagar in Uttar Pradesh. The SAUs were given autonomous status and direct funding from the state governments. They were autonomous organizations with state-wide responsibility for agricultural research, education and training or



extension education. The establishment of the SAUs, based on a pattern similar to that of the land-grant universities in the United States, was a landmark in reorganizing and strengthening the agricultural education system in India. These universities became the branches of research under the ICAR and became the partners of the National Agricultural Research System (NARS).

Subsequently, implementation of the recommendations of the Education Commission (1964-1966) and Review Committee of Agricultural Universities (1977-1978) streamlined their functioning, and all matters related to agricultural research in the states were transferred to the universities. According to Review Committee of Agricultural Universities (1978), an essential feature of the agricultural university system is the acceptance of the philosophy of service to agriculture and to rural communities with the following mandates:

- ❖ State-wide responsibility for teaching, research and extension education.
- ❖ Integration of teaching, research and extension at all levels of the university administration.
- ❖ Multi-disciplinary teamwork in the development programs of education, research and extension. Acceptance by all concerned in the university of a philosophy of service to agriculture and the rural community and emphasis on programs that are directly and instantly related to solving social and economic problems of the countryside.
- ❖ Quick communication of new knowledge to students in classrooms, to extension personnel and to farmers.
- ❖ Programs giving specialized training to the rural youth and adult men and women who are not candidates for degrees, through departments involved in responsibility for the subject matter being taught.

The teaching programme

Through the National Academy of Agricultural Research Management (NAARM), newly recruited faculty members undergo foundational courses (FOCFAU) in 'Agricultural Scenarios', (NARES) which consists of the basics of learning, teaching, instruction, educational technology, e-learning, research project management, transfer of technology and, administration and finance management. The faculty members of the SAUs also serve as 'resource persons' for the SAMETIs of the Department of Agriculture, thus, involve in training of extension personnel of their respective states. SAUs have Open and Distance learning courses (certificate and diploma), to directly teach farmers in various agricultural and allied sciences. Through Massive open online courses (MOOCs),



SAUs instruct various stakeholders through single course. Numerous ICAR initiatives implemented by SAUs such as Rural Entrepreneurship and Awareness Development Yojana (READY), Experiential Learning Programme (ELP), Rural Agricultural Work Experience (RAWE) and in-plant training are relevant. The Student READY programme has been introduced in all State Agricultural Universities as an essential prerequisite for the award of a degree in order to ensure students hands-on experience and practical training in agriculture.

The research programme

Under National Agricultural Research Project (NARP), the country is divided into 127 agro-climatic zones. Directorate of Research is the nodal agency of the SAU and directs frontline research activities. Regional Agricultural Research Stations (RARSs) are established in several agro-climatic zones to provide need-based and location-specific research. Many state agriculture universities are actively involved in climate smart agriculture research and also have projects related to dry land agriculture. Zonal Research and Extension Advisory Councils (ZREACs) and Research and Extension Advisory Councils (REACs) meet annually to identify the thrust areas for research in various disciplines, identify research gaps and to also provide a framework for faculty research projects. All India Coordinated Research Projects of the Indian Council of Agricultural Research (ICAR), engaging in multi-location trials are generally based in SAUs and are also administratively controlled by the SAUs.

The extension programme

The core agenda of SAUs extension programmes is to reach farming community through state extension advisory services. Directorate of Extension is the nodal agency of SAUs and they promote agricultural development through fast transfer of technology programmes by providing timely information, consultancy and training to the extension personnel of line departments. SAUs not only provide technical support to line departments but also have convergence programmes with line departments and NGOs. The multi-disciplinary team of scientists at various extension centers coordinates the activities with the department of agriculture and other allied departments of agriculture. All SAUs supports All India Radio, print media and electronic media for dissemination of agricultural and allied sciences information.

Agricultural extension for rural development

Extension is an informal educational process directed towards the welfare and development



of rural populations. This process offers advice and information to help them solve their problems. Rural family is the fundamental unit of various SAUs agricultural extension programmes. Agricultural extension also aims to enhance the efficiency of the 'farm family', increase production and generally increase the standard of living of the farm family.

The major stress of agricultural extension is on conducting front line extension activities viz., testing and the introduction of new technologies in the farmers' fields, dissemination of technical information, imparting training to the extension personnel, rural youth and farmers, developing innovative extension methods and strategies. SAUs also prepare crop contingency plans for both *Kharif* and *Rabi* seasons.

The agricultural extension wing of SAUs provides updated timely information on weather forecasts, prices of major crops for *Kharif* and *Rabi* seasons, bulletins, pest and disease outbreak forecasts, market intelligence, etc. All SAUs have agro-meteorology centers to forecast weather and release weather-related advisory bulletins to the farmers of their state. Directorates of Extension in SAUs encourage literacy in rural communities and ensure provision of vocational training to rural youth through KVKs. Vocational training helps in creating employment opportunities in the long run for rural youth. KVKs and Research stations adopt villages for at least three years for a range of transfer of technology (ToT) programs.

Major schemes operating through KVKs for rural development

- ❖ Cluster frontline demonstrations on pulses and oilseeds.
- ❖ National Innovations on Climate Resilient Agriculture (NICRA).
- ❖ Attracting and retaining rural youth in agriculture (ARYA).
- ❖ Tribal sub plan.
- ❖ Seed hubs for pulses.
- ❖ Skill development and vocational training courses.
- ❖ E-extension services - advisory services on farmers cell phone, mobile apps development in regional language, Annapurna Krishi Prasar Sewa, etc.
- ❖ Important government schemes and programmes in convergence with allied departments are Soil Health Card Scheme, Rashtriya Krishi Vikas Yojana, National Food Security Mission, National Mission for Sustainable Agriculture, Pradhanmantri Fasal Bhima Yojana, Pradhanmantri Krishi Sinchai Yojana, Grameen Krishi Mausam Sewa, Krishi Kalyan



Abhiyaan, National Agriculture Market (e-NAM), Micro Irrigation Fund, Agriculture Contingency Plan, National Watershed Development Project, Rainfed Area Development Programme (RADP), etc.

The way forward for SAUs for strategic rural development

- ❖ At present, SAUs are adopting few villages every three years and focusing on transfer of technology in agricultural and allied sciences. Furthermore, SAUs can also assist to convert the adopted villages into smart villages by focusing on integrated rural development and thus, increasing standard of living of the rural population.
- ❖ SAUs should inculcate spirit of agripreneurship among rural youth by nurturing the new ideas in agri-incubation centers.
- ❖ Gender mainstreaming in agriculture should be given priority because women constitute 70 per cent of the rural population.
- ❖ SAUs should engage more directly and more effectively in rural development and partnership with line departments and non-government organizations.

References

- International Fund for Agricultural Development (IFAD). (2020). Smallholders, food security, and the environment. Rome: IFAD.
- 3.KVK Portal. (2020). Krishi Vigyan Kendra Knowledge Network. Retrieved from the website (<https://kvk.icar.gov.in/>) on 14.10.2020.
- Lalitha, A., Purnima, K.S., Reddy, K.G. Babu, S. and Sambaiah, A. (2022). Strategic Role of Indian State Agricultural Universities (SAUs) in Rural Development: A Review. *Agricultural Reviews*. 43(1): 84-90. DOI: 10.18805/ag.R-2268.
- Simpson, B. M., & Singh, K. M. (2022). Assessment of agricultural extension and advisory services, Modernizing Extension and Advisory Services Project. Washington, DC: USAID.
- World Bank. (2020). World development report 2010: Development and climate change. Washington, DC: World Bank.



De-Worming - An Ignored Boon

¹Dr. Aditya Pratap and ²Dr. Varsha Mishra

¹PhD Scholar, Department of Veterinary Medicine, College of Veterinary science and A. H., NDVSU, Jabalpur (M.P.), 482001

²PG Scholar, Department of Veterinary Medicine, College of Veterinary science and A. H., NDVSU, Jabalpur (M.P.), 482001

<https://doi.org/10.5281/zenodo.7800594>

Abstract

Worms or other parasite infestations, particularly in the lungs and intestines, are the cause of many of the most prevalent health issues seen in dogs and cats. These illnesses are typically brought on by drinking stagnant water, playing in contaminated ground or dirt, or getting bitten by rats or fleas. In such cases, it is always suggested to get your pet deworm and use preventative measures to remove fleas from your dogs and cats on a regular basis, even if they appear to be in excellent health.

Introduction

De-worming is a crucial part of a preventive care regimen that can help your pet feel better and have fewer parasites (both internal and external). Worms are nasty parasites that when present inside the body of your pet can generally cause problems ranging from lethargy, Anemia to Infection of dermis, acute as well as chronic gastrointestinal problems, decreased immunity and many more; hence compromising your pets health.

Pets that are not dewormed routinely get ill and suffer from growth retardation. In addition, although most worms and fleas prefer to feed on our pets, they can also bite humans and use them for transport and can also infect humans rendering zoonotic infection threat to the pet parents as well.

As there are many types of worms which affect your pet (ex- Heartworm, Roundworm, Hookworm, tapeworm, whipworm etc.) and are not sensitive to only one kind of dewormers, hence here comes the role for a veterinarian's advice, who with their practical experience, advises the

suitable drug according to the body weight and age group to which animal belongs.

Nonetheless, prevention is always the best option, regardless of the type of worms. Don't let your pet drink from ponds, streams, or lakes, and swiftly clean up after him. Furthermore, prevent him from eating any faeces, especially his own. It's crucial to ensure that your pet receives preventative medication for heartworms, fleas, and ticks.

General Schedule

- Puppies/ Kittens can be dewormed from as early as 2 - 3 weeks of age with a repetition in every 15 days for up to 3 months of age.
- From 3 - 6 months of age deworming should be done on an interval of 1 month.
- After 6 months of age - Deworming should be done 3 - 4 times annually or in every 3-month interval.

Natural remedies to deworm your furry pets

Feeding your pet healthy diet can be an icing on the cake as healthy pet treats with the goodness of fruits and vegetables are extremely beneficial for the health as well as deworming.

1) Fruits and Vegetables: - Grated carrots, beetroot, banana, apple, coconut, and papaya are vegetables that are high in fibre and function as natural dewormers. In addition to being rich in vitamin A, carrots scratch the intestinal and stomach walls when coarsely sliced, removing any parasites and mucus that may be present.

2) Pumpkin Seeds: - Cucurbitacin, a deworming agent, is present in pumpkin seeds. The worms are rendered paralyzed by this substance, which prevents them from clinging to the body's intestinal walls during bowel movement. As a result, the digestive tract will be free of all worms.

3) Papaya: - All varieties of intestinal worms can be killed by the anti-amoebic effects of papaya seeds in the digestive system. The papaya fruit also produces papain, an enzyme that aids in the elimination of intestinal worms.

4) Coconut: - Dried coconut or coconut oil is a vermifuge and can also be used to deworm cats naturally. As cat's body converts the lauric acid in coconut oil into monolaurin, which is known to be helpful against tapeworm, giardia, and other parasites.

Natural remedies are fewer popular recommendations generally practiced by owners but their intensity, way of administration and reactions varies from pets to pets, hence cross checking with your veterinarian can be an added advantage to the love, you shower on your pet.



Preventive measures

- Use worm and flea prevention treatment regularly.
- Wash regularly pet bedding at 60°C (and other fabric that the pet lays on)
- Discard the faeces properly outside the periphery of your pet's reach
- Keep regular monitoring on shedding of worms in faeces and on beddings of your pet
- Vacuum floors, skirting and furniture regularly (to break the flea lifecycle, worms landed on floor with poop – and empty your vacuum cleaner after)
- Use a flea spray for bedding and furniture
- Groom your pet regularly so you can spot any early signs of infestation with fleas

Conclusion

Even if your pet might not leave the house, worms and fleas could readily enter on the clothing and bags of other pet owners, as well as on your own clothes and shoes, if you visit a friend who owns a pet and there are worm eggs in the faeces or worm shreds on the floor nearby. Regular deworming treatments for your pet are crucial, especially if there are kids living with you. Due to their immature immune systems, puppies and kittens are particularly vulnerable to worms and skin issues. Pet owners can deworm their pets at home as well, but it is always advised to visit your veterinarian first to receive the best guidance possible because every worming scenario is unique. It is usually preferable to first visit your veterinarian for the best method of treating and preventing worms because every pet's situation is unique with variations in breed, age, and health concerns. Regular and frequent flea, tick, and worm treatment is the best method to keep your pet safe.

Avoidance is far preferable to cure. Deworming your pet on a regular basis is cheap, and it's better to be safe than sorry. It will make your indoor pet happier and healthier.



DNA fingerprinting and wildlife forensics

Suruchi Sharma*¹ And Sahil Sharma²

¹M.V.Sc. Veterinary Biochemistry DGCN COVAS, CSKHPKV, Palampur,

²M.V.Sc. Animal Nutrition DGCN COVAS, CSKHPKV, Palampur

<https://doi.org/10.5281/zenodo.7808191>

Abstract

Illegal wildlife trading has been identified as a global threat to society's security and the sustainability of biodiversity. It welcomed the tight laws governing wildlife protection. In the last 20 years, forensic science has advanced quickly, thanks to successfully developing branch of "wildlife forensics". Enforcement of legislation pertaining to wildlife conservation is increasingly aided by investigations into wildlife crimes. The latter of two approaches—morphological study and molecular analysis—was shown to be the most successful approach for addressing such problems. The primers created for conserved regions on the genes of the mitochondrial genome have a wide range of applications in dealing with DNA forensics for animals.

Keywords: DNA fingerprinting, mitochondrial genome, primers, wildlife

Introduction

The stealing, trading, exploiting, or possession of the world's wild flora and fauna in violation of national and international regulations is referred to as wildlife crime. These crimes are committed all around the world and present a significant difficulty for law enforcement. Transporting wildlife as part of illicit international trade may have a serious impact on other factors, such as the spread of illness and the introduction of invasive species. The livelihoods and resources of the populace are also impacted by the illicit trade in plant and animal products. Also, it poses a threat to the dwindling numbers of endangered species. The delicate balance of nature in ecosystems may be disturbed by selective harvesting of wild species.

Falsifying wildlife items for financial benefit is a criminal activity that is outlawed by law, along with the unlawful trading of endangered species, wildlife poaching, and cruelty to wild and domesticated animals. Common examples of wildlife crime include the poisoning and persecution of animals, the trading in endangered species' products, like tiger skins for Oriental or Chinese medicine, and the poaching of protected species, like rhinos for their horns. So, a key driver of illicit hunting, a serious problem for wildlife management, is desire for the many parts and products produced from wildlife. When animal products are marketed on common trade platforms or through online marketing, it becomes more difficult. The biggest obstacles to combating wildlife crime are ornamental, superstitious, and other traditional uses of wildlife body parts. The most efficient way to correct the precise wildlife infraction is to identify the species from the available biological material. Wildlife forensics, which deals with identifying the species from available biological traces, has developed into a crucial subfield of forensic research. In the last ten years, wildlife forensics has expanded quickly and offers a huge potential for biodiversity conservation. When the morphological feature is present in the material that was taken, the analysis of the morphological traits of the biological material that was taken is the fastest way to offer the results. In order to verify the source of the origin of unidentified case samples, morphology compares the morphological characteristics of hair and the morphological characteristics of bones to recognised reference specimens. As a result, morphological characterization is somewhat constrained when analysing an unknown sample without access to reference material that is still intact from the source origin (Gupta 2018).

Hair morphology

Primary guard hairs, secondary guard hairs, and fur hairs, often known as underfur and overhair, are the different types of hairs. Of all the hair types, guard hairs are the thickest, straightest, and biggest. Shield hairs are another name for it, and there are two categories: primary and secondary. The basal region is thinner and more flexible than the medial and distal sections in both primary and secondary guard hairs. The primary guard hairs are a tiny bit longer than the secondary guard hairs. The species-specific characteristic is present in the bigger or principal guard hairs, which are particularly helpful in identifying a species. Guard hairs are superior to under hairs in length, softness, and quality. Their lengthwise thickness is nearly constant. They are not chosen for identifying species since they have limited diagnostic value. For investigation, they required



high-resolution microscopy, such as SEM. Hair on one side is longer than the other. They primarily have a circular cross section and aren't used to identify species. Vibrissae are mostly sensory, stiff, and big. They may also be referred to as sinus hairs, tactile hairs, or whiskers. They are the widest at the base and gradually narrow as they approach the tip. Certain mammals, including domestic and wild pigs, have bristle hairs. These hard, thick, and uniformly sized hairs have bristles along their whole length. They can be recognized by the presence of bifurcated or trifurcated tips and by the presence of a thin medulla.

Hair characteristics for species identification

The biological sciences have made extensive use of morphological characteristics such the microscopic hair character for dietary preferences, prey-predator relationships, and the identification of mammals living in dens or trees. Also, it has been applied to cases involving wildlife offences involving furry hides, Tibetan antelope-wool shawls, and paintbrushes manufactured from mongoose and cat hair. Since more than a century ago, many people have utilized hair to identify species. The hairs of Indian animal species have also been the subject of numerous research. As a result, it became clear that we needed a quick and reliable way to identify species from hair. A method for identifying species on the basis of a single characteristic of a hair could not be created due to the variation of the cuticular pattern over the length of a hair and among hairs from different body sections. As a result, a comprehensive strategy that incorporates all the traits as well as the external characteristics was established for species identification. There is no fast cut to reaching a conclusion while writing an inquiry report; microscopic analysis must be used as the foundation. When a veterinary expert from a veterinary medical college determined the species based on the readily apparent physical trait, it caused identification issues in one instance. DNA typing was used to find the solution.

Infrastructure setup

It is possible to examine hair under a microscope to determine the species. A decent compound microscope with a 100X to 400X magnification range is the main piece of equipment needed. The microscope can also be used to examine underfur if 1000X magnification is added to it. A digital/CCD camera and a computer with a color printer must be mounted on the microscope. It is essential that the computer have a decent graphics card capacity because hair comparison requires comparing a lot of photographs. To prepare a hair slide, you also need a microscope,



microscopic slides, cover slips, tweezers, glassware (Petri dishes, beakers, glass rods), gelatin, and methylene blue.

DNA wildlife forensics

DNA forensics, also known as molecular forensics or DNA wildlife forensics, is a critical component of wildlife crime investigation. DNA extraction, PCR amplification, DNA sequencing, and sequence verification are only a few of the fundamental procedures that make up DNA typing. The various mitochondrial DNA (mtDNA) regions form the basis of effective molecular markers for phylogenetics and wildlife forensics. With only 37 genes and only roughly 16,600 base pairs, the mtDNA can be regarded as the smallest chromosome. It comes from the mother in the vast majority of species. It serves as a cornerstone of phylogenetics, a method used by biologists to determine the evolutionary history of different species. The selection of conserved primers was based on the fact that, unlike nuclear DNA, mtDNA is passed down from mother to child and is not involved in the phenomenon of DNA crossing over, making it one of the purest forms of DNA. Additionally, conserved primers can be used in PCR amplification from the template DNA of the vast majority of species without knowing the identity of the victim animal. Hence, using universal primers reduces the researcher's work. 12S rDNA, 16S rDNA, cytochrome b, and control region (CR) are the most extensively used mtDNA markers in descending order of similarity; as a result, the 12S rRNA gene is largely conserved and the CR is very varied. To determine the precise, identify of the source species, the DNA sequence derived from the case property can be compared with the appropriate database. In cases involving Asian elephants, *Elephas maximus*, the gender-specific markers are also helpful in determining the sex of the decomposing carcass in order to determine the individual's cause of death. If the primary suspect species is likely to be known, species-specific primers may occasionally be employed for the confirmation of the species.

Application of DNA Typing in Wildlife Forensics

The routine use of DNA typing in wildlife crime investigation has been successful. It turns out to be an incredibly sensitive process because there are several mitochondria in a single cell, making it simple to amplify from little amounts of biological samples that have degraded. This procedure helped to clearly identify the undetectable biological samples that were taken from the wooden cutting board. Also, the suspect made an effort to deceive the investigative team by deliberately introducing samples of legal domestic chicken (*Gallus gallus*) into the crime scene.



Analysis of the DNA sequences acquired from the minute biological byproduct of wood-chopping could be used to prove who committed the crime. A peafowl (*Pavo cristatus*), which is listed as a Schedule-I protected species in the Wildlife (Protection) Act, 1973 of India, was the biological remnant, according to DNA testing.

The Himalayan black bear (*Selenarctos thibetanus*) and American Beaver's processed and dried internal organs have also been utilized to identify the species (*Castor canadensis*). Throughout the market, a number of phoney wild items, like tiger claws and skin, were also traded. By employing DNA typing, such bogus objects can be easily distinguished from the genuine ones. DNA analysis is used to identify the species of deer from the antlers. However, in the current situation, it has been difficult to identify the species from tanned skin products, including snake skin, which can be assessed by morphological traits such cuticular features, etc.

Application of Wildlife DNA Fingerprinting in Dealing Wildlife Offense

Microsatellite markers are non-coding repetitive DNA segments also referred to as short tandem repeats (STR) or simple sequence repeats (SSR). It is a brief motif that repeats 2–6 nucleotides in the eukaryotic and prokaryotic genomes. In kinship, demographic, and other research including marker-assisted selection and fingerprinting, it is a codominant marker. Microsatellites experience a higher rate of mutation than other neutral areas of the genome, which is the primary cause of their variability. During the recombination process at the meiotic stage, mutation is also absorbed into the STR region. Because of repeating sequences, the distribution of genomic microsatellites is linked to recombination sites. The use of microsatellite analysis for forensic research gains popularity around the middle of the 1990s. It is frequently used for genetic profiling, also known as DNA fingerprinting of people. Shorter repeats commonly experience selective allele amplification, PCR artefacts, and PCR stutter. Longer repeats, on the other hand, experience degradation and have trouble amplifying during PCR. Tri- to pentanucleotide (3-5 nucleotide) repeats are the most appropriate microsatellites for forensic examination because they provide error-free data and can withstand deterioration (Gupta 2018).

A person's or a deceased person's DNA fingerprint can be compared to that of their biological relations. This means that it has enormous potential for dealing with animal forensics. It has been used for human assassination since it was first introduced to forensic science. It was subsequently developed for the investigation into wildlife crimes.



Scope

Dealing with wildlife forensics is severely constrained by the absence of a reliable wildlife database. By research and development to strengthen DNA databases for endangered species, it can be supplemented by the creation of a trustworthy database for the entire spectrum of wild species. For such research and development, known biological samples from a known carcass of wildlife from the reserve forest must be used; as a result, forest officials, including the patrolling party, must make an attempt to regularly collect the known biological samples. This section has been broken into two parts, namely, what not to do and what needs to be done, due to the frequent errors made by enforcement authorities.

What not to do

The most crucial steps in forensic investigation are biological sample collection, preservation, and transmission. Enforcement agencies unknowingly make certain common mistakes as a result of improper sample collecting and storage expertise. These agencies make contact with a local veterinary officer for the preservation and packing of detained biological samples because the sample that was seized is probably from an animal species. It has frequently been noted that veterinary professionals use formaldehyde/formalin to preserve such biological material. Since it has been determined that samples maintained in formalin or formaldehyde cannot be used to extract DNA with a 400–500 bp PCR amplifiable quality, formalin preservation of samples should be avoided. Several DNA forensic labs won't take any biological samples that have been formaldehyde-preserved or exposed to it.

What needs to be done

When a crime is discovered, it would be challenging to gather all the necessary materials for the sample collection. Hence, a sample collection kit can be kept on hand for handling crime scenes and collecting biological evidence in order to prevent last-minute mistakes.

Conclusion

Illegal wildlife trading has been identified as a global threat to society's security and the sustainability of biodiversity. It invited stringent rules protecting wildlife. Wildlife forensics, an emerging discipline of forensic science, has flourished over the past two decades. Enforcement of legislation pertaining to wildlife conservation is increasingly aided by investigations into wildlife crimes. The latter of the two approaches—morphological study and molecular analysis—has been



shown to be the most successful approach for addressing these problems. In the context of dealing with wildlife DNA forensics, conserved primers play a key role. These primers were created using a variety of conserved areas on mitochondrial genome genes. As a result, using morphological analysis, DNA typing, and genetic profiling is now necessary to cope with the rising number of animal offenders.

References

S K Gupta. Application of DNA fingerprinting and wildlife forensics, DNA fingerprinting: advancements and future endeavors, (2018) pp 77-87



Keeda Jadi is said to be used as a natural steroid

Harish Kumar*, Julie D Bandral, Monika Sood and Duwa

Post Harvest Management

Faculty of Horticulture

Sher-e-Kashmir University of Agricultural sciences and Technology-Jammu (J&K)

<https://doi.org/10.5281/zenodo.7808449>

The Indian Himalaya area is referred described as a unique marketplace of herbal resources, due to its rich biodiversity. Important aromatic and medicinal species grow in this area and have a variety of traditional uses. A highly significant folklore medicine called as *Keeda jadi*, *Keeda ghaas*, *Yarsa gumba* etc. is widely found in the alpine regions of the Indian Himalaya, mostly in Arunachal Pradesh, Himachal Pradesh and Uttarakhand commonly at the altitudes of 3500-5000 m. *Hepialus armoricanus*, a small moth larva and *Cordyceps sinensis* a parasitic fungus is combined in this entomo-fungal organism. The most well-known use of cordyceps in medicine is to improve sexual and physical stamina. It has long been used to treat heart disease patients and has also been discovered to enhance liver, kidney and lung functioning. Asthma, renal injuries, bronchitis, cough,



respiratory tract resistance, blood pressure, weakness, immunity strengthening, lung malfunction and irregular menstruation are among the circumstances for which cordyceps sinensis is used. It is also used to prepare formulations that are energizing and revitalizing.

Cordyceps sinensis

Many bioactive components of Cordyceps sinensis have been extracted including nucleoside, polysaccharide, sterol, protein, amino acid and polypeptide.

Composition of Cordyceps

Amino acids present at concentrations of more than 5.00 mg/g were **lysine (15.06 mg/g)**, **glutamic acid (8.79 mg/g)**, **prolin (6.68 mg/g)**, **threonine (5.99 mg/g)**, **arginine (5.29 mg/g)** and **alanine (5.18 mg/g)** in the fruiting body.

Health benefits of Cordyceps sinensis

Keeda Jadi, also known as Himalayan Viagra, is a rare and valuable herb found in the high-altitude regions of the Himalayas. It is one of the most expensive herbs in the world due to its alleged benefits as a natural steroid.

In traditional medicine, Keeda Jadi has been used for centuries to treat a variety of ailments including impotence, asthma and rheumatoid arthritis. It is said to boost testosterone levels and improve overall physical performance, making it popular among athletes and bodybuilders. Recent studies have shown that Keeda Jadi contains phytochemicals such as alkaloids, flavonoids, and saponins, which possess anti-inflammatory, antioxidant, and immunomodulatory properties. These properties make Keeda Jadi a potential treatment for many modern health problems such as joint pain, fatigue and stress. The unique appearance of Keeda Jadi, a fungus-like organism found growing on remote Himalayan caterpillar species, adds to its mystique and rarity. However, the increasing demand for Keeda Jadi has led to over-harvesting, and some experts warn that the plant is at risk of extinction. Despite its potential benefits, the use of Keeda Jadi as a natural steroid has not been fully researched, and its efficacy in this regard remains unproven. Additionally, the high cost and rarity of the herb make it inaccessible to most people.

- 1. Boosts Energy:** Cordyceps sinensis is known to stimulate the production of ATP (adenosine triphosphate) in the body, which is responsible for providing energy to cells. It works by increasing oxygen uptake and improving the efficiency of the respiratory system, making it handy for athletes or those who require additional stamina.



2. **Supports respiratory health:** Cordyceps sinensis has traditionally been used to manage respiratory conditions such as bronchitis, asthma, and coughs. Studies show that its anti-inflammatory properties may help relax and open the airways, easing breathing, and improving overall lung function.
3. **Immune modulator:** Cordyceps sinensis is considered an adaptogen, a natural substance that helps the body balance its response to stress. Animal studies show that it boosts the immune system by increasing the number of white blood cells.
4. **May Help Manage Diabetes:** Some studies suggest that Cordyceps sinensis can help regulate blood glucose levels. It is believed that it may mimic the action of insulin, a hormone that regulates blood sugar.
5. **May have anti-cancer properties:** Some studies suggest that Cordyceps sinensis may benefit those with cancer. It is known to have antioxidant properties that help protect cells from damage and may slow the growth of tumors.

It is important to note that these health benefits are based on limited scientific evidence, and more research is needed to fully establish Cordyceps sinensis's effectiveness in treating various health conditions. As such, it is crucial to consult your healthcare provider before taking any supplements, especially if you have underlying conditions or are taking any medications. In conclusion, Keeda Jadi is a rare and valuable herb found in the high-altitude regions of the Himalayas, hailed for its potential as a natural steroid. While traditional medicine has used the herb for centuries, its modern applications require further research. Its rarity and environmental impact make its use controversial and alternatives to Keeda Jadi may prove to be more sustainable and accessible.



Immunosuppression and Cancer

Suruchi Sharma*¹ And Sahil Sharma²

¹M.V.Sc. Veterinary Biochemistry DGCN COVAS, CSKHPKV, Palampur

²M.V.Sc. Animal Nutrition DGCN COVAS, CSKHPKV, Palampur

<https://doi.org/10.5281/zenodo.7808536>

Abstract

Cancer is defined as an unregulated and abnormal cell proliferation that has been around since around 120,000 years ago. Its uncontrolled development is caused by the cell mechanism degrading as a result of chemical, radiation, or genetic causes. Our bodies' immune systems aid them in fighting off cancer cells that spread unchecked and harm other tissues. The immune system's reaction to antigens can, however, occasionally be suppressed. In some surgical procedures, such as transplantation, immunosuppression can be created by the use of medications or triggered by biological processes. Due to the suppression of cancer and the inability of the immune system to fully express the reaction, certain cancers are tolerated by the immune system while others do not receive any protection. In this scenario, the question is whether the immune system's response mechanism can be identified by utilizing immunosuppressive medicines in this manner.

Keywords: adaptive immunity, cancer, immunosuppression, innate immunity

Introduction

The World Health Organization (WHO) and the American Cancer Society (ACS) database provided data for 2018 showing that there were roughly 22.4 percent male and 18.2 percent female cancer patients in the 0-74 age range. The three most prevalent malignancies in 2018 are lung cancer (2.09 million cases), breast cancer (2.09 million cases), and prostate cancer (1.28 million cases). The most fatal malignancies are those of the lung, liver, and stomach. Major cancer types were chosen, with lungs, breast, colorectal, stomach, prostate, and liver accounting for around 55% of the global incidence in 2012. Even though the precise process by which cancer develops is unknown, it is



understood that the cells that require apoptosis continue to proliferate uncontrollably and more quickly. Human genome project data suggests that cancer is genetically inherited and is characterised by mutations. Similar to how it works with any disease, the immune system has tight interactions with tumours throughout the entire cancer phase. Cancer cells and immune cells coexist in a relationship that both inhibits and encourages the formation of tumours. This trait is currently thought of as a differentiating trait. Cancer's traits were first recognised in 2000. The continuation of proliferative signalling, resistance to cell death, avoidance of immunosuppression, and activation of invasion and metastasis are all dependent on these traits. In 2011, two crucial features were added in addition to these features. Two of them include reprogramming energy metabolism and guarding against immune system deterioration. Cancer is distinguished by immunosuppressive T lymphocytes, which offer promise for treatment by eradicating cancerous cells. The immune system's capacity to either promote or treat cancer is related to immunosuppression. Immunosuppressive medications and other techniques have been applied in animal experiments to establish a particular immunological state. With epithelial-induced cancer making approximately 75% of the cases, immunosuppressive medications have only recently been used to diagnose cancer. Pediatric children with all of these issues are unable to grow and develop normally due to immunosuppressive medications. Prednisone, azathioprine, and cyclosporin A are all used together as part of the current immunosuppressive therapy paradigm. Excessive stress is also known to harm the immune system and cause cancer. Noradrenaline and adrenergic receptors have been shown to have an impact on tumour cells, and psychosocial stressors have a direct impact on the formation of tumours, according to research by psycho-immunologists. A ray of hope in the fight against cancer is immunotherapy, which was created by turning off the immunity mechanisms. In many situations, immunotherapy has already taken the place of conventional cancer therapies. Because that return rates for tumours range from 20 to 80%, it was not regarded as a curative treatment for all malignancies, although there has been significant advancement as long as a return occurs (Yurkeli and Erbas, 2021).

Cancer

The unchecked proliferation of cells with aberrant growth traits is referred to as cancer. It can be brought on by bacteria, viruses, radiation, inheritance, environmental factors, eating habits, and chemicals, among other things. According to studies, the dynamic alterations in the genome play a role in the development of cancer. There are two types of tumor cells: benign and malignant. The



fact that benign tumors are localized to the location in which they are located defines them. Malignant tumours can infect lymph tissue or blood arteries in addition to the location in which they are detected. There are various phases in the genesis of cancer, and four to seven age-related stochastic malignancies have been identified in the human population. Cancer produced by external factors is more frequent than cancer that is inherited. Predisposition is brought on by the hereditary transmission of the problem in suppressing genes that control tumour formation and the make-up of environmental factors. Point mutations and other minor alterations appear to cause observable degradation in tumour cells. Researchers are still examining if certain diseases are predisposed to by genes. Although being genetically passed down from our ancestors, cancer has emerged as one of the most prevalent diseases of the modern period due to the impact of numerous environmental variables. The metabolism of cancer cells must be rearranged for them to develop and proliferate. The effect of changed metabolism is an increase in glucose consumption and lactate fermentation. This process goes on in the presence of mitochondria. It can be explained by the propensity of malignancy to glucose. This occurrence is known as the "Warburg Effect." For the past ten years, additional research has been done on this occurrence, which has been well-known for more than 90 years. The activation of cancer cells' immune defence mechanisms and immunosuppressive networks is greatly aided by tumour glycolysis. Current research has demonstrated that anti-tumor cells are effective against cancer cells. It is believed that metabolism and immune evasion are interdependently involved in the progression of cancer during metabolic reprogramming.

Immune system and Cancer

Immune defenses are employed by the body against antigens. Many proteins and cells make up the immune system. Innate immunity and acquired immunity are the two categories. Innate immunity is responsible for the initial evolution of the immune system. Humoral immunity and cellular immunity are the two subtypes of acquired immunity. In cellular immunity, the body fights intracellular antigens, whereas humoral immunity engages antigens outside the cell. The immune system eliminates cancerous cells before they develop into a threat. This condition is known as cancer immuno-surveillance. To achieve this, regular cell homeostasis and carcinogenesis inhibition are used. Tumor cells are no longer passive targets for the immune system, according to immune surveillance theory. Studies show that the suppression of the immune system has resulted in some circumstances, cancer. These two features of the immune system led to the creation of the phrase



"immune regulation." The term "cancer immuno-surveillance" is abbreviated as 3E. The stages of these processes include elimination, equilibrium, and escape. If the tumour cell progresses through these stages, it will grow. NK cells, a key component of the immune system's immunological surveillance, are very significant. Effector lymphocytes called NK cells assist in the elimination of malignancies. They can accomplish this via interacting with and enhancing immune responses, using cytolytic granules and death receptors, inducing the generation of cytokines, and employing cytolytic granules and death receptors. NK cells have been demonstrated to exhibit leukaemia activity against the vaccination in the context of hematopoietic stem cell transplantation, and they are crucial to the therapeutic effectiveness of antibodies. Yet, tumour cells have a higher expression of adaptive immune components such CD4 + auxiliary T cells, CD8 + cytotoxic T cells, and antibodies. T cells that are efficient and successfully get through the endothelial barrier are directed to the tumour stroma rather than the target tumour cell. Immunosuppressive signals could very well be present here. At this stage, tumour cells may be completely eliminated, and clonal variations may appear. Clonal variations act immune-suppressively to decrease their immunogenic characteristics and increase resistance. These events provide a description of the immunoediting theory. Since the earliest stages of carcinogenesis, the immune system and tumour have been interacting and changing one another. Either one side wins in this process, or it becomes chronic and the equilibrium lasts for years. The most frequent cause of cancer in those with immunodeficiency is viruses. There have been reports of malignancies connected to the human papillomavirus (HPV), Kaposi's sarcoma-associated herpesvirus (KSHV), and lymphomas connected to the Epstein-Barr virus (EBV).

Natural immunity to cancer

The body's initial line of defence against any antigen is natural immunity. Natural killer cells (NK), neutrophils, and macrophages are examples of innate immune cells. These cells work in conjunction with T cells. Oncological viruses also influence normal immunity, rendering the tumour site unprotected. The development of tumours is inhibited by natural immunological cells, according to extensive research on cancer immunity. It has been established that lymphocytes that express antigen receptors and the recombination activating gene 2 (RAG-2) are essential for the immunosuppression of cancer. Mice lacking RAG-2 have been found to be unable to reorganize lymphocyte antigen receptors. Natural killer T (NKT) and NK cells take involvement in cancer immunosurveillance as well.



Adaptive immunity and cancer

Signals of danger can be detected by the immune response's kinetics. The adaptive immune system can be strengthened when a signal of risk is received. By administering cyclophosphamide and fludarabine to T cells, it was possible to detect the adaptive immune system's beneficial effects on chemotherapy. An ongoing interaction exists between innate and acquired immunity. Adaptive immunity has been demonstrated to be suppressed by inflammatory stimuli, even if immunotherapy is anticipated to increase this synergy.

Immunosuppressive mechanisms

A hormone based on steroids called glucocorticoids is used to treat both acute and chronic disorders. It is the anti-inflammatory, immunosuppressive, and anti-allergic drug that is administered the most frequently. Recent research has shown that the immunosuppressive effect of glucocorticoids may be mediated via the release of target cells from leukocytes. Yet, immunosuppressive mechanisms function as a result of immunological modifications brought on by surgical operations, and in this instance, glucocorticoid release takes place. Nerve end releases of adrenaline and noradrenaline also depress the immune system. When these effects interact with immune cell receptors, immunosuppression results.

Interleukin-1 and TGF-beta, which are released by tumours into the fluid of tumour cysts, have been found to be effective at reducing lymphocyte activation. There are recognized impacts of glioblastoma on the microenvironment's immune response. There is a propensity for modulator use to prevent immunosuppression.

Cancer immunotherapy

With the advancement of technology, cancer therapy has improved recently. Currently utilized therapies include chemotherapy, surgery, radiation therapy, and immunotherapy, but no permanent cure has yet been found. The immune system is strengthened by the cancer-fighting therapy known as immunotherapy. By binding to cancer cells and inhibiting particular proteins (immune control points), monoclonal antibodies alter therapeutic tactics and halt uncontrolled proliferation of cancer cells. Despite this, not every patient saw success. Due to T cells' function in signaling, anti-tumor immunity is reduced as a method. The CTLA-4 ligand reduces T-cell responsiveness by inhibiting activating signals. It functions as a regulatory T-cell as well. The anti-



tumor effects are stopped as a result. At this point, immune suppressive agents are used to create an immunotherapeutic therapy procedure. There are three different categories of immunotherapeutic antigens that elicit an immune response against tumours. These include cancer-testis antigens, antigens associated to tumours, and tumor-mutated antigens. Different tumour tissues express tumor-related and cancer-testis antigens in different ways. These cells were able to respond to their own antigens in autoimmunity by reducing central tolerance. Effects from antigen expression in healthy tissues have been observed. Neo-antigens, or tumor-mutated antigens, arise through somatic mutation and are tumor-specific. The most promising immunotherapy targets are these antigens. The emergence of next-generation sequencing (NGS) technology has made it possible to search the genome for neo-antigens. In studies on the immune system's function in cancer, T cells are crucial. T cells with anti-CTLA-4, anti-PD-1, and anti-PD-L1 antibodies identify the control mechanism (programmed death-ligand 1). The most recent clinical trial of immune checkpoint treatment, which included blocking antibodies against cytotoxic T cells against PD-1 programmed to CTLA-4, was successful. It was discovered that these activities caused the death and modification of cancer cells (Yurkeli and Erbas, 2021).

Immunosuppressive drugs and cancer

During transplant surgery, immunosuppressive medications are frequently used to suppress immunity permanently or until the body takes the organ into the tissue. At the same time, it's crucial to comprehend how immunosuppressive medications affect the immune system in order to treat immunological illnesses. Cyclophosphamide is an effective immunosuppressive medication, as an example. It is frequently employed in bone marrow and blood transplantation. It was created to target the cancer cell, however it was discovered to be ineffective against the phosphamidases of the cancer cell. Aldehyde dehydrogenase has been discovered to have effects on a variety of cellular expressions, the anti-cancer therapeutic index of cyclophosphamide, and immunosuppressive qualities. Cancer-associated fibroblasts (CAFs) are typically the most noticeable elements of the microenvironment in the form of solid tumours. It is well recognized that tumour cell development stimulates angiogenesis, which fuels inflammation and promotes malignancy. In addition to the inflammatory microenvironment, tumours have a tendency to evade the immune system and suppress the immune system. By modifying the microenvironment around the tumour, CAFs influence immune control. They enter tumours to obtain immune cells. A paucity of T-cell infiltration in the



tumour microenvironment in cancer patients with reduced immune cytotoxicity suggests negative implications. Moreover, prednisone, ATG (Anti-Thymocyte globulin), and azathioprine—all immunosuppressive drugs—accelerated metastases in mice. This leads to the hypothesis that immunosuppression promotes the growth and spread of tumours that were previously underdeveloped.

Conclusion

The immune system's ability to be suppressed by immunosuppressive drugs is done so through cellular and molecular pathways. Due to the presence of suppressive cells and secretions in the tumour microenvironment, the immune system in cancer disease is unable to completely carry out its functions. Despite the fact that the processes seem to support the anti-tumor property, they have a negative impact on cancer treatment by creating a favorable environment for tumour development. This adverse impact may cause patients to unexpectedly pass away while pretending to be recuperating. Recent studies have demonstrated the potential of immunotherapeutic strategies and immune-suppressing agents in the treatment of cancer. Current research focuses on immunological development against oncological viruses and immuno-cancer vaccines. Chemo preventive and control agents are non-toxic substances that reduce or completely remove immunosuppression in the tumour microenvironment. These substances will aid in the development of treatment plans and the understanding of how cancers resist therapy.

References

A Yurekli and O Erbas. Cancer and Immunosuppression, *Journal of Experimental and Basic Medical Sciences*, (2021) vol 2(2): pp 116-121



खुर पक्का मुह पक्का / चपका / खुरपा

डॉ. अनिता राठौड़

पशु व्याधिकी विभाग

पशु चिकित्सा एवम् पशु विज्ञान महाविद्यालय, नवानिया, उदयपुर

<https://doi.org/10.5281/zenodo.7818423>

सामान्यत

इस बीमारी को चपका या खुरपा कहते हैं | यह विभक्त खुर वाले सभी पशुओ जैसे गाय, भैंस, भेड़, बकरी, ऊंट व सूअर में पायी जाती हैं | इस बीमारी से पशुओ में दूध का उत्पादन कम हो जाता है | इससे बाल झड़ते हैं तथा चमड़ी खुरदरी हो जाती हैं | यह रोग विषाणुजनित होता है | इनकी बहुत तरह की किस्मे पायी जाती हैं जैसे कि ओ, ए, सी, एशिया 1, 2, 3, सैट 1, 3 पायी जाती हैं | यह बिमारी पशु के एक जगह से दूसरी जगह जाने से भी फैलती हैं |

यह बिमारी पशु के नजदीक जाने, पानी, घास, बर्तन, दूध, हवा तथा लोगो के सम्पर्क में आने से भी होती हैं | इस बिमारी के विषाणु सबसे ज्यादा लार, मुँह, खुर व फफोलो में पाये जाते हैं | यह विषाणु घाव, आंत, मुँह, जीभ, खुर के बीच की जगह आदि के द्वारा स्वस्थ पशुओ में जाते हैं तथा 5 दिन में इसके लक्षण पैदा होते हैं |

रोग के लक्षण

- पशु को बहुत तेज बुखार (104 – 106°F) आता है |
- पशु खाना पीना बंद कर देता है |
- दूध का उत्पादन कम हो जाता है |
- मुँह से लार गिरने लगती है |
- पशु के मुँह के अन्दर, जीभ, होठ, मसूड़ो के अन्दर तथा खुरो के बीच छाले पड़ जाते हैं तथा छालों के कारण पशु खाना पीना बन्द कर देते हैं क्योंकि बाद में यह छाले फूट जाते हैं |
- पशु लंगड़ाकर चलता है क्योंकि खुर में छाले हो जाते हैं |
- पशु में गर्भपात हो जाता है तथा बछड़े की मौत हो जाती है |
- पशुपालक को आर्थिक रूप से बहुत नुकसान हो जाता है |



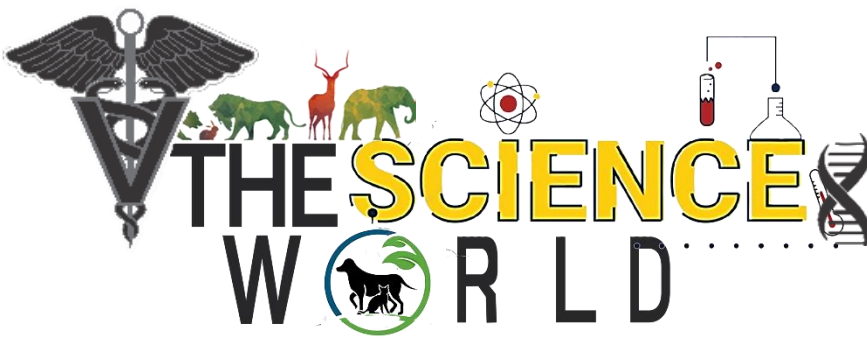
रोग का उपचार

- इसमें बीमारी के लक्षण दिखने पर कुछ इलाज किया जा सकता है |
- एंटीबायोटिक दवाईया दी जाती हैं |
- छालों पर फिटकरी या पोटेश का पानी लगाया जाता है |
- मुँह में बोरोग्लिसरीन तथा खुरो में Antiseptic लोशन या क्रीम का उपयोग किया जा सकता है |

रोग के बचाव

- इससे बचने के लिये साल में दो बार Polyvalent Vaccine के टीके लगवाने चाहिए |
- बछड़ों में पहला टीका 1 महीने की आयु में तथा दूसरा 3 माह की आयु व तीसरा 6 महीने की आयु में लगवाना चाहिए | इसके बाद नियमित टीका लगवाना चाहिए |
- स्वस्थ पशुओं को बीमार पशुओं से अलग रखना चाहिए |
- बीमार पशुओं के आने जाने से रोकना चाहिए |
- बाड़े को साफ सुथरा रखना चाहिए |
- मृत पशु को गाढना चाहिए |





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 482-493

Popular Article

Diagnostic Cytology in Veterinary Medicine

Sarjna Meena, Anita Rathore, Samita Saini, Manju, Sandeep Marodia, Sunil Jangid and Priya Saini
Department of Veterinary Pathology, Post Graduate Institute of Veterinary Education and Research, Jaipur
(RAJUVAS)-302031

<https://doi.org/10.5281/zenodo.7823437>

Phylogenetically ranging from invertebrates to marine mammals, cytology is a core diagnostic pathology service that uses specimens from domestic animals, laboratory animals, and foreign species. Cytology was first used to identify cancer and potential pre-cancers affections by George Nicholas Papanicolaou in 1928. The science of cells known as cytology, is used to distinguish between healthy, malignant and inflammatory cells. It is more widely accepted than other diagnostic techniques since it is quick, affordable, minimally intrusive and simple. It includes methods like centesis, fine needle aspiration, impression, scraping, swabs and catheterization for sample collection. Furthermore, squeezing, blood smearing, needle spreading and line smearing procedures are used in the preparation of slides. Cytology is so special and unique in that it can provide disease outcomes while the patient is still with us. This science is also widely used to diagnose both internal and external illnesses, including neoplastic alterations. In the case of neoplastic diseases, it is important to differentiate between neoplastic nuclei, neoplastic cytoplasm and neoplastic structures of different cells with their normal cells, as these features are abnormal in neoplastic diseases. A basic evaluation of the major pathologic process or processes such as inflammation, the presence or absence of infectious agents, hyperplasia, benign and malignant neoplasia, is made in this field after samples have been screened for quality. In many cases, depending on the sample's quality and the lesion's characteristics, a more precise diagnosis can be made (e.g., determining the etiologic agent or classifying a particular neoplasm) but this is not always the situation, in these cases, additional



testing (typically a biopsy with histopathology, molecular studies, or infectious agent culture) will be advised.

Branches of Cytology

Aspiration cytology

Several names are used to refer to this expanding method. The most well-known ones are FNA, specifically, Fine Needle Aspiration Cytology (FNAC), Fine Needle Aspiration Biopsy (FNAB) and Needle Aspiration Biopsy Cytology (NABC). These all refer to the same process of utilising a small needle to aspirate cellular matter in order to make a diagnosis. This method has been applied to both palpable and non-palpable lesions, two primary categories of body lesions.

Exfoliative cytology (body cavity effusion cytology)

The samples are made up of cells that exfoliate from superficial or deep mucosal or serosal surfaces. High numbers of immature (blast) cells such as lymphoblasts, can be found within a neoplastic effusion or as can epithelial cells (rarely spindle cells) that meet the necessary requirements for malignancy to be diagnosed as neoplasia.

Basic Cell Types

1. Non-inflammatory cells

According to specific cytological characteristics, cells can generally be divided into three groups, discrete cells (commonly known as "Round cells"), epithelial cells and mesenchymal cells. The evaluator can more easily determine the particular cell type present by classifying the cells into the primary group to which they belong. Even if a precise identification cannot be achieved, significant information can be learned, such as whether a cell type that is atypical for the tissue examined is present (e.g., epithelial cells in a lymph node aspirate).

Discrete cells (round cells)

Because they exist separately in tissues and are not adhered to other cells or the connective tissue matrix, thus discrete cells are a group of cells that share specific cytological characteristics. They are primarily hematogenous origin mobile cells. Normal lymphoid tissue aspirates, like those of the spleen and lymph nodes, produce cell populations with this distinct cell pattern. However, the majority of discrete cell cancers exhibit cytological features that are distinctive enough to enable a particular diagnosis. Mast cell tumour, lymphosarcoma (lymphoma), histiocytoma, plasmacytoma and transmissible venereal tumour (TVT) are the distinct cell cancers. Moreover, melanomas are a



master of mimicry, producing cell populations that can resemble distinct, epithelial or mesenchymal tissue.

Epithelial cells

Many cytological preparations frequently contain normal epithelial cells. The majority of surface scrapings and swabs contain surface epithelium, including columnar cells from transtracheal washes and squamous cells from skin scrapings, nasal or vaginal swabs and as the result of normal exfoliation (transitional cells from urine sediments). Neoplasms or hyperplastic proliferation can also give rise to epithelial cells.

Mesenchymal cells

The genesis of mesenchymal cells is connective tissue. Hematopoietic cells, which contain many of the cells referred to as "Discrete cells" are included in mesenchymal tissue because blood is a connective tissue. These hematopoietic cells are often categorised independently since their cytological appearance is so different from that of the other connective tissues. The term "Mesenchymal cells" is frequently used in cytology texts to refer to "Stromal" connective tissue cells.

2. Inflammatory cells

Neutrophils, macrophages, lymphocytes, and eosinophils are the four primary types of inflammatory cells. Because most clinicians have seen inflammatory cells in peripheral blood smears several times, they are more accustomed to their morphology and initially feel more confident identifying them.

Types of Cytological Techniques

Solid tissue sample collection techniques

Depending on the form and location of the lesion, the differential diagnosis list and the patient's disposition, the best sample techniques for cytology may change. Swabs, impression smears, scrapings, tape preparations, and needle aspirates are some sample types that can be used for cytological analysis. These different kinds of samples are obtained by using the various techniques described below

1. Fine needle aspiration techniques



The most effective and widely used technique for sampling proliferative masses and neoplastic lesions. As a general rule, the softer the tissue, the smaller the needle and syringe required to collect an acceptable sample from organs like the liver or spleen. Often recommend, using a 22–25-gauge needle and a 2-5 ml syringe for this technique. It is a helpful diagnostic tool for examining soft tissue masses including cutaneous lesions, lymph nodes and intra-thoracic or intra-abdominal masses and effusions from body cavities. The manoeuvre is simple to execute in a practise environment. An "Aspiration technique" or a "non-aspiration technique" can be used to take fine-needle aspirates.

Aspiration technique

Once the mass is stabilized between the operator's fingers, the fine gauge needle is inserted into the mass. When the needle is seated comfortably in the mass, negative pressure is applied to the plunger/syringe. Try and avoid redirecting the needle or moving it back and forth within the mass whilst vacuum (negative pressure) is applied as this generally results in increased blood contamination of samples. This procedure should be repeated at least 3–4 times at different angles within the lesion to obtain a representative cell population from the lesion in question. Smaller syringes attached to the needle offer the operator better control during the aspiration process, particularly when aspirating smaller lesions. A minimal amount of material within the hub of the needle is adequate and generally this is sufficient for cytological interpretation. Attempted further aspiration often leads to unwanted blood contamination. If blood is encountered during aspiration attempts, then the exercise should be ceased and repeated a little further away from the initial puncture site. Negative pressure should be released before the needle is removed from the mass and skin. Once the needle is removed from the syringe, air is drawn into the syringe and the needle is firmly reattached to the syringe.

Non aspiration technique (woodpecker method)

The non-aspiration technique is preferred for sampling of all masses or organs which are highly vascular (e.g., spleen, liver) in order to minimize blood contamination. Overall, the sampling procedure should take no longer than 5-10 s and several smears should be prepared. The non aspiration technique using a 'needle alone technique' is useful for obtaining samples from small lesions such as pustules. The non-aspiration technique with the syringe attached to the needle is used



here to sample the spleen of a dog with ascites and icterus under ultrasonographic control. Note the syringe is prefilled with air and is held between the thumb and forefinger.

2. Impression techniques

Skin ulcers, exudative lesions, surgically excised masses, and tissues from necropsies can all yield impression smear samples. It is important to imprint, clean, and reimprint ulcers. The tissue to be imprinted should first be cut in half to have a fresh surface in order to acquire impression smears from tissues collected at surgery or necropsy. The fresh area is subsequently blotted to remove as much blood and tissue fluid as possible (e.g., with a paper towel or a surgical gaze). A clean glass slide is then touched to the brand-new surface. No more smearing is necessary. On the glass slide, the tissue must not be moved, it must only be pressed down and raised immediately. The material is given time to air dry. Avoid rubbing the tissue on the slide since this can lead to cell rupture and nuclear stranding, which will distort the cellular shape. The most frequent issues with touch impressions are non-exfoliative lesions and insufficient specimen blotting. Less cells are gathered, bacterial contamination is more likely, and impression smears only collect cells from the surface of the lesion, which means they may not be typical of underlying pathology.

2. Swabs

Swabs are often only used in situations where other collecting techniques are impractical (e.g., ear canal, vaginal cytology, fistulous tracts). It is advisable to wet the swab with sterile saline if the area to be swabbed is dry. Moreover, a sterile cotton swab should be used to apply a smear on a glass slide if culture is to be performed. They are less beneficial when used to describe impression smearing.

3. Scrapings

In contrast to impression smears of comparable lesions, scrapings are utilised for superficial skin lesions and may be a better indicator of deeper abnormalities. First, gently wipe away any exudates or crusts that are on the surface of the lesion. Then, with a scalpel blade sample are then taken from the lesion's surface, transferred from the blade to a clean glass slide, smeared and let to dry naturally. Similar to imprinting, this technique can also be utilised when imprinting is predicted to produce insufficient numbers of cells for thorough evaluation (e.g., conjunctiva, mesenchymal neoplasia).



5. Tape preparation

A method for evaluation of skin disease is particularly for detecting *Malassezia dermatitis* and skin mites. A piece of clear, pressure-sensitive tape is placed on the skin lesion. The tape strip is removed and fixed on a microscopic slide containing a drop of blue (counter) stain.

Solid tissue slides preparation techniques

Slide-over-slide technique (“squash”) preparation

For the squash preparation, material collected by one of many techniques (e.g., aspiration or non-aspiration fine-needle biopsy, scrapings) is placed in the middle of a clean glass slide (smear slide). A second glass slide (spreader slide) is placed over the sample perpendicular to the smear slide. The sample will begin to spread out due to the weight of the spreader slide. Once the sample has begun to spread, the spreader slide is gently drawn across the sample slide, smearing the sample. One must be careful not to put any downward pressure on the spreader slide. Excessive pressure will cause cells to rupture. The slide-over-slide technique works well for spreading samples from nonfragile tissues (e.g., carcinomas). However, squash preparation tends to rupture excessive numbers of cells from more fragile tissues (e.g., lymph nodes). Once spread, the material is allowed to air-dry; No fixative is needed.

Fluid cytology (exfoliative cytology) sample collection techniques

Catheterization

Catheterization means collecting samples by performing various types of washes (e.g., bronchoalveolar lavage, transtracheal wash). Volume permitting, fluid aliquots should be collected into EDTA-containing tubes and sterile/plain tubes. Smears should also be made at the time of sampling. EDTA prevents coagulation and therefore allows for accurate cell counts to be performed when required.

Centesis

Centesis means aspiration of fluid or air from the body cavity by tabbing with aspirator, trocar, or needle. Sample is hold in the same manner as catheterization.

Fluid cytology (exfoliative cytology) slide preparation technique

Blood smear technique

The collected material is placed near one end of a glass slide (smear slide). The spreader slide is tilted to an angle of approximately 45 degrees, pulled backwards into the material and once



the material has dispersed along the width of the spreader slide, the spreader slide is smoothly, steadily and rapidly slid forward. The smear ends with a feathered edge of material. As a general rule, the more material placed on the specimen slide, the slower the spreader slide is slid forward and the more acute the angle between the spreader and specimen slide, the longer the smear will be. The blood smear technique has much less shearing force than squash preparation and causes less cell rupturing. However, blood smearing does not spread cells as well as using slide over slide.

Star fish preparation (needle spread) technique

A material collected by fine needle biopsy is placed in the centre of a glass slide and the needle is used to drag/tease the material outwards in multiple directions to produce a star/starfish shaped smear with multiple projections. Many areas of the smear will be too thick for evaluation, however, there is usually multiple cell monolayer regions present on the smear that should be acceptable for cytological assessment. This technique minimizes the amount of trauma to fragile cells and is useful if only a small volume of material is aspirated. It is used in both solid and liquid cytology slide preparation techniques.

Line smear's technique/role preparation

The line smear technique is useful for concentrating cells in a fluid sample when the sample cannot be centrifuged to make smears from the sediment. A drop of fluid is placed near one end of a glass slide (smear slide). A second slide (spreader slide) is placed on the smear slide at a 45-degree angle and backed up until it contacts the drop of fluid. Moderate downward pressure is applied, causing the nucleated cells to follow just behind the spreader slide (e.g., pulling out to end of smear). The spreader slide is then pushed forward as of making a blood smear, except a feathered edge is not created. After being advanced about two-thirds to three-fourths the distance required to make a smear with a feathered edge, the spreader slide is stopped and then lifted directly up. This creates a line at the end of the smear that has a much higher concentration of nucleated cells.

Cytological stains

Romanowsky-type stains (Wright's, Giemsa and Diff-Quick stain)

Romanowsky stains are inexpensive, easy to use and they are **readily** available to veterinary practitioners. They provide good nuclear **detail**; excellent cytoplasm detail and infectious organisms are readily **visualized**. In clinical practice, the most cost effective, quickest and **easiest** stain to use is the Diff-Quick stain.



Papanicolaou stains

Papanicolaou stains provide excellent **nuclear** detail and adequate cytoplasmic detail, however, they are time **consuming** and impractical for in-clinic usage. Supravital stains provide excellent nuclear detail but poor cytoplasmic detail and are typically reserved for evaluation of reticulocyte identification (peripheral blood smear) or for evaluating the presence of poorly granulated mast cells.

Microscopic evaluation

The light microscope is the basic tool that is used to observe objects **too** small to be seen with the unaided eye. Objects or specimens are **magnified** up to about one hundred times and as such could be observed **using** light microscope. The ability to distinguish between two objects **as** separate entities is referred to as resolution. The first objective or **lens** normally used in microscopic work is X10, Medium objective X20, **high** power objective X40 and oil immersion X100.

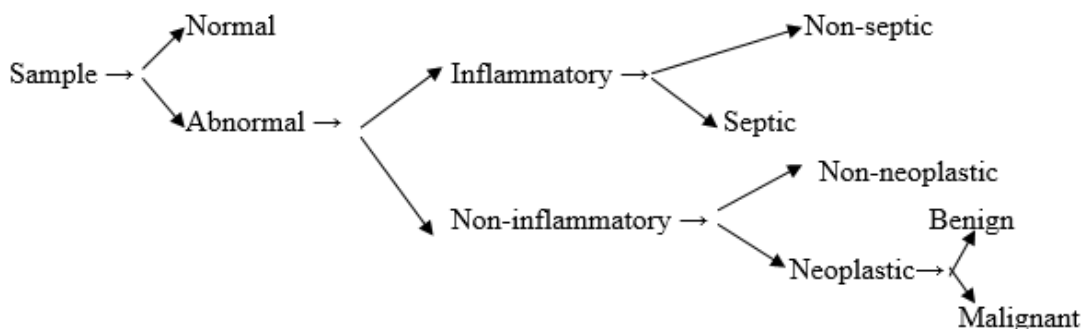
Applications of Cytology in the Diagnosis of Animal Diseases

Cytology is an inexpensive yet powerful diagnostic tool that allows for rapid diagnosis of many common diseases. There is great potential for application of cytological diagnosis to variety of veterinary and medical conditions. Some of most important application being applied in veterinary medicine has discussed below –

Cytological diagnosis of tumour

A uniform population of cells suggests the mass is benign, whereas variation in cells suggests malignancy. An important exception is lymphoma (lymphosarcoma), which consists of a fairly uniform population of lymphoblast, whereas lymphoid hyperplasia typically has marked variation due to the mixed population of small lymphocytes, lymphoblast, and plasma cells. Nuclear criteria of malignancy are considered diagnostic, whereas cytoplasmic criteria of malignancy are only supportive of malignant neoplasia. It is important to find more than three of the following nuclear criteria of malignancy in a few cells to many cells to call a mass malignant neoplasia. The cytological criteria of malignancy are basically based on nucleus and cytoplasm of cells under neoplastic transformation.





Easily recognized general and nuclear criteria of malignancy

CRITERIA	DESCRIPTION
General Criteria	
Anisocytosis and macrocytosis	Variation in cell size. With some cells > 1.5times larger than normal
Hypercellularity	Increased cell exfoliation due to decreased cell adherence.
Pleomorphism (except in lymphoid tissue)	Variable size and shape in cells or the same type
Nuclear Criteria	
Macrokaryosis	Increased nuclear size. Cells with nuclei larger than 10 u in diameter suggest malignancy
Increased nucleus cytoplasm ratio	Normal non-lymphoid cell usually has a N: C of 1:3 to 1:8 depending on the tissue ratios
Anisokaryosis	Variation in nuclear size. That is especially important if the nuclei of multinucleated cell vary in size.
Multinucleation	Multiple nucleation in a cell. This is especially important if the nuclei vary in size
Increased mitotic figures	Mitosis is rare in normal tissue.
Abnormal mitosis	Improper alignment of chromosomes.
Coarse chromatin pattern	The chromatin pattern is coarser than normal. It may appear ropy or cord – like
Nuclear molding	Deformation of nuclei by other nuclei within the same cell or adjacent cells



Prognosis of Neoplasms

Cytopathologic interpretations are helpful in prognosis of cancer in animals specially in urinary tract neoplasms, lymphoma, ovarian tumour, mammary gland tumour, horn cancer and tumours of reproductive tract.

Diagnosis of infectious diseases

It is helpful in diagnosis of various infectious diseases of animals, including bacterial and viral diseases e.g., infection in calves. One can demonstrate rotavirus antigen in desquamated cell in diarrhoeic feces.

Cytogenetics

Cytopathologic diagnostic procedures can be employed for chromosomal studies, including karyotyping and aberrations in chromosomes.

Other ancillary studies which could be used on cytological material

Basically, all ancillary studies can be done using cellular material obtained either from exfoliative or FNA technique. These include immunohistochemistry, flow cytometry, molecular pathology studies and electron microscopy *etc.*

Diagnostic Pitfalls

Diagnostic pitfalls can still occur and are usually due to -

Poor collection technique

This can occur when the appropriate slides or containers with appropriate fixatives are not used at the time of the procedure. This can be resolved by consulting with the pathology/cytopathology department for help.

Poor fixation

This is sometimes seen when there is no experience with cytopathology material preparation and collection. Communication with your pathologist is recommended.

Inflammatory changes

Sometime extensive inflammation may obscure cellular details and prevent appropriate interpretation. To avoid this problem, treating the patient and repeating the procedure afterwards is recommended.



Cellular changes related to radiation and/or chemotherapy

This issue comes up if the patient had already been diagnosed with malignancy and was treated with chemotherapy and/or radiation therapy. Certain changes are induced by these treatment modalities. To decrease the pitfalls from these changes, appropriate and detailed history should be given by clinicians and awareness of the changes by the pathologist should be taken into consideration.

Atypical cellular changes related to haemorrhage, infarction, or necrosis

Can be problematic. Awareness of these changes by the cytopathologist is very helpful to prevent both false positive and false negative diagnosis. Having a pathologist/cytopathologist at the time of the procedure or performance of the procedure by a pathologist will help alert the pathologist to these changes.

Conclusions

Utilizing the science of cytopathology whether exfoliative or FNA is cost effective, fast, simple and accurate. With the recent improvements in technical aspects and the appearance of cell block technique in cytopathology, the old gold standard of “must have tissue to make an accurate diagnosis” is rapidly changing.

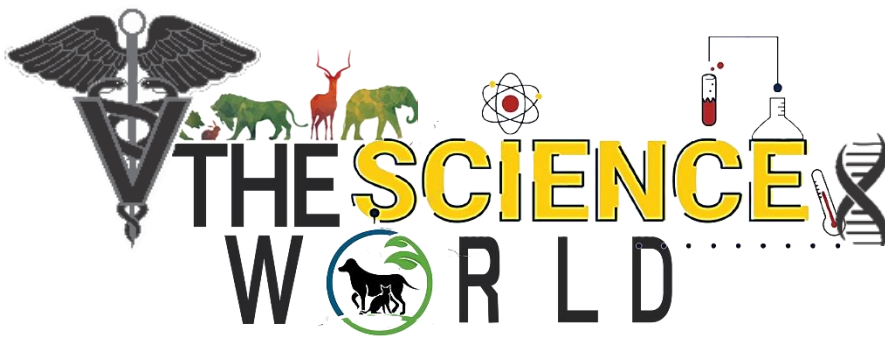
References

- Al-Abbadi MA. (2011). Basics of cytology. *Avicenna J Med.* 1:18-28.
- Allison RW, Velguth KE (2010). Appearance of granulated cells in blood films stained by automated aqueous versus methanolic Romanowsky methods. *Vet Clin Pathol* 39: 99-104
- Ayele L, Mohammed C, Yimer L (2017). Review on Diagnostic Cytology: Techniques and Applications in Veterinary Medicine. *J Vet Sci. Techno* 18: 408.
- Cowell RL, Meinkoth JH (2002). Sample collection and preparation in cytology: increasing diagnostic yield. *Vet. Clin. North Am Small Anim. Pract.* 32: 1187-1235.
- Cowell RL, Tyler RD, Meinkoth JH, DeNicola DB (1999). *Diagnostic Cytology and Haematology of the Dog and Cat.* Third Edition. Mosby, St. Louis (MO), USA.
- Goldschmidt MH, Hendrik MJ (2002). Tumors of the skin and soft tissues. In: *Tumors in Domestic Animals.* (4thEdn.)
- Joan H (2013) Using cytology to increase small animal practice revenue. *Vet Clin Small Anim* 43: 1387-1390
- John D (2014) *Manual of Diagnostic Cytology of the Dog and Cat.* Axiom Vet. John Wiley & Sons pp: 288
- King F, Mousa A (2012) Fine needle aspiration immediately followed by core Needle Biopsy in the Same Setting: Modifying Our Approach. *Acta Cytologica* 60: 1-13.
- Koss LG. Errors and pitfalls in cytology of the lower urinary tract. *Monogr Pathol* 1997:60-74



- Meinkoth JH, Cowell RL, Tyler RD, Morton RJ (2008). Sample collection and preparation. In: Diagnostic cytology and hematology of the dog and cat. (3rdEdn.)Mosby Elsevier. pp: 1-18
- Meyer DJ, Connolly SL, Heng HG, Raskin RE, Burkhard MJ, et al. (2015) The acquisition and management of cytology specimens. Atlas of Canine and Feline Cytology. Philadelphia, PA USA: Saunders1
- Pereira AV, Pereira SA, Gremial ID (2012). Comparison of acetate tape impression with squeezing versus skin scraping for the diagnosis of canine demodecticosis. Aust Vet J 90: 448-450.
- Sharkey LC, Dial SM, Matz ME (2007). Maximizing the diagnostic value of cytology in small animal practice. Vet Clin Small Anim Prac 37: 351-372.
- Sharkey, Leslie C; Seelig, Davis M.; Overmann, Jed; Baloch, Zubair (2014). All lesions great and small, part 1: Diagnostic cytology in veterinary medicine. Diagnostic Cytopathology, 42(6), 535–543.
- Steven I, Hajdu H, Ehya H (2008). Foundation of Diagnostic Cytology. Annals of Clinical & Laboratory Science. 38: 296-299
- Tseng SH, Chen YT, Huang FC (1999) .Seborrheic keratosis of the conjunctiva simulating a malignant melanoma: An immunocytochemical study with impression cytology. Vet Ophthalmology 106: 1516-1520
- Tseng, Waddell (2000). Approach to the patient in respiratory distress. Clinical Techniques in Small Animal Practice. 15: 53-62.
- Villiers E, Dunn J (1998).Collection and preparation of smears for cytological examination. In Practice 20: 370-377.
- Zajicek J. (1974). Aspiration Biopsy Cytology: Cytology of supradiaphragmatic organs. Science, Basle.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 494-501

Popular Article

Role of Plant Extracts on Growth and Development of Mulberry and Non-Mulberry Silkworms

Indrani Nath¹, Pankaj Lushan Dutta², Ankush S Gadge³, Prety Rekha Narzary^{4*}
Department of Sericulture, Forest College and Research Institute, Tamil Nadu Agricultural University, Mettupalayam - 641301, Tamil Nadu, India
<https://doi.org/10.5281/zenodo.7827408>

Abstract

Sericulture, to put it simply, is the utilization of an insect's method of producing silken cocoons. It is the activity of raising silkworms on a commercial scale for the production of silk. In sericulture, the quality and productivity of cocoon production to produce quality silk are of great concern. The primary criterion for good cocoon crop production is said to be the quality of the host plant leaves fed the silkworms. The growth and development of silkworms is significantly influenced by nutrition obtained from the leaves. Apart from this, different biotic and abiotic elements have an impact on the nutritional composition of host plant leaves. The growth and development of silkworms can be increased by improving the nutritional status of the leaves. To achieve this, a variety of strategies have been tested. Host plant leaf fortification with additional nutrient components is one method that can be used to enhance nutritional value and increase the production of silk with higher grades. In this context, using botanicals or plant extracts from *Ziziphus jujuba* L., *Rosa rubiginosa*, ferns, spirulina, *Ipomoea quamoclit*, *Pongamia glabra*, etc., are studied. Many plants have been shown to effect silkworm behaviour by boosting biomass or food consumption, growth and development of silkworm which increases cocoon output. Even though there are a ton of reports on these topics, the application tactics recommended are neither sufficient nor commensurate with the current production level. Therefore, a concerted effort has been undertaken in the current review to assemble all the data on the use of botanicals for the integrated improvement in economic features of the silkworms which may aid in the development of future plans.

Keywords: cocoon production, leaf fortification, nutritional status, botanicals, growth and development



Introduction

Raising silkworms for the purpose of producing raw silk is known as sericulture. Despite the fact that there are multiple commercial species of silkworm, *Bombyx mori* L. and *Antheraea mylitta* in South India; *Samia ricini* Donovan and *Antheraea assamensis* Helfer in Northeast India are the most utilized species. Due to its dazzling brilliance, smoothness, elegance, toughness, and elastic characteristics, silk is recognized as the queen of textiles and a sovereign material (Venugopal 1991). Hence, the silkworm is seen as a necessary economic insect (Wang *et al.*, 2011). Because of their fragility and sensitivity to environmental changes, silkworms cannot endure drastic changes in temperature and humidity. The effects of temperature and humidity show a significant relationship with silkworm physiology based on overall parameters and formative ranges influencing development, profitability, and silk (Bhatia and Youshuf, 2014).

Silkworms are phytophagous and depend solely on host plant leaves, from which it derives all of the nutrients it needs to grow and develop, including water (moisture content). The primary factor influencing the development of high-quality crop cocoons has been identified as the quality of leaves offered to the worms for eating. Superior leaves increase the likelihood of getting a good harvest of cocoons (Ravikumar, 1988). Diseases caused by pathogens in mulberry and silkworms limit the quality and quantity of silk production, which has an impact on the country's economy (Aruga and Tarada, 1985). Thus, the commercial worth of the cocoon can be raised by fortifying mulberry leaves with additional nutrients and feeding silkworms (Muniandy *et al.*, 1995). One method for boosting the output and quality of cocoons and silk is the enrichment of mulberry leaves with nutrients, such as pre and probiotics, antibiotics, vitamins, and amino acids (Radjabi *et al.*, 2007; Radjabi *et al.*, 2009). The amount of nutrition needed when eating has a direct impact on genetic features such as pupation, reproductive qualities, pupal weight, and amount of silk production (Thangapandiyan and Dharanipriya, 2019).

Effect of plant extracts on mulberry silkworm

The total silk production in India during 2021-22 was 34,903 MT, an increase of 3.4% over the previous year (33,770 MT). The share of mulberry production is the largest among the other type of silks produced in the country which is almost about 71%. Several initiatives have been attempted to increase the quantity and quality of silk in order to preserve this output, including boosting the leaves with nutrients, spraying with antibiotics, vitamins, hormones, and hormone analogues, plant



products, or employing plant extracts. The richest supplies of organic molecules on earth are found in plants, and phytochemicals have been shown to affect the survival and functionality of several insects (Rajasekaragouda *et al.*, 1997). By supplementing the silkworm *B. mori*, several plant extracts have been evaluated to examine how they affect the silkworm's body weight, silk gland weight, and silk thread length (Fig. 1).

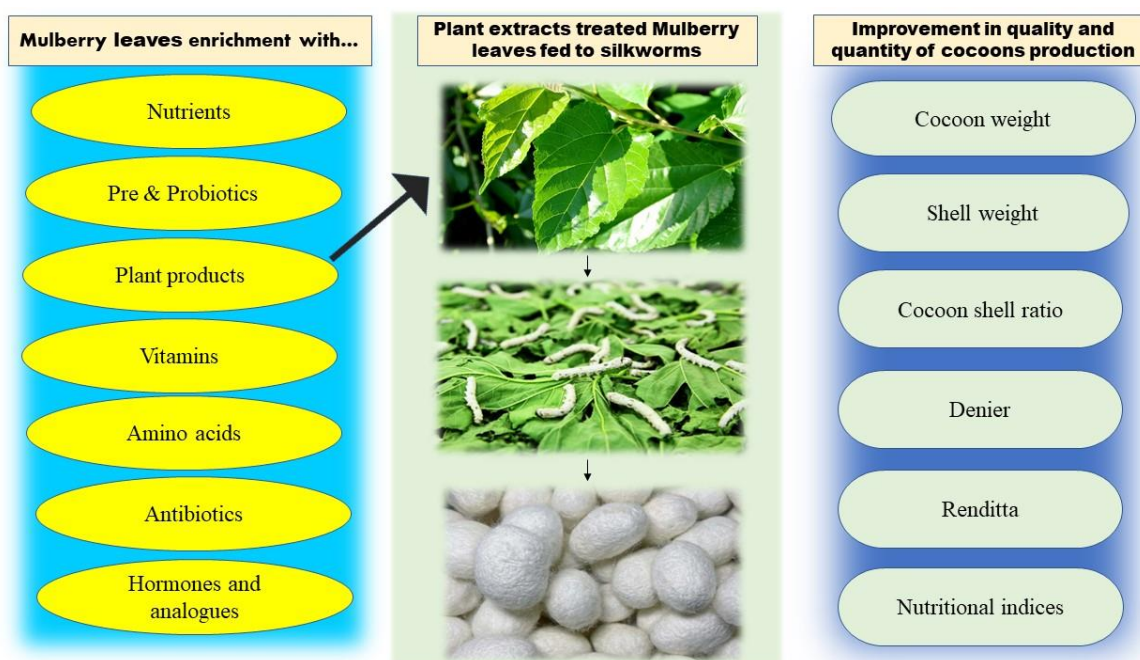


Figure 1. Effect of plant extracts on silkworms' growth and development

Efficacy of ferns on *B. mori* L.

In a lab setting with a mean temperature of 29.2°C and relative humidity of 70.5%, the growth-enhancing effects of the ferns *Nephrolepis auriculata* (L.), *Christella parasitica* (L.), *Dicranopteris linearis* (Borm.F) and *Pityrogramma calomelanes* (L.) on *Bombyx mori* L. L X NB4D2 were examined by Jeyapaul *et al.* (2005). They observed that after treatment with fern extracts, mulberry leaf consumption and efficiency measurements were much higher. The economic features were shown to be improved by fern concentrations of 0.1%. All ferns, with the exception of *Christella parasitica*, improved the efficiency of converting ingested food at a 0.4% concentration.

Efficacy of mulberry leaves fortified with *Ziziphus jujuba* L. on *B. mori*

Avhad and Hiware (2016) performed an experiment to examine the effects on the biological parameters (larval weight, mortality, cocoon weight, shell weight, pupal weight, shell ratio, filament



length, filament weight, denier, and the number of filament breakages) of fifth instar larvae of *B. mori* L. PM X CSR2 hybrid race fed on mulberry leaves enriched with plant extracts of *Ziziphus jujuba* L. with concentrations (1: 2, 1:4 and 1:8). The outcome was quite intriguing and favorable for every aspect of the study subject, *B. mori* L. The study revealed that it had a significant impact on improving the quality and quantity of silk, which benefits farmers' ability to increase their income.

Efficacy of *Ipomoea quamoclit* plant extract on *B. mori*

Tests were conducted by Barge and Pardeshi (2022) to determine the effect of *Ipomoea quamoclit* plant extract on the growth and cocoon characteristics of *B. mori* L. silkworm larvae in their III, IV, and V instars. Various *Ipomoea quamoclit* plant extract concentrations in ethyl acetate (0.5, 1.0, 1.5, 2.0, and 2.5%) were given to silkworms in their third, fourth, and fifth instars together with mulberry. It was found that the weight of the larvae and the characteristics of the cocoon were affected by different plant extract concentrations. The exposure period and dose had a strong impact on the weight of the larvae and the characteristics of the cocoon. They also found that higher larval growth and increased cocoon weight were the results of the plant extract at a 2.0% concentration. The addition of this plant extract over the control also resulted in a rise in the typical pupa weight, weight of the shell, ratio of the shells, and silk filament length, sericin, and fibroin content.

Efficacy of phytoecdysteroid extracted from *Achyranthes aspera* on *B. mori*

Since the phytoecdysteroid stimulates physiological and developmental processes to speed up the larval stage so that cocoons can spin simultaneously and labour can be saved, studies of its administration to silkworm larvae have been conducted by Upadhyay and Pandey (2013). The *Achyranthes aspera* plant extract with phytoecdysteroid activity was used in this experiment. The tests used single, double, and triple treatments with phytoecdysteroid concentrations of 40, 50, 60, and 70%. They found that the duration, length, weight, and survival of *B. mori* larvae were all strongly influenced by a variation in the number of treatments ($P > 0.05$). The number of days a larva spent developing fell from 22.90 days (the control) to a minimum of 21.52 days in the case of 60%, double treatment of larvae. They reported that the number of treatments, up to 60%, and double treatment of the larvae all contribute to an increase in larval length. The greatest recorded larval length was 6.98 cm in the case of 60% of double-treated larvae, while the minimum was 4.90 cm in the case of 70% of triple-treated larvae. Larval weight increased as phytoecdysteroid therapy intensified (from single to double treatment at concentrations of 40, 50, and 60%), reaching its



highest level (0.14.36 gm) in the latter case. The maximum larval survival observed was 95.25-1.55 percent when larvae were doubly treated with 60% phytoecdysteroid concentration.

Efficacy of *Aloe vera* oil on the fecundity and hatchability on *B. mori*

In the sericulture sector, the use of *A. vera* oil on *B. mori* has been demonstrated to be significant. In order to treat *B. mori* larvae in their third, fourth, and fifth instars, the studies were carried out by Singh *et al.* (2014) using different concentrations of *A. vera* oil, namely 0.25, 0.50, 0.75, and 1.0 ml as single, double, and triple treatments. A triple treatment with 0.75 ml of *A. Vera* oil resulted in the highest levels of fecundity (409.663.31 eggs) and hatchability (96.751.22%). In the event of triple treatment with 1.0 ml of *A. Vera* oil, the lowest fecundity (270.001.86 eggs) and hatchability (75.001.60%) were observed. They have suggested that if *A. Vera* oil is applied carefully, it may promote the production of high-quality cocoons on a commercial scale.

Efficacy of dietary supplementation of *Sida acuta* plant extract on *B. mori*

To improve the performance of growth and cocoon characteristics of silkworms, *B. mori* the *Sida acuta* plant extract was tested against III, IV, and Vth instar larvae of silkworms by Barge and Pardeshi (2022). Several concentrations of *Sida acuta* plant extracts in methanol (0.5, 1.0, 1.5, 2.0, and 2.5%) were given to silkworms in their third, fourth, and fifth instars together with mulberry. They found that the weight of the larvae and the characteristics of the cocoon were affected by different plant extract concentrations. The exposure period and dose had an impact on how strong the influence was. They reported that higher larval growth and increased cocoon weight were the results of the plant extract at a 2.0% concentration. The average larval weights and the final instar larva of *B. mori* relative growth rate both rose. With this addition of plant extract over the control, the average pupa weight, shell weight, shell ratio, and silk filament length were also increased. They concluded that plant extract from *Sida acuta* has a growth-promoting function in silkworms, which helps to improve the silk's performance in *B. mori*.

Efficacy of dietary supplementation of *Stevia rebaudiana* extract on *B. mori*

The research was carried out by Shahin (2019) to determine the effect of stevia leaf extract on the biological, economic, and physiological traits of *B. mori* L., as well as the traits of the larvae in their fifth instar. The last instar consumed more than 80% of the mulberry leaves during its lifetime, so, the fifth instar larvae were fed mulberry leaves supplemented with stevia leaf extract in varied doses. They observed that when 0.05 followed by 0.1% was applied, there was a noticeably



greater rise in the weights of the larva, silk gland, pupal cocoon shells, and the number of eggs laid as compared to the control. The stevia leaf treatment at 0.05% had the highest total hemolymph protein levels, and protease activity followed a similar pattern. Through enhancing digestion, which in turn boosts the production of protein and fertility, the usage of stevia leaves appears to have a good effect on increasing the amount of silk produced. It was concluded that stevia leaves may have the same impact as a juvenile hormone since the larval stage was prolonged by two days over the control.

Effect of plant extracts on non-mulberry silkworm:

Effect of plant extracts on larval growth parameters of Eri Silkworm, *Samia ricini*

Eri silkworms can be raised all year long, up to 6-7 times per year (Rajesh and Elangovan, 2012). It has been domesticated and raised indoors. In the 30-35 day period from hatching to mature cocoon-forming stages, the worms moult four times (Gogoi and Kalita, 2009). The polyphagous Eri silkworm is mostly raised on the leaves of the Castor (*Ricinus communis* L.) and Kesseru (*Heteropanax fragrans* Seem) plants. The research was carried out by Lalmuankimi et al. (2020) to investigate the impact of plant extracts on the larval growth characteristics of the eri silkworm, *Samia ricini*, by treating *Ricinus communis*, the host plant. For aqueous extraction, three distinct plant materials —*Mikania micrantha*, *Murraya koenigii*, and *Pongamia glabra* were used. The aqueous extracts of the leaves from each plant were then produced in distilled water at various strengths, namely 5, 10 and 15%. It was observed that feeding enriched castor leaves with plant extracts in various dosages had no discernible impact on the eri silkworm larval duration and larval weight compared to the control. However, the significant increase in the weight of mature larvae, as well as silk gland, was observed over the control batches of worms when the worms are fed with the fortified castor leaves with plant extracts. Thus, they found that among the concentrations 10 % exhibited better results in all the parameters.

Conclusion

Plant-based products are cheap, biodegradable and easily available and therefore environment friendly and cost-effective. Thus, it may be concluded that the treatment of mulberry and non-mulberry silkworms with different concentrations of plant extracts influence the economic traits of silkworm. However, the treatment of larvae with a moderate concentration of plant extract caused a beneficial effect on economic parameters, whereas the higher concentration of plant extract caused an adverse effect. Thus plant extracts, botanicals, essential oils or plant based products for



nutritional fortification have emerged and has the potentiality to develop as an effective and sustainable alternative to uplift the silkworm health in a broad spectrum as well as prove to be a safe and cost effective method for the sericulture farmers for quality cocoon crop production.

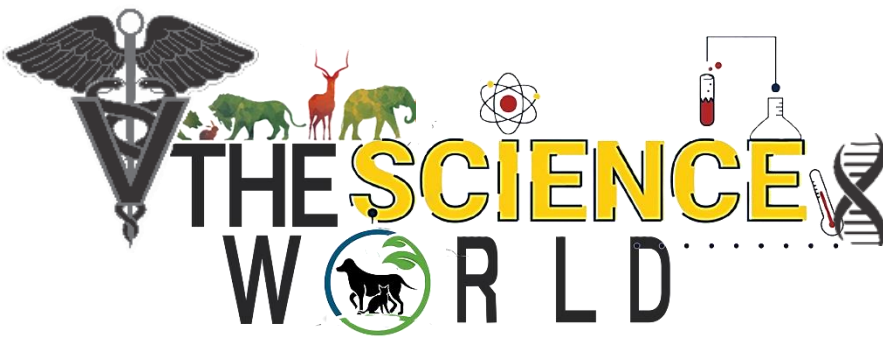
References:

- Avhad, S.B., Hiware, C.J. (2016). Studies on rearing performance of *B. mori* L. (race: PM × CSR2) with fortification of mulberry leaves using plant extracts. *Kaav. Int. J. of Sci., Eng. and Tech.*
- Barge, S. B. and Pardeshi, A. B. (2022). Efficacy of *Ipomoea quamoclit* plant extracts on the larval growth and cocoon performance of silkworm, *B. mori* L. *Int. J. of Recent Scientific Res.*, Vol. 13, Issue, 06 (B), pp. 1477-1480.
- Barge, S.B., Pardeshi, A.B. (2018). Influence of dietary supplementation of *Sida acuta* plant extract on the mulberry silkworm, *B. mori* L. *International Journal of Zoology Studies*, Volume 3; Issue 2; Page No. 199-202.
- Bhatia, N. K., & Yousuf, M. (2014). Effect of rearing season, host plants and their interaction on economical traits of tropical tasar silkworm, *Antheraea mylitta* Drury-an overview. *International Journal of Industrial Entomology*, 29(1), 93-119.
- C. Ravikumar. (1988). Western Ghats as a bivoltine region prospects, challenges and strategies for its development. *Indian Silk*, Vol. 26 (9), pp. 39-54.
- H. Aruga and Y. Tarada. 1985. The Cytoplasmic Polyhedrosis virus of the silkworm Hormone analogue. *Journal of Sericulture Science*. Vol. 54, pp. 297-299.
- Jeyapaul, C., Padmalatha, C., Singh, A.J.A.R., Murugan, A.G. (2005). Growth promoting effect of ferns on *B. mori* L. (LXNB4D2). *Journal of Advanced Zoology*, 26(2):90-94.
- Lalmuankimi, C., Gogoi, I., Singha, A. (2020). Effect of plant extracts on larval growth parameters of eri silkworm, *Samia ricini* Boisid. *International Journal of Current Microbiology and Applied Sciences*, 9(12): 2655-2666.
- Radjabi, R., Ebadi, R., Mirhoseini, S.Z., Seidavi, A.R., Zolfaghari, M., Etebaria, K. (2007). A review on nutritive effect of mulberry leaves enrichment with vitamins on economic traits and biological parameters of silkworm *B. mori* L. *Invertebrate Survival Journal*. 4, pp. 86-9.
- Radjabi, R., Ebadi, R., Mirhoseini, S.Z., Nair, S. (2009). Effects of feeding alanine- enriched mulberry leaves on the economic characters of silkworm *B. mori* (Lepidoptera Bombycidae). *Formosan Entomologist*, 29, pp.73.
- S. Muniandy, M. Sheela and S.T. Nirmala. (1995). Effect of vitamins and minerals (Filibon) on food intake, growth and conversion efficiency in *B. mori* . *Environ Ecol* 13, pp.433-435.
- Shahin, R. (2019). Effect of *Stevia rebaudiana* extract of the physiological and economical aspects of the mulberry silkworm, *B. mori* L. *Current Science International*, Vol: 08; Pages: 958-965
- Singh, P., Prasad, S., Upadhyay, V.B. (2014).Effect of Aloe vera oil influences the fecundity and hatchability of multivoltine mulberry silkworm (*B. mori* Linn.). *Pinnacle Biological Sciences*, Vol. 2014.



- Thangapandiyan, S., and R. Dharanipriya, R. (2019).Comparative study of nutritional and economical parameters of silkworm (*B. mori*) treated with silver nanoparticles and Spirulina. *The Journal of Basic and Applied Zoology*, Vol. 80 (21).
- Upadhyay, V. B., Pandey, P. (2013). Impact of phytoecdysteroid treatment on the larval performance of multivoltine mulberry silkworm *Bombyx mori* L. *Malays. Appl. Biol.*, 42(1): 51–60.
- Venugopal, B. R. (1991). Silk-Queen of textiles. *Colourage*, 38(1), 46-47.
- Wang, Y. H., Li, B., Wang, D., Zhao, H. Q., Wei, Z. G., & Shen, W. D. (2011). Cloning and transcriptional expression of CYP6AE22-A member of cytochrome P450 family from *Bombyx mandarina*. In *Advanced Materials Research* (Vol. 175, pp. 46-50). Trans Tech Publications Ltd.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 502-504

Popular Article

Summer Management of Your Furry Pets

Dr. A. Abinaya* and Dr. R. Eazhisai

*Assistant Professor, Dept. of Animal Nutrition, Veterinary College and Research Institute,
Udumalpet – 642126.

<https://doi.org/10.5281/zenodo.7827475>

Abstract

As temperature is soaring, maintaining our pets hydrated, healthy and happy is not a cakewalk in this summer season. Protecting the pets from dehydration and heatstroke is the top priority to the pet parents. It is important to modify the routine with summer-friendly diet and other activities to keep them cool and sound and to have a happy summer season.

Introduction

Summer is a fun and exciting time for both pets and their owners to enjoy their time in outdoors. However, it is important to take extra precautions to ensure that your furry friends stay healthy and safe during the hot and humid weather. The most serious issue of pets during the warmer months of the year are dehydration and heatstroke.

Dehydration

Water is an important nutrient and our body organs rely on water for proper functioning. When pets are losing more water than they are taking in, dehydration occurs. It refers to shortage of fluid in the body which also affects the delivery of oxygen to the body tissues and organs. Dehydration is a serious concern, which could be fatal in severe cases. The symptoms of dehydration include dizziness, agitation, weakness, excessive drooling, xerostomia, sunken eyes, loss of skin elasticity. The simplest way to test for dehydration in animals is to pinch a little skin on pet's back or top of their head using your thumb and forefinger. If the animal is hydrated enough, it springs back to the original place immediately. If the animal is dehydrated, the folds of skin moves back very



slowly and in severe case it doesn't spring back at all. To prevent the animal from dehydration, ensure that the pet animal is having plenty of access to clean and fresh water and one must check the bowl after every few hours.

Heat stroke

It is commonly referred as hyperthermia or elevated body temperature. If the pet's body temperature exceeds 39.5°C, it is considered hyperthermic. High body temperature of the animal without any signs of previous illnesses is mostly due to high temperature of the external environment and are referred to as heat stroke. Dogs have relatively small number of sweat glands, so they are not able to cool themselves down as easily as humans by sweating. Their primary way of regulating their body temperature is by panting. When the pets are left in a yard with no access to shade or water in a hot day are more susceptible to heatstroke. The muzzled dogs are also at greater risk since their ability to pant is restricted by muzzle. Heatstroke is very common in brachycephalic breeds with restricted airway.

The symptoms of heatstroke include elevated breathing rates, dry or sticky gums, abnormal gum color, bruising in the gums, may appear lethargic or disoriented, agitation, dizziness and can have seizures. The heat stroke could be fatal as it results in multiple organ failure.

Here are some tips to help you manage your pets during the summer months.

1. Keep your pets hydrated

Pets tend to overheat and go dehydrated during the warmer days. Make sure your pets have access to clean and fresh water at all times. You can also give them ice cubes or frozen treats to help them cool down. If you are going out for a walk or a hike, bring a water bottle and a bowl for your pet.

2. Groom your animals

Brush your companions a few times a week to get rid of loose hairs so that they feel lighter and are more comfortable in high temperatures.

3. Avoid walking your pets during the hottest times of the day

The pavement and concrete can get very hot during the summer months and can burn your pet's paws. Try to walk your pets early in the morning or late in the evening when the temperature is cooler. You can also take your pets to a shaded park or If you are taking your pets on a walk or outing, bring a water bottle and a portable bowl to keep them hydrated.



4. Avoid leaving pets in hot cars

Leaving pets in hot cars can be extremely dangerous and even deadly. Even if you think it will only be a few minutes, the temperature inside a car can rise rapidly and cause heatstroke.

5. Avoid hot surfaces

Hot asphalt, concrete, and sand can burn your pet's paws. Try to walk your pet on grassy areas to protect their paws. You can also walk your pet during cooler parts of the day, such as early morning or late evening.

6. Feeding

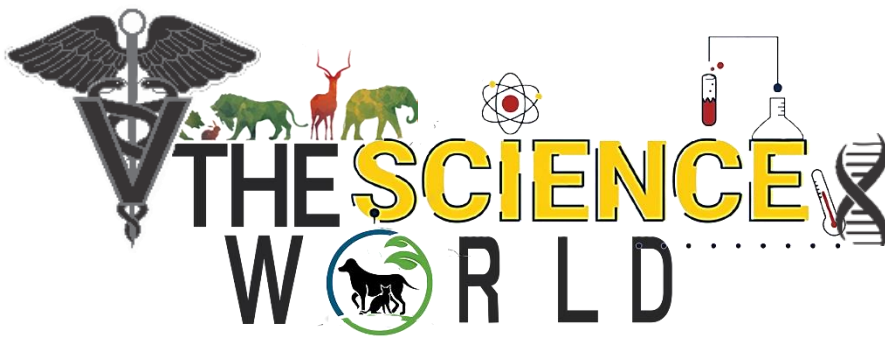
Avoid feeding foods that are warm in nature. With rise in temperature, pets tend to lose appetite. Light, freshly prepared and easily-digestible meals are beneficial in summer to maintain their nutritional intake. Pet foods are advised to be stored in the cool place and avoid leaving them outside as it can be spoiled easily. Watery-fruits, buttermilk and yoghurt, green leafy veg are summer-friendly to the pets.

Conclusion

Labored breathing and abnormal head movements are indications of heatstroke. Pour water at room temperature on the animals' body to cool them down, wipe them with a wet towel, and call a veterinarian. Avoid sudden cooling like putting the animal in an ice bath.

Stay alert and save a life. Happy summer with your furry friends.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 505-509

Popular Article

Role of Biological Control Agents in Integrated Pest Management

Dharanikota Lalithambica Devi^{1*}, Dr. Sunil Kumar Mandal², Dr. Md.Abbas Ahmad³

¹Msc (ag), Department of Entomology, RPCAU, Pusa, Bihar,

²Assistant professor, Department of Entomology, RPCAU, Pusa, Bihar

³Assistant professor, Department of Entomology, RPCAU, Pusa, Bihar

<https://doi.org/10.5281/zenodo.7831851>

Abstract

The global population is projected to reach 8.5 billion by 2030, 9.7 billion by 2050, and exceed 11 billion in 2100. There is continued need for pest management in agriculture, with pressure continuously increasing on agriculture to achieve higher yield from limited or even lesser land. Negative impact of pesticides has brought into focus the need for safer and effective alternative such as bio agents/bio pesticides. Biological control is successful management of a pests by means of another living organisms (parasitoids, predators, pathogens) that is disseminated by human. The biocontrol agents are not only safer and specific to handle but are gifted with the self-perpetuating ability, which is more sustainable in nature than the repeated applications by chemical pesticides.

Biological Control

Biological control is an innate component of integrated pest management strategy. It is defined as the reduction of pest populations by natural enemies and typically involves an active human role. Natural enemies of insect pests, also known as biological control agents, include predators, parasitoids, and pathogens. Biological control of weeds includes mitigation of weed problems by employing insects and pathogens.

Techniques In Biological Control

Introduction

It is the introduction and establishment of natural enemies to a new locality where they did not occur to originate naturally. *Rodolia cardinalis*, the Vedalia beetle was imported from Australia to California in the 19th century, successfully controlling cottony cushion scale.



Augmentation

Propagation and release of natural enemies to supplement the numbers of naturally occurring natural enemies

- **Inoculative release**

Large number of individuals are released only once during the season and natural enemies are expected to reproduce. *Encarsia formosa*, are used to control greenhouse whitefly While the predatory mite *Phytoseiulus persimilis* is used for control of the two-spotted spider mite.

- **Inundative release**

Involves mass multiplication and periodic release of Natural enemies when the pest populations reach damaging levels. The egg parasitoid *Trichogramma* is frequently released inundatively to control harmful moths.

Conservation

Actions to preserve and release of natural enemies by environmental manipulations to protect natural enemies. Providing a suitable habitat, such as shelter belt where natural enemies can survive and reproduce can help to ensure the populations of natural enemies. Earwigs are natural predators that can be encouraged in gardens by hanging upside-down flowerpots filled with straw.

Biological Control Agents

Parasitoids

Parasitoids are insects that parasitize other insects. The immature stages of parasitoids develop on or within its host, eventually killing it. Parasitoids may attack all stages of their host (eggs, larvae, nymphs, pupae, adults).

- *Trichogramma*, *Encarsia formosa* and *Aphidius* parasitoids such as *Aphidius ervi*, *A. colemani*, *A. matricariae* are commercially available.
- *Trichogramma* is an egg parasitoid and works well on many caterpillars.
- *Encarsia formosa* is used for the control of whiteflies in greenhouses.
- *Aphididius* parasitoids are effective against aphids.

Predators

A Predator is one which catches and devours smaller or more helpless creatures called prey. Beetles, ground beetles, lacewings, syrphid (hover) flies, mantids, yellowjacket wasps are some of the examples of predators.

Entomo Pathogens

An organism (generally a bacterium, virus, protozoan or fungus) causing disease in insects.



These include: Entomopathogenic fungi, Entomopathogenic Bacteria, Entomopathogenic Virus, Entomopathogenic Nematodes, Entomopathogenic Protozoa.

Need For Biocontrol

The global population is projected to reach 8.5 billion by 2030, 9.7 billion by 2050 and exceed 11 billion in 2100 (UN. World Population Prospects, 2011). There is continued need for pest management in agriculture, with pressure continuously increasing on agriculture to achieve higher yield from limited or even lesser land. (Shukla *et al.*, (2019). The indiscriminate use of chemical pesticides in agriculture have not only resulted in adverse effects on health, environment, but also causes depletion of natural enemies and increase of minor pests. Negative impact of chemicals has brought into focus the use of safer and effective alternative such as bioagents or biopesticides.

Benefits Of Biocontrol Agents

Biological control is less expensive and more ecofriendly than any other methods. Bio control agents give protection to the crop during the critical stages of the pest incidence and avoid blanket applications. They do not cause phytotoxicity issues. The bio control agents are not only safer and specific to handle but are gifted with the self-perpetuating ability, which is more sustainable in nature than the repeated applications by chemical pesticides. Many of the bio control agents are also known to have both disease control ability and also enhance the root and plant growth by way of encouraging the beneficial soil microflora thereby increases the crop yield. Bio control agents are very safe to handle and apply to the target. Most of the bio control agents are having proven compatibility with other methods of pest control, in general, and other biocontrol agents, in particular, there by facilitating integration of different methods of pest control with more practicability.

Despite being in practice for several decades, biological control was evolving continuously, and lot of innovations has taken place in the field of biological control to suit the present day needs for the effective pest management.

Biological Control of coconut rugose spiraling whitefly with entomopathogenic fungi, *Isaria fumosorosea* (NB AIR- Pfu 5) was proved effective in managing rugose spiraling whitefly.

Trichogramma pretiosum is also produced commercially and released for the control of Fall army worm.

Encyrtid parasitoids *Acerophagus papayae*, known to suppress the papaya mealybug in its native range, effectively controlled the papaya mealybug when introduced into Guam, Palau islands



and more recently to Sri Lanka. The same was introduced in India and successfully managed papaya mealybug in India.

Limitations Of Biocontrol Agents

Biocontrol agents may take longer to achieve their maximum effectiveness compared to traditional chemical pesticides. Some biocontrol agents may have a limited range of activity or may only be effective in certain geographic regions. Biocontrol agents may be more expensive and their effectiveness may require multiple applications, which can add to the cost.

Biological Control Current Issues and Solutions

A) Communication with stakeholders and the public

Stakeholders and the public are usually poorly informed about biological control and indeed sometimes dismiss it as a feasible option for pest management. The public often express negative views on biocontrol. Biocontrol practitioners could assist in reversing some of the misconceptions about biological control by communicating the benefits of their work, not only in the scientific literature, but also verbally and in popular publications.

B) Cost effectiveness of biocontrol

Biological control practitioners are often not effective in demonstrating the financial and other benefits of their programmes. Biocontrol practitioners to involve economists, social scientists and stakeholders early in a biocontrol or IPM programme so that the desired social, economic and environmental benefits can be defined.

Present Status of Biological Control Agents in India

An overview of the current structure of biocontrol laboratories and units working in India

Biocontrol laboratories/ Units in India	361
Private sector laboratories	141
State biocontrol laboratories	98
ICAR/ SAUs/ DBT laboratories	49
Private sector	38
Central Integrated Pest Management Centres (CIMPCs)	35

In India, amongst all types of biopesticides, the percentage share of fungal products is highest. Further, in the category of fungal biopesticides, strains of *Trichoderma* are mostly used, followed by *Beauveria bassiana* and *Verticillium sps.* In India, most of the share of bacterial biopesticides is occupied by *Pseudomonas* followed by *Bacillus*. In case of *Bacillus* strains of *B. thuringensis*, *Bacillus sphaericus* and *Bacillus subtilis* are registered as biopesticides.



In India, only Nucleopolyhedrosis viruses (NPVs) based viral biopesticides are being used for biocontrol of *Helicoverpa armigera*, and their percentage share is very low. Natural occurrence of granulosis virus (GVs) infecting larvae of sugarcane pests in southern and northern states of India was reported very early, yet their mass multiplication and commercial production in the form of biopesticides has not started (Easwaramoorthy and Jayaraj, 1987).

Application of nematodes in pest management has started now. *Heterorhabditis* and *Steinernema* are the two most effective entomopathogenic nematodes that are being used against different soil-borne pests under field conditions (Sankaranarayanan et al. 2006). However, no registered product is available in the market to date.

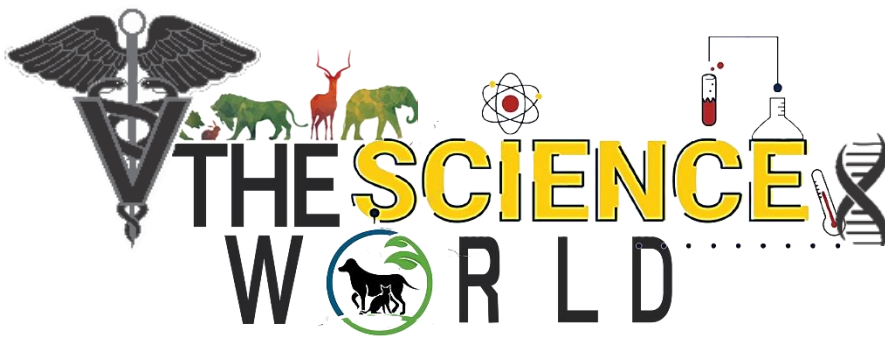
Conclusion

In the present scenario of Organic Farming and Natural Farming for adoption of ecofriendly plant protection measures, it is imperative that chemical control methods need to be weaned out. In view of the operating prominence the biological control methods pave a clear pathway and perfect strategy is the need of the hour. With the present status of biological control methods occupying larger share in IPM of important pests of major crops, the fine tuning of biological control technologies will continuously help in better adoption by stakeholders.

References

- Manzoor, U., Mandal, R., Kumar, V., Acharya, A., Moyong, M., Ahmed, A. and Bhadauriya, A.S. (2020). Status of Biological Control in India. *Vigyan Varta*. **1**(6): 58-60.
- Martin, P. A., Hirose, E., Aldrich, J.R. (2007). Toxicity of *Chromobacterium subtsugae* to southern greenbug (Heteroptera: Pentatomidae) and corn rootworm (Coleoptera: Chrysomelidae). *Journal of Economic Entomology*. **100**(3): 680–684.
- Mishra, J., Dutta, V and Arora, N. K. (2020). Biopesticides in India: technology and sustainability linkages. *Biotech*. **10**: 210.
- Sharma, A., Diwevidi, V. D., Singh, S., Pawar, K. K., Jerman, M., Singh, L. B., Singh, S and Srivastawa, D. (2013). Biological Control and its Important in Agriculture. *International Journal of Biotechnology and Bioengineering Research*. **4**(3): 175-180.
- Shukla, N., Singh, E. A. N. A., Kabadwa, B. C., Sharma, R and Kumar, R. (2019). Present Status and Future Prospects of Bio-Agents in Agriculture. *International Journal of Current Microbiology and Applied Sciences*. **8**(4) : 2319-7706.
- Singh, S., Bal, J. S., Sharma, D. R and Kaur, H. (2016). Current status of biological control agents of insect pests of Indian jujube (ber) in North-Western India. *Acta horticulturae*. 1116: 115-118





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 510-513

Popular Article

Hydroponics: Green Fodder Production without Soil

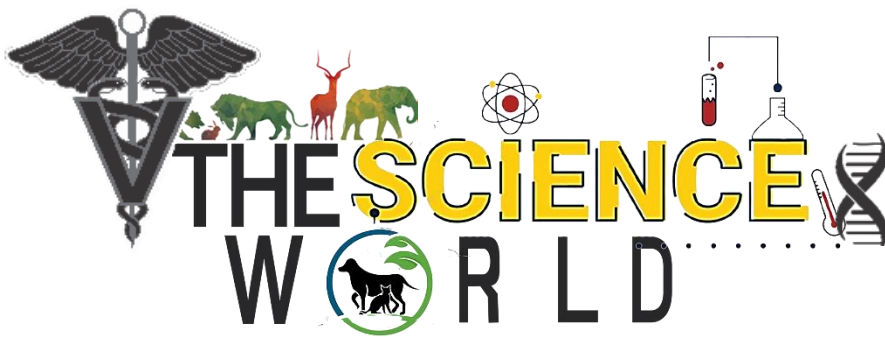
Dr. Lakhyajyoti Borah

Assistant Professor, Department of LFC (Animal Nutrition), AAU, Khanapara
<https://doi.org/10.5281/zenodo.7831891>

Green fodder plays a significant role in the diet of dairy animals since it offers the nutrients required for both maintaining health and productivity. Generally, it is observed that the feed cost constitutes about 70 to 75% of the total cost of milk where in green fodder comprises 13 to 35% of the total feed input. But it is become difficult to produce required quantity green fodder throughout the year due to shrinkage of land available for grazing, lack of water, more labour requirement a climatic impediment. The unavailability of quality green fodder adversely affects the productive and reproductive efficiency of the dairy animals. The lack of green fodder compels the farmer to look for alternative options and explore sustainable methods of obtaining quality green fodder. In such situation, the novel approach called Hydroponic fodder would be the best solution.

To Read the full Article, Download from the main website
www.thescienceworld.net





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 510-513

Popular Article

Hydroponics: Green Fodder Production without Soil

Dr. Lakhyajyoti Borah

Assistant Professor, Department of LFC (Animal Nutrition), AAU, Khanapara
<https://doi.org/10.5281/zenodo.7831891>

Green fodder plays a significant role in the diet of dairy animals since it offers the nutrients required for both maintaining health and productivity. Generally, it is observed that the feed cost constitutes about 70 to 75% of the total cost of milk where in green fodder comprises 13 to 35% of the total feed input. But it is become difficult to produce required quantity green fodder throughout the year due to shrinkage of land available for grazing, lack of water, more labour requirement a climatic impediment. The unavailability of quality green fodder adversely affects the productive and reproductive efficiency of the dairy animals. The lack of green fodder compels the farmer to look for alternative options and explore sustainable methods of obtaining quality green fodder. In such situation, the novel approach called Hydroponic fodder would be the best solution.

Hydroponic Fodder Production is a technology of growing plants without soil, but in water or nutrient solution for a short duration in a controlled environment. Hydroponic fodder production systems require less space, and it is perfect for present situation with limited land for fodder cultivation specially in urban area. This system can be easily established indoors which can help in land preservation. It is boon for the farmers whose soil is infertile and naturally devastated.



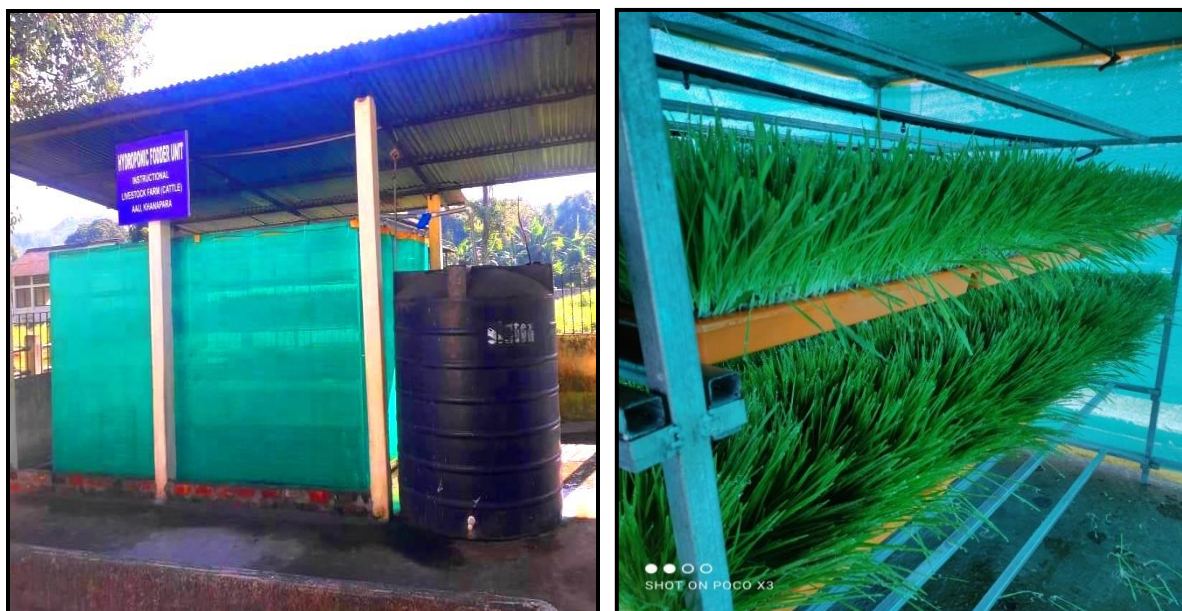
Advantages of hydroponic green fodder production

- 1. Nutritional Quality:** The fodder produced hydroponic technology is highly nutritious and better quality than the conventional fodder. Hydroponics are highly succulent and relished by dairy animals.
- 2. Growth Rate:** It grows faster than conventional fodders, requires only 7-8 days against 60 days for conventional fodder. The hydroponic fodder is fed to animal when the plants are at just 7-8 days from seed germination when they are about 20 to 30 centimeter in height.
- 3. Land requirement:** Hydroponic green fodders production requires lesser space as compared to the conventional methods of fodder cultivation. Land is required to establish the hydroponic unit only.
- 4. Man power requirement:** Labour requirement for hydroponic fodder production is less than conventional fodder cultivation where labour is required for sowing, earthing, weeding, harvesting, etc.
- 5. Fertilizer Use:** There is no need to use fertilizer, herbicides and pesticides etc. for hydroponic green fodders which is essential for conventional fodder cultivation. Hydroponic fodders are completely organic as except water, no other inputs like pesticides that could contaminate the fodder.
- 6. Water Requirement:** High water efficiency as water can be reused in Hydroponic fodder production.
- 7. Need of Protection:** No requirement of fencing and any other protection in hydroponic fodder production unlike conventional fodder production.
- 8. Round the year production:** Fresh and green fodder production is possible round the year as hydroponic fodder yield does not depend on climate but on controlled environment.

Production of Hydroponic fodders:

The hydroponic green fodder can be produced in a controlled environment which can be either hi-tech, fully automatic which is very costly or can be low cost, effectual structure developed locally by using principle of the seed germinating and growing for short interval (about 7 to 8 days) till they are about 20 to 30 cm in height using only water.





Low-cost Hydroponic fodder Production

In low-cost hydroponic fodder production unit, a specially constructed frame made of GI pipes or angle bars is erected to hold plastic trays measuring 1.5x2 feet in which 1.5 kg of seed can be placed for production of hydroponic fodder. The entire arrangement is covered with shade net cloth. An arrangement is designed to pump water from a reservoir to pipes in which holes have been punched and foggers are fitted. The water sprinkles over the tray at a fixed time interval as set in the timer and drains out in to the reservoir for the process to be repeated. To make hydroponic fodder production more farmers affordable, the GI rack can be erected using bamboo and instead of plastic trays, bamboo baskets can be used.

Procedure for production of green fodder

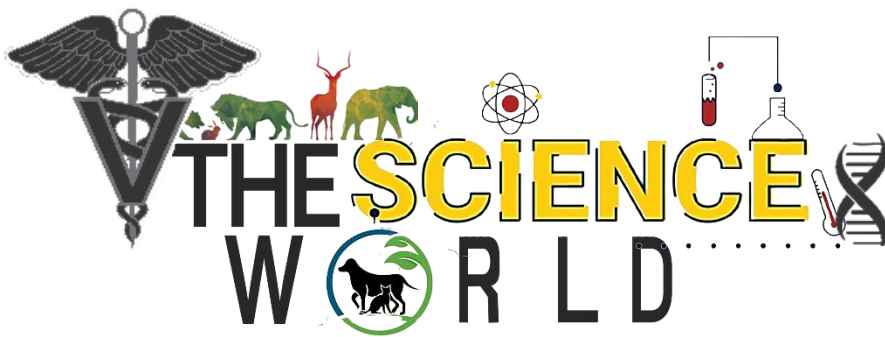
For production of hydroponic fodder production, good quality seeds should be selected with 80-85% germination rate. Then desired quantity of seeds should be soaked in water for 6-8 hour after removal of impurities and damaged seeds. After that the excess water should be drained out. To minimize chance on fungal growth on sprouted seed, seed is often soaked or washed with salt water (80-100gm of salt in 7-8 lits water). Then this washed seed should be transferred into a gunny bag and allow them to sprout. After that the sprouted seeds should be transferred from gunny bags to



trays and spread in trays for sprouting usually for 6-8 days. Water should be sprinkled every day over the sprouted seeds to keep them moist during this period.

For sustainable dairy animal production, the supply of good quality green fodder round the year is very much essential. But during winter there is shortage of green fodder. There must therefore be an alternative like that of the production of hydroponic fodder. Hydroponic fodder production is more suitable for the dairy farmers of urban area with less land for conventional fodder production. Dairy farmers need to be encouraged to adopt the hydroponics systems of green fodder cultivation to make sure a steady supply of green fodder though out the year for the animals.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 514-518

Popular Article

Antimicrobial resistance in Veterinary Medicine and its effects

Vijay Bhaskar Gajula, Vishnu Kiran M, Vijaya Kumar A and N Krishnaiah

Department of Veterinary Public Health & Epidemiology, College of Veterinary Science,
Rajendranagar. P V Narsimha Rao Telangana Veterinary University, Hyderabad

<https://doi.org/10.5281/zenodo.7833915>

Abstract

The present literature describes about the over use of antimicrobial drugs, development and spread of antimicrobial resistance (AMR), multi drug resistance which has adverse effects on animal as well as public health care systems. This is a global challenge not only pertaining to antimicrobial residues in food animals but also can cause huge economic losses to livestock, mankind, agriculture and the ecosystem, its effect on morbidity and mortality in both man and animals and challenges faced by both human and veterinary medicine. Monitoring initiatives, policies and strategies should be developed and implemented in obstruction of antimicrobial resistance by local bodies, national and international authorities.

Introduction

Antimicrobial resistance is one of the major public health issues of this era which poses a threat to health care systems. It has been showing significant interference in effective prevention and treatment of an ever-growing number of pathogenic infections such as bacterial, viral, fungal and parasitic infections which are no longer susceptible to previously used conventional medications (Prestinaci *et al.*, 2015). Multidrug resistance is defined as resistance of a microorganism to the administered antimicrobial medicines despite their earlier sensitivity to it. Multidrug resistance (MDR) microbes are sometimes referred to as superbugs because they are immune to numerous antimicrobials (Magiorakos *et al.*, 2012).



Development of antimicrobial resistance

Mechanisms of AMR'S are 1) enzymatic inactivation of antimicrobial agents, the enzymes act on antimicrobial agents which metabolizes hydrolytically to inactive end -products .example esterases, which inactivate certain macrolide antimicrobials.2) Mediation of inhibitory effects by antimicrobial agents through modification of targets. This type of drug resistance mechanism also known as target alteration or modification. example- alteration of DNA gyrase often by point mutation which are determinants for Quinolone and Fluoroquinolone resistance. 3) Blocking of antimicrobial target thereby, providing target protection example- protection of tetracycline binding site on the ribosome by small peptides. 4) Reduction in entry of antimicrobial agent into cytoplasm by bacterium, it is referred to as drug permeability reduction hence preventing access of antimicrobial agents to their intracellular drug targets resulting in antimicrobial resistance. example- resistance to Aminoglycosides, Beta lactams, Fluoroquinolones and chloramphenicol. 5) By active efflux of antimicrobial agents from bacterial cell. This mechanism effectively reduces drug concentrations and confers resistance to antimicrobials example- Extrusion of antimicrobial agents from bacterial cell by ATP-binding cassette transporters through the use of biological energy of ATP hydrolysis. (Lekshmi *et al.*, 2017).

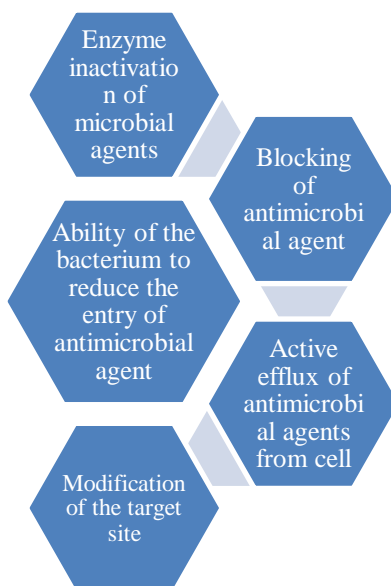


Fig 1.1: Depicts of Development of antimicrobial resistance Through various mechanisms

Types of antimicrobial resistance

Antimicrobial resistance is of two types: Natural resistance and Acquired resistance.



Natural Resistance

It may be intrinsic., always expressed in the species or induced (naturally occurring genes in the bacteria, but only expressed to resistance level upon an antibiotic exposure). A trait which is universally shared within a bacterial species, independent of previous antibiotic exposure and in no relation with horizontal gene transfer. Some of the intrinsic resistant bacteria are *Listeria monocytogenes* to Cephalosporins, Enterococci to Aminoglycosides and Cephalosporins, Anaerobic bacteria to β -Lactams, Aminoglycosides, Quinolones, etc.

Acquired Resistance

It is possible for the bacteria to acquire resistance by acquisition of genetic material through main routes like transformation, conjugation and transposition along with an experience of mutations to its own DNA. The acquisition may be temporary or permanent. Plasmid mediated transmission is most common whereas bacteriophage borne transmission is very rare. Naturally competent bacteria such as *Acinetobacter* spp are capable of direct acquisition of genetic material from the outside environment. Genes that encode drug targets or drug transporters or regulators that control drug transporters or antibiotic modifying enzyme are most preferentially mutated to aid in antimicrobial resistance (Reygaert, 2018).

Effects of antimicrobial resistance

Having access to powerful antibiotics is essential, and the emergence and spread of resistance that eventually depletes the stockpile of antibiotics will have severe repercussions. Due to pervasive resistance, some antibiotics are no longer advised as first-line options. For instance, since the 1950s, penicillin has been used to treat mastitis brought on by *Staphylococcus aureus* in cattle. However, due to regionally widespread resistance today, penicillin is no longer an appropriate empirical first option for this indication. (Oliver and Murinda, 2012).

A proven and crucial component of managing infectious diseases is improved hygiene and infection control. Antimicrobial resistance will decrease as general hygiene is improved throughout the entire production process, decreasing the microbial load on food products. A well-established risk management practice is establishing thresholds for the acceptable number of pathogenic bacteria in foods. There are thresholds for a variety of bacterial species or subgroups in foods (e.g., *Listeria monocytogenes* and *E. coli* O157:H7). Therefore, setting thresholds for bacteria that are resistant to particular antimicrobials is a viable but rarely used choice to take into account. (Wegener, 2006).



There are many reasons people keep dogs, pets, and horses. Most people maintain these animals in wealthy neighborhoods for social and sporting purposes. Antibiotics are frequently used to treat skin diseases and urinary tract infections in dogs, as well as skin and reproductive system illnesses in horses. (Bengtsson B and Greko C, 2014). A number of contagious bacterial diseases reduce food production's profitability and wellbeing. Mastitis is a common condition in animals maintained for milk production, primarily cows but also goats, sheep, and buffaloes, and respiratory and enteric diseases are among the most prevalent in many species. (Page and Gautier, 2012). Ambulatory veterinary services or the owner or keeper of the animal are used to inspect and treat animals maintained for food production. Access to and justifications for using antibiotics in food production differ significantly across the globe. (Maron, Smith, Nachman, 2013). Lack of effective illness therapy will cause suffering for the animals and welfare issues, which in turn cause mental stress for the animal attendants (Vaarten, 2012). Trimethoprim-sulphonamide has been regionally replaced as a useful first line of treatment due to resistance in *Escherichia coli* that causes enteritis in young pigs (Aarestrup, Oliver Duran, Burch. 2008).

Impact of biofilms in antimicrobial resistance

Development of Biofilms takes place when microorganisms associate with and adhere to submerged surfaces. Pathogens among the wide range of bacteria that form biofilms provide a mechanism for these organisms to defend themselves from antimicrobial agents. Mechanisms that defend antimicrobials are Delayed Penetration of the Antimicrobial agent, Alteration of the Cellular Growth Rate and association of bacteria with a surface during biofilm formation caused a number of physiologic responses as a result of the repression or induction of genes (Donlan and Rodney, 2000).

Conclusion

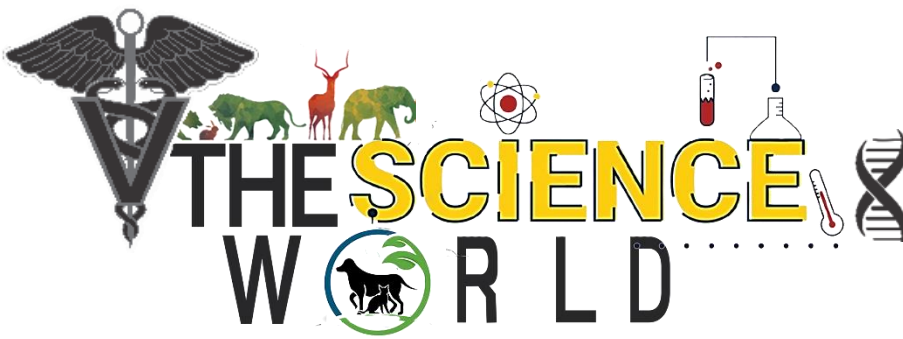
In both human and veterinary health, the effects of microbial resistance to antimicrobials are essentially the same. The increased expense of medical care for people and animals will have an impact on the economy. Although resistance primarily has negative effects, the realization of the seriousness of the issue and the attention given to these problems by the scientific community and the media also have positive effects. The emergence of resistance has served as motivation for the creation, assessment, and adaptation of alternative therapy or prevention regimes. Monitoring initiatives, policies and strategies in obstruction of antimicrobial resistance should be taken up by local bodies, national and international authorities for the welfare of animals and mankind.



References

- Aarestrup FM, Oliver Duran C, Burch DG. Antimicrobial resistance in swine production. *Anim Health Res Rev.* 2008 Dec;9(2):135-48. doi: 10.1017/S1466252308001503. Epub 2008 Nov 5. PMID: 18983723.
- Bengtsson B, Greko C. Antibiotic resistance--consequences for animal health, welfare, and food production. *Ups J Med Sci.* 2014 May;119(2):96-102. doi: 10.3109/03009734.2014.901445. Epub 2014 Mar 28. PMID: 24678738; PMCID: PMC4034566.
- Donlan, Rodney M.. Role of Biofilms in Antimicrobial Resistance. *ASAIO Journal* 46(6):p S47-S52, November 2000.
- Lekshmi M, Ammini P, Kumar S, Varela MF. The Food Production Environment and the Development of Antimicrobial Resistance in Human Pathogens of Animal Origin. *Microorganisms.* 2017 Mar 14;5(1):11. doi: 10.3390/microorganisms5010011. PMID: 28335438; PMCID: PMC5374388.
- Magiorakos AP, Srinivasan A, Carey RB, Carmeli Y, Falagas ME, Giske CG, Harbarth S, Hindler JF, Kahlmeter G, Olsson-Liljequist B, Paterson DL, Rice LB, Stelling J, Struelens MJ, Vatopoulos A, Weber JT, Monnet DL. Multidrug-resistant, extensively drug-resistant and pandrug-resistant bacteria: an international expert proposal for interim standard definitions for acquired resistance. *Clin Microbiol Infect.* 2012 Mar;18(3):268-81. doi: 10.1111/j.1469-0691.2011.03570.x. Epub 2011 Jul 27. PMID: 21793988.
- Maron, D.F., Smith, T.J. & Nachman, K.E. Restrictions on antimicrobial use in food animal production: an international regulatory and economic survey. *Global Health* 9, 48 (2013). <https://doi.org/10.1186/1744-8603-9-48>
- Oliver SP, Murinda SE. Antimicrobial resistance of mastitis pathogens. *Vet Clin North Am Food Anim Pract.* 2012 Jul;28(2):165-85. doi: 10.1016/j.cvfa.2012.03.005. Epub 2012 Apr 28. PMID: 22664201.
- Page SW, Gautier P. Use of antimicrobial agents in livestock. *Rev Sci Tech.* 2012 Apr;31(1):145-88. doi: 10.20506/rst.31.1.2106. PMID: 22849274.
- Prestinaci F, Pezzotti P, Pantosti A. Antimicrobial resistance: a global multifaceted phenomenon. *Pathog Glob Health.* 2015;109(7):309-18. doi: 10.1179/2047773215Y.0000000030. Epub 2015 Sep 7. PMID: 26343252; PMCID: PMC4768623.
- Reygaert WC. An overview of the antimicrobial resistance mechanisms of bacteria. *AIMS Microbiol.* 2018 Jun 26;4(3):482-501. doi: 10.3934/microbiol.2018.3.482. PMID: 31294229; PMCID: PMC6604941.
- Vaarten J. Clinical impact of antimicrobial resistance in animals. *Rev Sci Tech.* 2012 Apr;31(1):221-9. doi: 10.20506/rst.31.1.2110. PMID: 22849278.
- Wegener HC. ANTIBIOTIC RESISTANCE—LINKING HUMAN AND ANIMAL HEALTH. In: Institute of Medicine (US). *Improving Food Safety Through a One Health Approach: Workshop Summary.* Washington (DC): National Academies Press (US); 2012. A15.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 523-526

Popular Article

Diet and Gut Microbiota: Understanding the Link for Optimal Health

Dr. Tanvi Bansal¹, Dr. Asha Kawatra² and Dr. Rupal Hooda³

^{1,2}Department of Foods and Nutrition and ³Department of Family Resource Management, CCS Haryana Agricultural university, Hisar
<https://doi.org/10.5281/zenodo.7834952>

What is Gut health?

Gut health refers to the state of the digestive system and the complex community of microorganisms that live within it, collectively known as the gut microbiota. A healthy gut is one that has a balanced microbiota and functions optimally to digest and absorb nutrients from food, regulate the immune system, and produce essential hormones and neurotransmitters.

The gut microbiota is made up of trillions of microorganisms, including bacteria, viruses, fungi, and protozoa. These microorganisms play important roles in regulating the immune system, protecting against pathogens, breaking down and fermenting dietary fibers, and producing vitamins and other metabolites that influence host health.

Maintaining a healthy gut involves a balance of several factors, including diet, lifestyle, and environmental exposures. A healthy diet rich in fiber, fruits and vegetables, and fermented foods can promote the growth of beneficial gut bacteria and reduce inflammation in the gut. Regular exercise, stress management, and adequate sleep can also positively impact gut health.

When the gut microbiota is imbalanced, known as dysbiosis, it can lead to a range of health problems, including digestive disorders, metabolic disorders, and even mental health issues. Scientific research is still ongoing in understanding the complex relationship between the gut microbiota and human health, but it's clear that maintaining a healthy gut is crucial for overall health and well-being.



Importance of gut microbiota to human health

The importance of gut health to human health and disease cannot be overstated. The gut microbiota plays a vital role in regulating several physiological processes and functions, including:

1. **Digestion and nutrient absorption:** The gut microbiota helps to break down and ferment dietary fibers and complex carbohydrates that the human body cannot digest on its own. This process produces short-chain fatty acids (SCFAs), which are essential for gut health and overall health.
2. **Immune system regulation:** The gut microbiota helps to regulate the immune system, protecting against pathogens and reducing inflammation in the gut. Dysbiosis, or an imbalance of the gut microbiota, has been linked to several autoimmune diseases, including inflammatory bowel disease and type 1 diabetes.
3. **Neurotransmitter and hormone production:** The gut microbiota is involved in the production of several neurotransmitters and hormones, including serotonin and dopamine, which are crucial for mood regulation and mental health.
4. **Metabolic health:** The gut microbiota has been linked to several metabolic disorders, including obesity and type 2 diabetes. Dysbiosis has been shown to alter metabolism and increase the risk of these diseases.
5. **Mental health:** There is growing evidence that the gut microbiota can impact mental health, with dysbiosis being linked to several mental health disorders, including anxiety and depression.

Dysbiosis of the gut microbiota has also been linked to several diseases, including inflammatory bowel disease, irritable bowel syndrome, allergies, and certain cancers. Maintaining a healthy gut microbiota is crucial for overall health and can be achieved through a healthy diet, regular exercise, stress management, and other lifestyle factors.

Nutrition and Gut

Diet and nutrition play a critical role in shaping the composition and function of the gut microbiota. The gut microbiota is composed of trillions of microorganisms, including bacteria, viruses, and fungi, that reside in the gastrointestinal tract. These microorganisms play important roles in digestion, absorption of nutrients, immune system function, and overall health.

The gut microbiota is influenced by various dietary factors, including macronutrient content (carbohydrates, proteins, and fats), fiber content, and the presence of specific nutrients and bioactive compounds. Here are some of the ways that diet and nutrition impact the gut microbiota:



1. **Fiber:** Dietary fibre is the primary source of nutrition for many beneficial gut bacteria. Fiber is broken down in the colon by bacteria, producing short-chain fatty acids (SCFAs) such as acetate, butyrate, and propionate. These SCFAs are important for gut health, regulating gut motility, reducing inflammation, and providing energy for colonocytes.
2. **Macronutrient content:** The macronutrient content of the diet can also impact the gut microbiota. For example, diets high in fat and low in fiber can lead to a reduction in beneficial gut bacteria and an increase in harmful bacteria.
3. **Polyphenols:** Polyphenols are compounds found in plant-based foods such as fruits, vegetables, tea, and wine. These compounds have been shown to promote the growth of beneficial gut bacteria and can have anti-inflammatory effects in the gut.
4. **Probiotics and prebiotics:** Probiotics are live microorganisms that provide health benefits when consumed, while prebiotics are non-digestible fibers that promote the growth of beneficial gut bacteria. Both probiotics and prebiotics can impact the composition and function of the gut microbiota.
5. **Food additives:** Food additives such as emulsifiers, artificial sweeteners, and preservatives have been shown to disrupt the gut microbiota and contribute to inflammation in the gut.
6. **Nutrient deficiencies:** Deficiencies in key nutrients such as vitamin D, iron, and zinc can negatively impact the gut microbiota and contribute to dysbiosis.

Here are dietary tips to improve and maintain gut microbiota in humans:

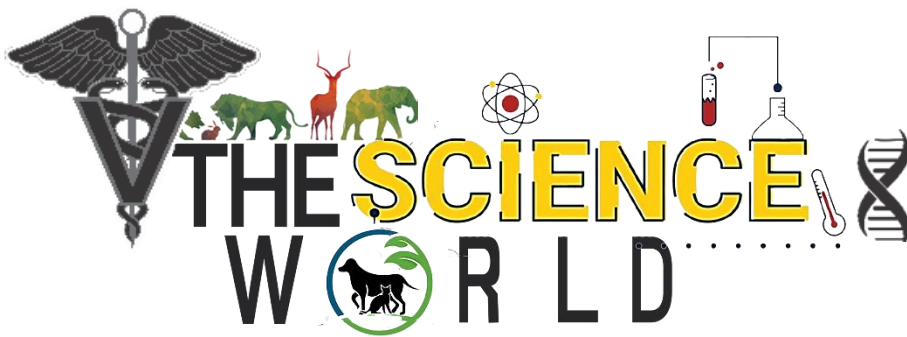
1. **Eat a variety of plant-based foods:** Eating a variety of fruits, vegetables, whole grains, legumes, nuts, and seeds can help to provide a diverse range of nutrients and fiber that feed beneficial gut bacteria.
2. **Include prebiotic foods in your diet:** Prebiotic foods contain non-digestible fibers that feed beneficial gut bacteria. Examples include onions, garlic, leeks, asparagus, bananas, apples, and oats.
3. **Consume probiotic-rich foods:** Probiotic-rich foods contain live bacteria that can colonize the gut and provide health benefits. Examples include yogurt, kefir, sauerkraut, kimchi, miso, and tempeh.
4. **Limit sugar and refined carbohydrates:** Diets high in sugar and refined carbohydrates can promote the growth of harmful bacteria in the gut and disrupt the balance of the microbiota.



5. **Include fermented foods in your diet:** Fermented foods contain beneficial bacteria and other microorganisms that can help to support the gut microbiota. Examples include kefir, yogurt, sauerkraut, kimchi, and kombucha. It's important to choose varieties that are low in sugar and additives.
6. **Avoid artificial sweeteners:** Artificial sweeteners have been shown to alter the gut microbiota and can promote the growth of harmful bacteria.
7. **Consume omega-3 fatty acids:** Omega-3 fatty acids have been shown to improve gut health and reduce inflammation in the gut. Sources include fatty fish, flaxseeds, and chia seeds.
8. **Stay hydrated:** Drinking plenty of water can help to keep the digestive system functioning properly and support the growth of beneficial gut bacteria.
9. **Avoid processed foods:** Processed foods often contain high levels of sugar, salt, and unhealthy fats, which can negatively affect the gut microbiota.
10. **Consume foods high in polyphenols:** Polyphenols are plant compounds that have been shown to promote the growth of beneficial gut bacteria. Examples include green tea, dark chocolate, berries, and red wine.

In conclusion, the gut microbiota plays a crucial role in human health, and diet and nutrition are important factors that influence its composition and function. A diet that is high in fiber, whole foods, and plant-based foods, and low in processed foods and added sugars, can promote a healthy gut microbiota. It's important to remember that everyone's dietary needs and preferences are unique, and consulting with a healthcare professional or a registered dietitian can help develop a personalized nutrition plan to support gut health. By understanding the link between diet, nutrition, and gut microbiota, we can take proactive steps to maintain optimal gut health and overall well-being.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 527-530

Popular Article

Saprolegnia infection: a hurdle in aquaculture

Khangembam Victoria Chanu and Dimpal Thakuria

ICAR-Directorate of Coldwater Fisheries Research, Bhimtal, Uttarakhand-263136

<https://doi.org/10.5281/zenodo.7874712>

Introduction

Saprolegnia is a genus of oomycetes or water mold that can infect fish causing a disease known as saprolegniasis. Oomycetes is a class of fungus-like organisms but they are not true fungi. They differ from fungi in the composition of cell wall and chromosome content in the vegetative stage. Unlike fungus, they have non-septate hyphae and are more closely related to algae. Taxonomically, Oomycetes was previously divided into six orders which have been expanded in recent years. One of the order, Saprolegniales contains three main genera, *Saprolegnia*, *Achlya* and *Aphanomyces*. *Saprolegnia* species are primarily considered as saprobes which feed on decayed organic matter, though some can cause secondary infection in fish depending on the immune status of the host. However, under right circumstances, species like *Saprolegnia parasitica* can act as primary pathogens especially on catfish, salmon and trout species. The infected fish are lethargic and show loss of appetite. A very prominent sign of *Saprolegnia* infection is presence of white patches on the body surface of infected fish. The organisms also produce white hyphae which forms visible cotton-like mycelial growth at the site of infection especially fins, gills or skin. As the disease progress, the hyphal growth spread throughout the body and ultimately the infected fish die due to osmoregulatory failure. *Saprolegnia* species can infect different life stages of fish, right from egg to adult fish causing huge economic loss in terms of millions of dollars in aquaculture. Economic loss may be due to



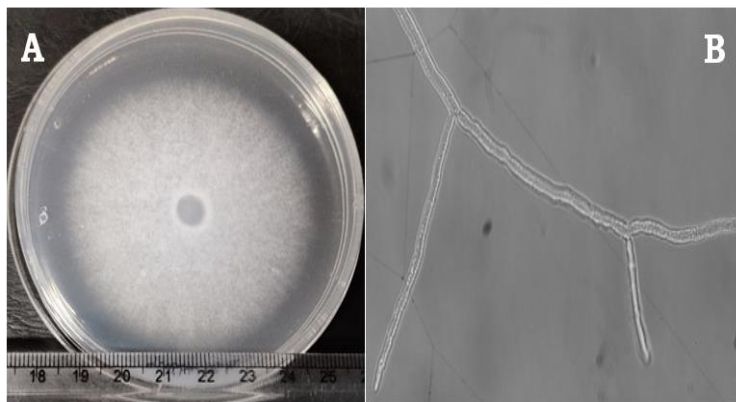
decreased growth rate, poor quality of fish, high mortality, expensive medications and additional labour cost. *Saprolegnia* species is endemic to all the fresh water habitats worldwide and are also considered responsible for decline in wild population of fish and amphibians.

Isolation and identification

Saprolegnia species can be isolated from the site of infection. For isolation, mycelia or tuft of hyphae are collected and cultured on suitable media such as potato dextrose agar. They produce white hyphae which grow radially on agar. The hyphae are aseptate which can be clearly observed microscopically. There are two types of hyphae; i) rhizoidal which penetrates into the substratum to anchor and absorb nutrition, ii) extrametrical which extends above the surface and bears reproductive organs. *Saprolegnia* reproduces both asexually and sexually. In asexual reproduction, there is release of primary zoospores which further encyst after few minutes and releases secondary zoospore, the infective stage. In sexual reproduction, there is production of gametangium, antheridia and oogonia which fuses to form morphologically distinct oospore. Traditionally, species identification largely relies upon characteristics of the sexual reproductive structures. However, defining species based on these morphological characteristics is not consistent and often impossible because these structures do not usually form on lesions. Sometimes, the morphological characteristics of different species are similar which may lead to misidentification. Further, many isolates fail to develop these structures in laboratory culture condition and it requires an expert taxonomist for species identification. So, an easier way to identify *Saprolegnia* species is through molecular approach. Most commonly, amplification of internal transcribed spacer (ITS) region followed by sequencing is practiced for species identification in *Saprolegnia*. ITS region is the spacer DNA situated between the small subunit and large subunit ribosomal DNAs, where ITS1 is located between 18S rDNA and 5.8S rDNA followed ITS2 and 28S rDNA in the eukaryotic genome. This region has highly variable nucleotide sequence and has been recommended as the barcode for fungal identification. Other advantages of using ITS region is its small size flanked by conserved sequences and its high copy number making it easy to detect even from small quantities of genomic DNA. PCR amplification of this region can be done by using universal primers; ITS1 (forward) and ITS4 (reverse). This will give amplicons of 750 bp approximately that can be easily visualized in gel electrophoresis. Further, we have also developed a multiplex PCR protocol using primers targeting a hypothetical protein gene in addition to ITS1/ITS4 for identification of *S. parasitica*. This will amplify two target genes in one



reaction producing amplicons of 750 bp and 365 bp in case of *S. parasitica* whereas the 365 bp PCR products will not be there in other *Saprolegnia* species. Generally, more accurate species identification can be achieved through combined approach using both morphological and molecular approach. Correct identification of the causative agent is important because different species may exhibit variable susceptibility towards anti-oomycete agent.



A- *Saprolegnia parasitica* on potato dextrose agar

B- Aseptate and branched hypha of *S. parasitica*

Treatment

Earlier, *Saprolegnia* infections were successfully controlled by using malachite green. Since malachite green poses significant health risk, it has been banned for use in aquaculture. This has led to recurrence of *Saprolegnia* as an economically important fish pathogen. At present, there is no drug as effective as malachite green for control of saprolegniasis. Many research publications reported the trial of various chemicals for their anti-*Saprolegnia* activity. One of them is formalin which is reported to be effective against *Saprolegnia* but associated with issues of environmental pollution, accumulation in flesh and health hazard. Other chemicals such as hydrogen peroxide, boric acid, potassium permanganate, peracetic acid and sodium chloride have also demonstrated anti-*Saprolegnia* activity. Some have used ozone treatment of water but this cannot be used for curing infected fish. We have also evaluated the effect of chlorhexidine gluconate against different *Saprolegnia* species. It has broad antimicrobial activity and can kill microbes rapidly. In our study, it was found that the drug can disrupt cell membrane of *Saprolegnia*, ultimately killing it. Some researchers have also tried plant derived compounds against *Saprolegnia* and found complete inhibition *in vitro*. Future research may focus on development of rapid identification protocol and effective compounds for use against *Saprolegnia* infection.

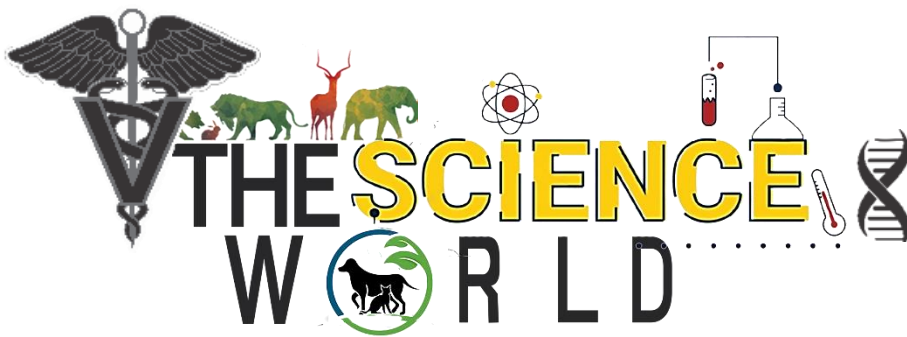
Prevention and control

In addition to use of chemicals for control of saprolegniasis, environmental management is equally important to prevent the spread of infection. It is essential to maintain good water quality to



prevent *Saprolegnia* infection. This includes maintaining the water temperature, pH, dissolved oxygen at optimum levels to reduce stress on the fish. Excessive stocking and rough handling should be avoided to keep the fish in good condition. Rearing of fish of similar size and sex can be practiced if possible, to prevent fighting and injuries which may invite infectious diseases. Further, good farm management practices such as proper disinfection of equipments and quarantine of new stock before introduction to the existing populations should be carried out with utmost sincerity to prevent the spread of infection. Another important aspect to make the farmed fish healthy is the proper nutrition. A balanced and high-quality diet can improve the immune system of fish and can defend against infection. Overall, prevention and control of *Saprolegnia* infection requires good management practices in farm environment and early detection and treatment to prevent further spread of infection.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 531-536

Popular Article

Seabuckthorn a ‘Super Healthy Fruit’ of Ladakh: Nutritional Value, Health Benefits and Applications

Skarma Choton*, Julie D Bandral, Monika Sood and Anjali Langeh

Division of Food Science and Technology, Sher-e- Kashmir University of Agricultural Sciences and Technology, Jammu

<https://doi.org/10.5281/zenodo.7874756>

Abstract

Seabuckthorn (*Hippophae rhamnoides L*) belongs to the family *Elaegnaceae* is an economically and ecologically important plant of Ladakh. Seabuckthorn is a Super Healthy Fruits rich in bioactive compounds viz., vitamins, antioxidant and minerals. Seabuckthorn exhibits antibacterial, antifungal, antiviral, anticancer activity and several other health benefits. Seabuckthorn has a wide range of application in food, cosmetics and pharmaceutical industry. Seabuckthorn has immense potential in the sustainable socio-economic development and nutritional security of Ladakh. Judicious exploitation, traditional usage coupled with commercial value and modern scientific research will bring immense benefit to modern society and local people from the ‘Wonder Plant’ of Ladakh.

Keywords: Seabuckthorn, Bioactive compounds, Antioxidant, Antiviral, Nutritional Security

Introduction

Ladakh the northern most Trans-Himalayan region of India houses diverse groups of medicinally important wild plant species. One of these plants is Seabuckthorn (*Hippophae spp. L.*) traditionally known by different names like *Shishu-lulu*, *tses-ta-lulu*, *Tsermang*, *Tsoks-kyur*, *Pili* etc. Seabuckthorn (*Hippophae rhamnoides L.*) is an ecologically and economically important plant that belongs to the family *Elaegnaceae*. The ripe fruits of Seabuckthorn referred to as ‘Super Healthy Fruit’ are among the most nutritious and vitamin-rich fruits. Every part of the plant viz. fruit, leaf, twig, root and thorn has been traditionally used as medicine, nutritional supplement, fuel and fence, and therefore seabuckthorn is popularly known as ‘Wonder Plant’, ‘Ladakh Gold’, ‘Golden Bush’ or



‘Gold Mine’(Stobdan *et al.*, 2011).



Fig 1. Seabuckthorn (*Hippophae rhamnoides L.*)

Distribution

In India, Seabuckthorn is widely distributed in UT Ladakh, followed by Kumaon Garhwal (Uttarakhand), Lahaul- Spiti and Kinnaur (Himachal Pradesh) and Sikkim/Arunachal Pradesh in the North east region as in fig 1. (Tamchos and Kaul, 2018). Ladakh remains the major site for a natural seabuckthorn resource with over 13,000 ha of the total area under seabuckthorn in the country (Husain *et al.*, 2018).

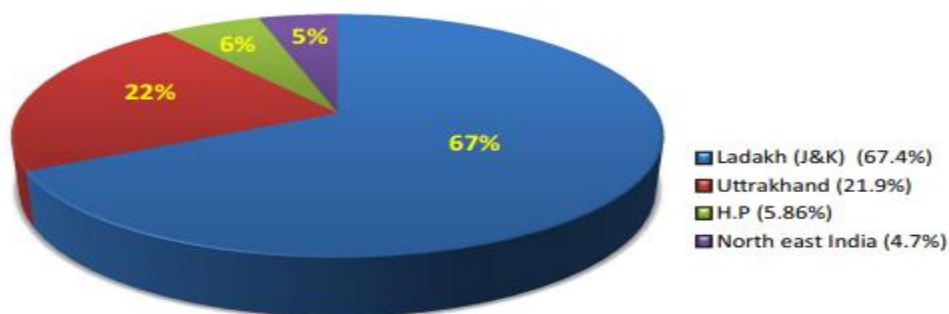


Fig. 1. Area (in %age) under Seabuckthorn in Indian subcontinent (Source: Tamchos and Kaul, 2018)

Nutritional value of seabuckthorn

Seabuckthorn berries are rich source of as many as 190 bioactive compounds. Seabuckthorn berries of Ladakh region content multivitamins including vitamin C (275 mg/100g), vitamin A (432.4 IU/100g) and minerals including potassium (647.2 mg/l), calcium (176.6 mg/l) and iron (30.9 mg/l) as in (Table 1) (Stobdan *et al.*, 2017). Vitamin C represents a nutrient of major importance in Seabuckthorn and presence of these antioxidant vitamins in high quantity indicates its strong



antioxidant property. Seabuckthorn exhibit 10 times higher vitamin C concentration than that of kiwi fruit (*Actinidia deliciosa P.*) which is commonly known as a rich source of ascorbic acid (Nawaz *et al.*, 2019). Seabuckthorn seed content valuable oil that is characterized by high oleic acid content and one to one ratio of omega-3 and omega-6 fatty acids. Seabuckthorn leaf is a rich source of protein, antioxidant including tannins, flavonoids, carotenoids, free and esterified sterols.

Table 1. Nutritional value of Seabuckthorn

Nutrient	Composition
Vitamin C	275 mg/100g
Vitamin A	432.4 IU/100g
Vitamin E	3.54 mg/100g
Riboflavin	1.45 mg/100g
Niacin	68.4 mg/100g
Potassium	647.2 mg/l
Calcium	176.6 mg/l
Iron	30.9 mg/l
Phosphorous	84.2 mg/l
Magnesium	22.5 mg/l
Zinc	1.4 mg/l

(Source: Stobdan *et al.*, 2017)

Health benefits of Seabuckthorn

Seabuckthorn is mentioned in the writings of ancient Greek scholars such as Theophrastus and Dioscorides, known as a remedy for horses. The medicinal value of seabuckthorn was recorded as early as the 8th century in the Tibetan medicinal classic *rGyud Bzi*. Seabuckthorn (*Hippophae rhamnoides L.*) is recorded as *Bar-sTar* in Tibetan medicine and there are over a hundred popular seabuckthorn based formulations in various pharmacopoeias of *Sowa Rigpa* (Tibetan medicine), which is being practiced in Ladakh as *Amchi* (Stobdan *et al.*, 2013). Seabuckthorn (*H. rhamnoides L.*) has recently gained worldwide recognition, for its pharmaceutical and nutraceutical potential and is currently cultivated in several parts of the world (Masoodi *et al.*, 2020). The pharmacological studies demonstrated seabuckthorn exhibits antibacterial, anti-sebum, antifungal, anti-psoriasis, anti-



atopic dermatitis, antiulcerogenic effect, anti-atherogenic effect, radioprotective effects, beneficial effects on experimental injury and clinical diseases of the liver, inhibition of platelet aggregation and wound healing activities. A high amount of vitamin C strengthens the immune system by removing free radicals due to its antioxidant activity. Sea buckthorn extract can effectively inhibit prostate cancer growth and its advantage as an adjuvant in cancer therapy is that fastens regeneration after the use of chemotherapy. Seabuckthorn oil improves blood circulation, facilitates oxygenation of the skin, removes excess toxins from the body, protects against infections, prevents allergies, eliminates inflammation and inhibits the aging process. Seabuckthorn oil lowers blood cholesterol and helps to prevent atherosclerosis. Seabuckthorn oil positively influence brain functions and the central nervous system by an antidepressant effect. Besides, it has also been included in various cosmeceuticals for its use in skin-eventone, rejuvenation, smoothening, removal of scars, wrinkles and pigmentation, and also in hair-related problems (Ahani and Attaran, 2022). Seabuckthorn exhibited an antiviral activity against the herpes virus, influenza virus (Enkhtaivan *et al.*, 2017) and Dunge virus (Jain *et al.*, 2014). In addition, viruses like Adeno, HIV and HPV can also limit by seabuckthorn. 14-Noreudesmanes and a phenylpropane heterodimer from seabuckthorn berry inhibit replication of Herpes simplex type 2-virus (Redei *et al.*, 2019).

Applications of Seabuckthorn

Seabuckthorn has been used traditionally for a variety of purposes as every part of the plant viz. fruit, leaf, twig, root and thorns has been used as medicine, nutritional supplement, fence and fuel. A wide array of products is possible from Seabuckthorn for pharmaceuticals, cosmetics and food industry (Figure 2). The high vitamin concentration makes seabuckthorn fruit highly suitable for the production of nutritious soft drinks. Defense Institute of High-Altitude Research (DIHAR) has been working on Seabuckthorn since early nineties and has developed various seabuckthorn based products such as beverages (Leh Berry), jam, herbal tea, antioxidant herbal supplement, herbal appetizer, UV protective oil and animal feed. Seabuckthorn oil is mostly used in cosmetic industry or as nutraceutical supplement. The oil has topical antioxidant, skin nourishing, UV reflective and moisturizing properties that protects the skin against harmful UV radiations (Husain *et al.*, 2018).



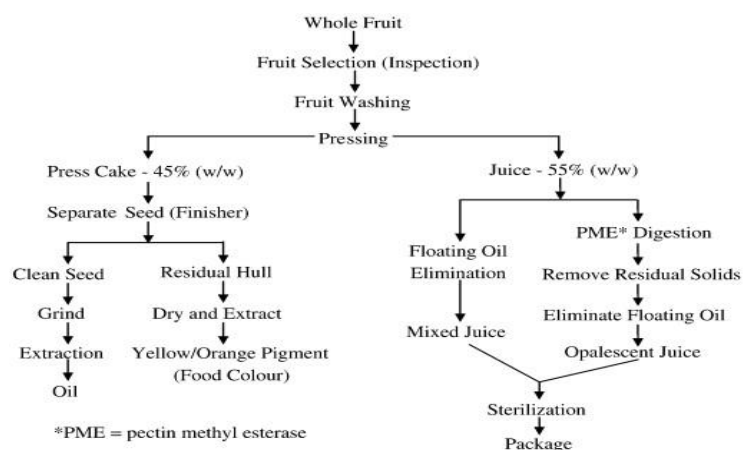


Fig. 2. Processing of seabuckthorn berries (Source: Bal *et al.*, 2011)

Conclusion and Future Prospects

Seabuckthorn has immense potential in the sustainable socio-economic development and nutritional security of Ladakh. However, the local people of Leh and Kargil districts are still unaware of the multitudinal benefits of this Super plant. There is a need for undertaking research of rich nutritive food values and make farmers aware of the utility of this species. There is a need for novel techniques and approaches for integrated processing of Seabuckthorn berries into their nutraceutical and therapeutic products. The products can be certified as organic as most seabuckthorn products are derived from natural forest and community land where application of chemical fertilizers and pesticides is negligible. It is necessary that this wonder plant should be promoted on a large scale and religiously by the local and Governments. Judicious exploitation, traditional usage coupled with commercial value and modern scientific research will bring immense benefit to modern society from the lesser-known shrub of the Himalayas.

References

- Ahani, H. and Attaran, S. 2022. Therapeutic potential of Seabuckthorn (*Hippophae rhamnoides* L.) in medical sciences. *Cellular, Molecular and Biomedical Reports*, **2**(1): 22-32.
- Bal, L.M., Meda, V., Naik, S.N. and Satya, S. 2011. Sea buckthorn berries: A potential source of valuable nutrients for nutraceuticals and cosmoceuticals. *Food Research International*, **44**(7): 1718-1727.
- Enkhtaivan, G., John, K.M., Pandurangan, M., Hur, J.H., Leutou, A.S. and Kim, D.H. 2017. Extreme effects of Seabuckthorn extracts on influenza viruses and human cancer cells and correlation between flavonol glycosides and biological activities of extracts. *Saudi Journal of Biological Sciences*, **24**(7):1646-1656.



- Husain, M., Rathore, J.P., Rasool, A., Parrey, A.A., Vishwakarma, D.K. and Mahendar, K. 2018. Seabuckthorn: A multipurpose shrubs species in Ladakh cold desert. *Journal of Entomology and Zoology Studies*, **6**(2): 1330-1337.
- Jain, A., Chaudhary, S. and Sharma, P.C. 2014. Mining of microsatellites using next generation sequencing of seabuckthorn (*Hippophae rhamnoides L.*) transcriptome. *Physiology and Molecular Biology of Plants*, **20**(1):115-123
- Masoodi, K.Z., Wani, W., Dar, Z.A., Mansoor, S., Anam-ul-Haq, S., Farooq, I., Hussain, K., Wani, S.A., Nehvi, F.A. and Ahmed, N., 2020. Sea buckthorn (*Hippophae rhamnoides L.*) inhibits cellular proliferation, wound healing and decreases expression of prostate specific antigen in prostate cancer cells in vitro. *Journal of Functional Foods*, **73**: 104102.
- Nawaz, M.A., Khan, A.A., Khalid, U., Buerkert, A. and Wiehle, M. 2019. Superfruit in the Niche-Underutilized Sea Buckthorn in Gilgit-Baltistan, Pakistan. *Sustainability*, **11**(20): 5840.
- Redei, D., Kusz, N., Rafai, T., Bogdanov, A., Burian, K., Csorba, A., Mandi, A., Kurtan, T., Vasas, A. and Hohmann, J. 2019. 14- Noreudesmanes and a phenylpropane heterodimer from sea buckthorn berry inhibit Herpes simplex type 2 virus replication. *Tetrahedron*, **75**(10):1364-1370.
- Stobdan, T., Dolkar, P., Chaurasia, O.P. and Kumar, B., 2017. Seabuckthorn (*Hippophae rhamnoides L.*) in trans-Himalayan Ladakh, India. *Defence Life Science Journal*, **2**(1): 46-53.
- Stobdan, T., Targais, K., Lamo, D. and Srivastava, R.B. 2013. Judicious use of natural resources: A case study of traditional uses of seabuckthorn (*Hippophae rhamnoides L.*) in trans-Himalayan Ladakh, India. *National Academy Science Letters*, **36**: 609-613.
- Stobdan, T., Yadav, A., Mishra, G.P., Chaurasia, O.P. and Srivastava, R.B. 2011. Seabuckthorn: the super plant (production, characterization, postharvest & health applications). *DIHAR, Defence R&D Organisation: New Delhi, India*.
- Tamchos, S. and Kaul, V. 2019. Seabuckthorn: opportunities and challenges in Ladakh. *National Academy Science Letters*, **42**: 175-178.



Dental hygiene in Dogs

¹ Dr M. D. Odedara and ² A. H. Sharma

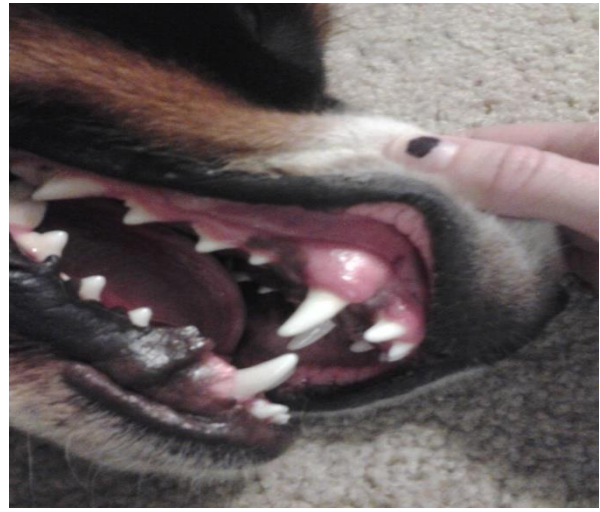
¹ Associate professor, COVASH, KU, Junagadh

² Internee student, COVASH, KU, Junagadh

<https://doi.org/10.5281/zenodo.7874789>

The most common complaint of pet parents is that their dog is having bad breath.

Though this problem is very much neglected by pet owners but it should be given proper attention because problem of bad breath seems simple but its occurrence is because of many reasons.



Causes

Dental tartar, dental plaque, gingivitis, discolored teeth or any mass within the mouth, bacterial infection, periodontal disease, kidney disease, liver disease, dehydration, etc can cause bad breath in pets.

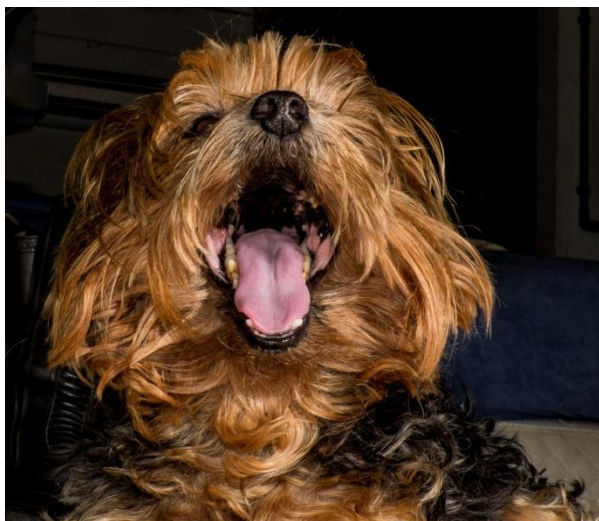
Preventive measures

Followings are the preventive measures to be taken to maintain dental hygiene of pets.

1) Oral Examination at Home

Checking dog for dental tartar, plaque, swollen gums, bleeding gums, discoloured tooth or any mass within mouth cavity

2) Brushing of teeth



Almost daily brushing of teeth is very important to prevent bad breath and oral disease in dogs.

3) Dental Treats

Dental treats, chew bones and chew toys are helpful to remove plaque from dog's teeth and gingival border which prevents tartar and gingivitis.

4) Offer Dry Dog Food

Dry dog food encourages dog to chew their food which leads to prevent dental plaque/ dental tartar formation.

5) Dental powder

Adding dental powder to dog's meal will encourage mouth cleaning process which will prevent bad breath in dog.

6) Dental Water Additives

Dental water additives in drinking water will help to keep teeth clean and also prevents tartar formation and reduces harmful bacteria, will ultimately freshening dog's breath.

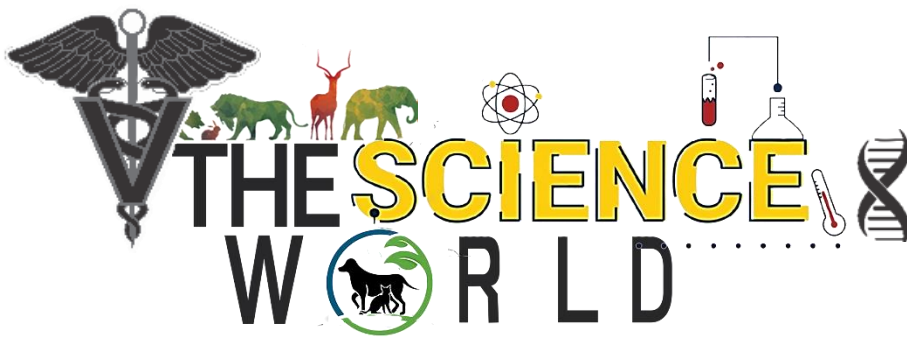


7) **Regular Dental check up**

Regular dental checkup is very necessary for dental health of dog. A veterinarian will examine and check it and if there is any problem, it can be solved at an early age with proper medication or process like, dental scaling.

If any dental problem arises, immediately consult your veterinarian.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 540-544

Popular Article

Precision Livestock Farming Technologies for thermal stress management in Farm animals

K. Rajamanickam¹ and P. Visha²

¹ Assistant Professor, Department of Veterinary Physiology and Biochemistry, Veterinary College and Research Institute, Salem, Tamil Nadu – 636 112.

² Associate Professor and Head, Department of Veterinary Physiology and Biochemistry, Veterinary College and Research Institute, Salem, Tamil Nadu – 636 112.
<https://doi.org/10.5281/zenodo.7874835>

Abstract

Heat stress has become a major issue in the era of climate change. Together with climate change and the drivers of burgeoning population led developmental changes will add on to the tough set of challenges for the livestock sector. Therefore, to maintain the quantity and quality of livestock products in the advent of increase in global temperature, role of precision dairy farming tools is of paramount importance. Precision dairy farming tools are used to measure physiological, behavioural and production indicators on individual animals to improve management strategies and physical resource variability to optimize economic, social benefits and minimize environmental impact. Recently developed on-animal and off-animal automated technologies for collection of temperature, animal behaviour, respiration rate has increased the feasibility of effective monitoring of heat stress in animals.

Introduction

Livestock is an integral part of agricultural system and majority of the world's population depends on it for their livelihoods. However, the livestock production in turn is critically affected by climate related variability and extremity. In spite of large-scale development of breeds and production technologies to optimize and sustain the livestock productivity in the recent past, the latter continues to be affected significantly by number of climatic factors. Deviation from the optimal environmental conditions adversely affects the animal productivity and growth. Rising global earth surface temperature is one of the most intriguing factors emerging from the changing climate. Heat



stress is well documented as a cause of significant financial loss in cattle production throughout the world. It is likely that the financial losses will be greater if proper monitoring and mitigation strategies are not implemented in line with continued global warming and increased intensity and duration of heat waves. Cattle heat stress monitoring and mitigation decisions have been traditionally based either on visual monitoring of animal response or on weather-based indices incorporating climatic factors and animal factors. As visual monitoring is impractical for large commercial farms and weather-based indices are impacted by individuality and microclimatic variability within farm, there is a need for autonomous monitoring systems to determine the degree of heat stress on a real-time basis

Therefore, to maintain the quantity and quality of livestock products in the event of increased global temperature, the role of precision dairy farming tools is of paramount importance. Precision dairy farming tools are used to measure physiological, behavioural and production indicators on individual animals to improve management strategies to minimize environmental impact and to optimize economic and social benefits.

Empirically, precision livestock farming (PLF) may be defined as a set of farming practices, which include use of advanced technologies, to deliver better results in livestock farming. PLF encompasses collection of data from animals and their environment by innovative, simple and low-cost techniques, followed by evaluation of the data by using knowledge-based computer models. Under precision livestock farming, livestock is monitored by continuous automated real-time animal monitoring systems to improve production, health and welfare and environmental impact. Large animals are tracked "per animal", however other animals, such as poultry, are tracked "per flock".

The basic objectives of PLF are to maximize individual animal potential, early detection of diseases and increase longevity, minimizing the use of medication through preventive health measures, supplements observation activities of skilled herd persons, reduction in number of farms labour required, optimize economic, social and environmental farm performance. Helps to make timely important decisions and informed decisions, resulting in better productivity and profitability.

Precision livestock farming in heat stress detection

Thermal stress indices which indicate the magnitude of thermal stress enforced on the animal have existed for years, but remain underutilized as they lack the comprehensive integrated approach of encompassing the technological advances in livestock rearing, information communication and



the traditional rearing practices that farmers follow as a part of their farm management. Recently developed automated technologies for collection of temperature, animal behaviour, respiration rate has increased feasibility of effective monitoring of heat stress in animals.

On animal thermal stress monitoring technologies

Respiration Rate monitor

Increased respiration rate is a primary response in heat stress and it is responsible for 60 % of total body heat loss. The pressure changes associated with chest muscle movement and its tone, flank movement and amount of exhaled air form the basis of autonomous respiratory rate. Long term respiration rate can be automatically monitored through different sensors like thin-film pressure sensors, pressure sensors with data filter algorithm, differential pressure sensors and Micro-electro-mechanical-system (MEMS) based magnetic sensors.

Radio Telemetric Temperature Sensors

Biosensors have been developed to detect cattle body temperature and it accounts for individual variability in thermoregulation. Recently developed Radio Telemetric Temperature Sensors includes temperature sensing ear-tags, wearable and implantable (micro-chips) devices, rumen-reticular boluses and intra-rectal and intravaginal devices and accelerometer tags. However, temperature-logging sensors without remote transmission of data option limits real-time temperature monitoring.

Temperature sensing ear-tags

Temperature sensing ear tags has been used to measure the real-time tympanic temperature in cattle. The hourly collection of temperature under thermoneutral and heat stress conditions have enabled effective monitoring of heat stress status. However, tag placement and probe dislodgment can limit the heat stress detection accuracy.

Microchip transponders

A wide range of subcutaneous microchips are being developed for the continuous measurement of body temperature in animals. Microchip transponders are generally implanted under the skin and the temperature is recorded through handheld receiver. Microchips are commonly implanted into the intra-peritoneal or intraabdominally in sheep, retroperitoneal and tail regions in goat and legs in cattle. Limitations of microchip transponders are their invasiveness and direct effects of animal physiology status like blood flow.



Rumen/reticular boluses

Rumen temperature is a reliable indicator of thermal stress which increases with increase in temperature humidity index (THI). Rumen bolus is integrated with temperature sensors and chips, which detects the real-time rumen or reticular temperature and the data is collected through wireless transmission and stored.

Rectal and vaginal temperature sensor probes

Inbuilt thermal sensors such as rectal and vaginal sensor probes enable monitoring of animal core body temperature without affecting its production. Vaginal probe has better utility because of the high association between vaginal and body core temperature. It is highly effective in measuring livestock body core temperature under grazing conditions.

Accelerometer

Accelerometer tags are lightweight and has minimal interference in animal's natural behaviour. Accelerometer sensors are generally placed under lower jaw and ear to detect the behavioural alterations. It monitors complex behaviours which are direct indicative of heat stress in animals.

Real-time location systems (RTLS)

Real-time location systems (RTLS) are animal tracking systems with a fixed receiver or reader that wirelessly reads the animal's location information from a small ID tag that is attached to it. These systems are typically used indoors or in a specific, restricted areas. The location and movement of an individual animal in the proximity of feed, water and other resources can be detected and used for developing behavioural indices. The RTLS based location data can be used to develop algorithms to predict eating, drinking, lying, and grooming behaviours. This system is effective where GPS-based positioning is interrupted. Here, the individual animals that are spending more time near water and shade can be identified and thereby determine its heat susceptibility.

Off-animal thermal stress monitoring technologies

Bioclimatic indices

Bioclimatic indices are calculated by using Temperature humidity index (THI). THI provides information on the severity of thermal stress prevailing in animals. Improved weather indices such as Heat load index (HLI) has also been effectively used in livestock. Portable weather devices along with Bluetooth connectivity provides a better prediction on animal thermal stress conditions.



Depth Imaging, Video Surveillance, and Artificial Intelligence

Computer vision-based video surveillance and depth imaging could be the ultimate off-animal thermal stress monitoring device in the future. Depth imaging provides better image resolution with high accuracy under different thermal stress environmental conditions. Video surveillance monitors the animal physiological and behavioural changes during heat stress. Artificial intelligence tools such as artificial neural network, fuzzy logic and machine learning based techniques are helpful in observing animal behaviour under thermal stress environment.

Infrared thermography

Infrared thermographs capture images based on the heat emitted from the animal's body surface which is highly correlated to THI and thus provides information about animal heat stress. Thermographic indicates the increased body temperature and changes in blood circulation under heat stress conditions.

Limitations and Future Prospectives

Automated monitoring of heat stress using advanced technologies can increase the cost of farm management especially for small holding farmers. Implantation of certain temperature sensors requires expertise. The ear tags and respiration rate sensors need to be properly installed to avoid being misplaced during the animal movement. Despite having limitations, automated real-time detection of heat stress is a cutting-edge technology in precision livestock farming under the current and future climate change scenario. Customisation as per animal microenvironment, species, herd size and local weather conditions will increase the use of automated thermal stress detection technologies.



Treditional Herbs Used in Aquaculture

R. Mahesh Kumar

Ph. D. Scholar, Department of Aquaculture, College of Fisheries Science, Muthukur, APFU, Nellore
<https://doi.org/10.5281/zenodo.7874870>

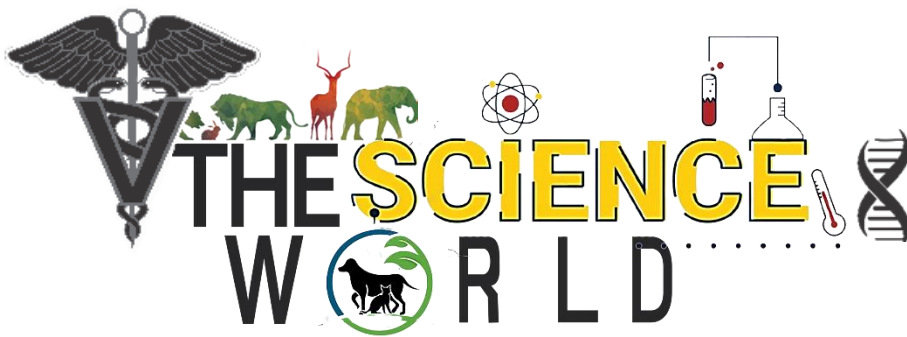
The present study: “**Studies on the effect of ginger, garlic and fenugreek powder supplementation diets on the growth and survival of pacific white shrimp, *Litopenaeus vannamei***” was conducted in the Wet Laboratory of the Department of Aquaculture, College of Fishery Science, Sri Venkateswara Veterinary University, Muthukur. *L.vannamei* shrimp was fed with three different herbal powder of ginger, garlic and fenugreek of varying levels of 1%, 2.5%, 5%, 2%, 4%, 6%, 0.5%, 1% and 1.5% of concentrations respectively to assess the optimal growth promoting potential and survival rate. The feeding trial was continued for 63 days with triplicates in each treatment. The growth parameters (ABW, weight gain, SGR), feed efficiency parameters (FCR) and survival rate were significantly ($P<0.01$) higher in treatment diets fed vannamei compared to control diet fed vannamei. Highest weight gain was observed in GP 4% supplemented diet fed vannamei compared to all other garlic supplemented diets. Growth measured as specific growth rate was improved with the herbal supplementation in the basal diets. The elevation in the SGR is in the order of garlic > ginger > fenugreek > control. It was found that GP 4% supplementation in the diet was optimal level of inclusion in garlic supplementation for vannamei culture. The diet supplemented with GP 4% fed vannamei was showed best FCR with higher significance ($P<0.01$) compared to other treatments. Survival rate of the vannamei fed diets containing garlic powder were significantly ($P<0.01$) higher in GP 6% (91.6%) compared to control (58%). Similar trend of elevated survival rates was noticed in vannamei at ZP 2.5 (91.3%) and FP 1.5% (83.3%) compared to control. The growth promoting ability of herbs with varying concentrations higher in GP 4% followed by ZP 2.5% and FP 1% supplemented in vannamei diets.

Note:

GP 2%: Per Kg feed contain 20g of garlic powder
GP 4%: Per Kg feed contain 40g of garlic powder
GP 6%: Per Kg feed contain 60g of garlic powder
ZP 1%: Per Kg feed contain 10g of ginger powder
ZP 2.5%: Per Kg feed contain 25g of ginger powder

ZP 5%: Per Kg feed contain 50g of ginger powder
FP 0.5%: Per Kg feed contain 5g of fenugreek powder
FP 1%: Per Kg feed contain 10g of fenugreek powder
FP 1.5%: Per Kg feed contain 15g of fenugreek powder





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 546-550

Popular Article

Breeds of Cattle in Gujarat: Important for Improvement of Socio-Economic Status

Lokendra*, S. W. Sawarkar, M. D. Odedra, G. M. Chaudhari

College of Veterinary Science & Animal Husbandry, Kamdhenu University, Junagadh, Gujarat

<https://doi.org/10.5281/zenodo.7874910>

Introduction

The livestock sector plays a significant role in the world's food system, helping to reduce poverty, provide food security, and advance agriculture. About 1.3 billion people depend on livestock for their livelihoods, food security, and nutrition, which accounts for 40% of global agricultural output. Livestock are crucial to the development of sustainable food systems. For instance, manure is a vital source of organic fertilizer, and livestock used as draught animals can boost productivity in regions with little access to mechanization. Livestock is a valuable resource for vulnerable communities. Increased incomes, altered diets, and population expansion have all led to a rise in demand, making the livestock sector one of the fastest-growing agricultural sub-sectors in middle- and low-income nations. This presents a major opportunity for smallholders, enterprises, and job creators across the entire livestock supply chain. If expansion is not properly controlled, it runs the risk of escalating difficulties with public health, environmental damage, and equity across the board.

In Gujarat, total livestock population is 26.8 million showing decrease of 0.75% over previous Livestock Census-2012 and among that 9.6 million are Cattle (showing decrease of 3.51% over previous Livestock Census-2012), which are cover 35.9% of total livestock population.



Nari cattle

- ❖ **Synonyms:** Sirohi
- ❖ **Breeding tract:** Nari cattle are native to Sirohi and Pali districts of Rajasthan, Sabarkantha and Banaskantha districts of Gujarat.
- ❖ **Milk Production/ lactation:** 1119 to 2223 Kg
- ❖ **Milk Fat percentage:** Average milk fat is 4.64 % (ranges from 3.1 to 8.3 %).
- ❖ **Colour:** The majority of cows have white or greyish white coats, whereas bulls typically have white, greyish white, or black coats.
- ❖ **Horn Shape & Size:** These are capable of great migration, are medium in size, and can thrive on pasture and in an open housing arrangement in all types of weather. Horns have a spirally curved shape and point forward or outward. Most often, the forehead is broad and slightly concave.
- ❖ **Weight:** Average 366 Kg in Males and 258 Kg in Females.
- ❖ **Special point:** Excellent in draught power in both plains and hilly forest areas.



Dagri cattle

- ❖ **Synonyms:** Gujarat Malvi
- ❖ **Breeding tract:** Dagri cattle are distributed in Dahod, Chhotaudepur and parts of Mahisagar, Panchmahals and Narmada district of Gujarat.
- ❖ **Age at First Parturition:** 48-60 months
- ❖ **Milk Production/ lactation:** 75-650 Kg
- ❖ **Calving Interval:** 15.8- 18.2 months
- ❖ **Milk Fat percentage:** Average milk fat of 4.08 % (range from 3 to 5.5 %).



- ❖ **Colour:** The tint of the coat is primarily white, occasionally with a touch of grey.
- ❖ **Horn Shape & Size:** Small-sized animal with a compact physique and a straight forehead. Horns can be straight with sharp points or upwards curved in the shape of a lyre.
- ❖ **Weight:** Average 224 Kg in Males and 170 Kg in Females.
- ❖ **Special point:** Less feed requirement, survives mainly on grazing, hardly stall fed.



Gir cattle

- ❖ **Synonyms:** Sorathi
- ❖ **Breeding tract:** The native tract of the breed is the area around forests of Gir including Junagadh, Bhavnagar, Rajkot and Amreli districts of Gujarat.
- ❖ **Age at First Parturition:** 38-55 months
- ❖ **Milk Production/ lactation:** 2000-2200 Kg
- ❖ **Calving Interval:** 14.47-19.73 months with average of 16.97 months.
- ❖ **Milk Fat percentage:** 4-5 %.
- ❖ **Colour:** There are three different strains of Gir cattle, and their coat colors range from reddish-brown to nearly black and white to completely red.
- ❖ **Horn Shape & Size:** Horns have an odd curvature. They begin at the base of the crown and curve downward and backward before inclining slightly upward and forward and assuming a spiral inward sweep before ending in a fine taper, giving the impression of a half-moon.
- ❖ **Weight:** Average 500-540 Kg in Males and 300-350 Kg in Females.



- ❖ **Special point:** India's best breed for milk production. The ears were long and pendulous, folded like a leaf. Their insides face forward, and their ears hang constantly.

Kankrej cattle

- ❖ **Synonyms:** Vadhiyari
- ❖ **Breeding tract:** It gets its name from the North Gujarati taluka of Kankrej. The breeding tract is located in the southern portion of the Rann of Kachchh, stretching from Ahmedabad to Disa and from Radhanpur to the southwest corner of Banaskantha District, Kankrej Taluka, and Tharparker District (now in Pakistan).
- ❖ **Age at First Parturition:** 39-56 months
- ❖ **Milk Production/ lactation:** 1700-1900 Kg.
- ❖ **Calving Interval:** 13.33-21.02 Months with avg. of 16.12 months
- ❖ **Milk Fat percentage:** 4.7-5% with avg. of 4.8%
- ❖ **Color:** Silver-gray to steel-gray or iron-gray.
- ❖ **Horn Shape & Size:** Strong, lyre-shaped horns with an upward and outward curvature. Compared to other breeds, their skin has a longer, more curved shape.
- ❖ **Weight:** Average 550-570 Kg in Males and 330-370 Kg in Females.
- ❖ **Special point:** Cattle of the heaviest breed. Large wide ears and horns in the shape of a lyre. The gait of the Kankrej is unique to the breed; it is smooth, the body moves very little, the head is kept conspicuously high, the stride is long and even, and the hind hoof is positioned far in front of the fore hoof imprint. Breeders refer to this gait as 1¼ paces ("Sawai chal").

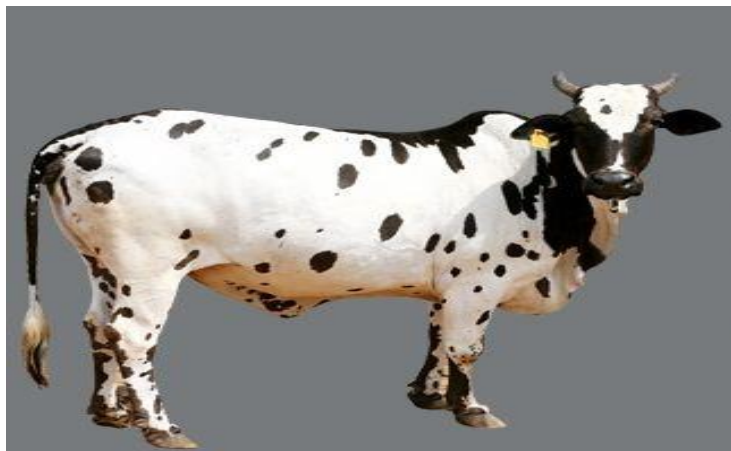


Dangi cattle

- ❖ **Synonyms:** Kanadi
- ❖ **Breeding tract:** Dang district of Gujarat and Ahmednagar and Nasik Districts of Maharashtra.

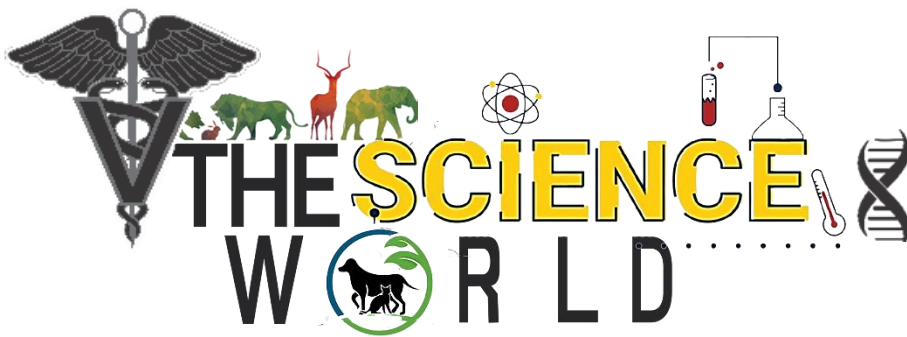


- ❖ **Age at First Parturition:** 46-56 months with average of 53 months
- ❖ **Milk Production/ lactation:** 430-600 Kg
- ❖ **Calving Interval:** 17-21 months
- ❖ **Milk Fat percentage:** 3.8-4.5 % with avg. of 4.3 %.
- ❖ **Colour:** Unevenly spaced red or black dots throughout the body of a coat of a particular shade.



- ❖ **Horn Shape & Size:** There are also a considerable number of animals having horn tips that point inward as well as downward.
- ❖ **Weight:** Average 310-330 Kg in Males and 220-250 Kg in Females.
- ❖ **Special point:** The Dangi breed is renowned for its exceptional ability to operate in dense rain, in rice fields, as well as on incline roads. Depending on the terrain, they can travel 20 to 24 miles per day while carrying heavy lumber at a speed of 2 to 3 miles per hour.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 551-555

Popular Article

Breeds of Sheep and Goat in Gujarat and Their Importance

Lokendra*, S. W. Sawarkar, M. D. Odedra, G. M. Chaudhari
College of Veterinary Science & Animal Husbandry, Kamdhenu University, Junagadh, Gujarat

<https://doi.org/10.5281/zenodo.7875430>

Introduction

The national rural economy depends heavily on goats. In rural India, they are raised by more than 70% of small farmers and landless agricultural laborers. Comparing raising goats to raising other livestock breeds, poor farmers can profit greatly socioeconomically from doing so. A few of the many benefits of this firm that guarantee high income are low input, great efficiency, easy marketing, and unprejudiced social acceptance of their products. Sheep produce meat, fleece, hides, excrement and to some extent milk in addition to being utilized for transportation. Goat milk is beneficial for those with peptic ulcers, liver issues, jaundice, biliary diseases, and other digestive issues since it has significant buffering characteristics. Each year, three different sorts of cash are generated by the production of wool, meat, and manure. Sheep and goats can be sold for a quick profit as early as 5 to 6 months of age (preferably, before 1 year).

In Gujarat, total livestock population is 26.8 million showing decrease of 0.75% over previous Livestock Census-2012 and among that 1.8 million are sheep (showing increase of 4.63% over previous Livestock Census-2012), which are cover 6.66% of total livestock population and 4.9 million are Goat (showing decrease of 1.84% over previous Livestock Census-2012), which are cover 18.14% of total livestock population of the country (Anonymous, 2019).



BREED OF GOAT

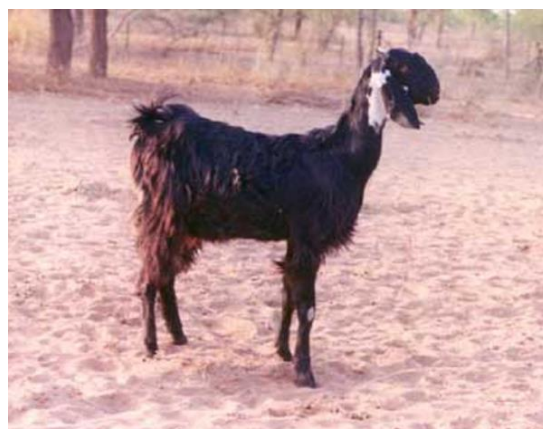
SURTI (Place: Mahi river valley of Saurashtra, Baroda, Gujarat)

- ❖ Coat Colour: Mainly white, with black and brown hair occasionally found in various body regions.
- ❖ Body and legs: Medium sized and tail is short.
- ❖ Ears: Medium sized and drooping.
- ❖ Horns: Small, backwards-running, slightly bent.
- ❖ Live weight: Average live weight for a buck 35 kg and doe is 32 kg.
- ❖ Kidding: Once a year, single or twins. Average age at first kidding is 21 months.
- ❖ Meat: Good
- ❖ Milk: The breed produces a considerable amount of milk, averaging 2.0 kg per day. Lactation length is 150 days.



KUTCHI/KATHIWADI (Kutch, Kathiawad district of Gujarat)

- ❖ Coat Colour: Ears, neck, and face are primarily black, white, or speckled.
- ❖ Body and legs: Medium sized somewhat Romanized nose.
- ❖ Ears: Broad, long and drooping.
- ❖ Horns: Slightly twisted, upward-pointing.
- ❖ Live weight: Average for a buck 44 kg and doe is 39 kg.
- ❖ Kidding: Once a year, single or twins; age at first kidding 17 months.
- ❖ Meat: Good.
- ❖ Milk: Average lactation yield 80-90 kg in 130 days.



MEHSANA (Banaskantha, Mehsana, Baroda & Gandhinagar districts of Gujarat)

- ❖ Coat Colour: Black with white spots at the base of the ear, hair coarse having admixture of grey and white; staple length 8-10 cm; small heard and grey black skin.



- ❖ Body and Legs: Moderate in size, with a Roman nose and a broad muzzle. The tail is short and abrupt.
- ❖ Ears: The ears are white, hanging like leaves, and white.
- ❖ Horns: Slightly twisted and curved upwards and backwards.
- ❖ Live weight: A typical buck weighs 37 kg, whereas a doe weighs 32 kg.
- ❖ Kidding: Once a year, single and twins occur as age advances.
- ❖ Meat: Average quality.
- ❖ Milk: High yielders; 5 kg a day quite common in the area.



ZALAWADI (Surendranagar, Rajkot, Zalwad districts of Gujarat)

- ❖ Coat Colour: Black with white patches. Hair is long, coarse, black, and shiny, with a staple length of 10-12 cm, and skin is pinkish blue.
- ❖ Body and legs: Large sized; broad nostrils; neck long and throat carry lobular appendages; and a short, curving tail.
- ❖ Ears: Long, broad, floppy ears that resemble leaves.
- ❖ Horns: Horns are long, straight, and corkscrew-shaped.
- ❖ Live weight: Average, 39 kg for bucks and 33 kg for does.
- ❖ Kidding: Once a year; the age at first kidding 23-24 months.
- ❖ Meat: Good.
- ❖ Milk: Peak yield up to 3 kg a day; average lactation yields 154 kg in 150 days.



GOHILWADI (Bhavnagar, Amreli, Junagadh districts of Gujarat)

- ❖ Coat Colour: Black with long, coarse hairs.
- ❖ Body and legs: Medium sized; nose line slightly convex.



- ❖ Ears: Tubular and drooping.
- ❖ Horns: Slightly twisted and facing the wrong way.
- ❖ Live weight: Average for buck is 37 kg and doe are 36 kg.
- ❖ Kidding: Once a year, single; age at first kidding 22-23 months.
- ❖ Meat: Good.
- ❖ Milk: Peak yield 3.2 kg a day; average lactation yields 80 kg.



KAHMI (This goat is native to Saurashtra region of Gujarat)

- ❖ Coat Colour: The coat colour is distinct, with a reddish-brown neck and face and a black belly portion.
- ❖ Body and legs: The majority of goats have wattles, and the forehead is convex.
- ❖ Ears: Ears are long, tubular & coiled, locally called “veludi”.
- ❖ Horns: Horns are directed upwards and backwards.
- ❖ Live weight: Adult body weight is 56 kg in males and 48 kg in females.
- ❖ Kidding: Once a year, Single or twins; age at first kidding 18-24 months.
- ❖ Meat: Good
- ❖ Milk: Average daily milk yield is about 1.7 kg.



BREED OF SHEEP:

MARWARI

- ❖ Medium-sized animals from the Marwari region of Rajasthan and the Jeoria region of Gujarat.
- ❖ The lower neck region and the face are all black. Ears very small and tubular.
- ❖ The Wool quality is coarse, white, and made up of hairy fibres of various types.



- ❖ Product-carpet wool of superior quality wool and yield is 1.8 kg/annum.
- ❖ Average body weight in male 30 kg and in female 26 kg.

PATTANWADI (also called Desi, Kutchi, Kathiawari, Vadhiyari and Charotari)

- ❖ Located in the Gujarati districts of Kutch, Jamnagar, Bhavnagar, and Janapura.
- ❖ Medium-sized to giant animals with rather long legs. Typical roman nose.
- ❖ Dark and tanned face. Ears are medium.
- ❖ A medium-quality white tubular fleece carpet.
- ❖ Adult male 33 kg and female 25 kg.



PANCHLI

- ❖ In the Panchal region of Gujarat, Panchali sheep are raised for both milk and meat.
- ❖ Animals have long legs, a huge body, and strong migrating skills.
- ❖ A white coat is used. Parts of the head or face are coloured black, blackish brown, brown, and light brown. Long and pendulous ears. Long tail. Udder is fully formed.
- ❖ The annual production of coarse wool is close to one kilogramme.
- ❖ Adult weight varies from 53 to 82 kg in males and 32 to 73 kg in females.



References

- Banerjee, G. C. (2018). Goat. A textbook of Animal Husbandry. (8th ed., pp. 932-979). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Banerjee, G. C. (2018). Sheep. A textbook of Animal Husbandry. (8th ed., pp. 980-1014). Oxford & IBH Publishing Co. Pvt. Ltd., New Delhi.
- Verma, D. N. (1999). Management of Camel. A textbook of livestock production management in tropic. (1st ed., pp.). Kalayani Publishers, Noida (U.P.).
- Yadav, A. K. and Singh, J. (2016). Registered indigenous Sheep breeds of India: An Overview. *Indian Farmer*, 3(2), 86-103.



Body Condition Score: A Tool for Health Assessment in Goat

Varsha Gupta^{1*} M. M. Farooqui² and Abhinov Verma³

1*. Associate Professor, Department of Veterinary Anatomy, COVSc, DUVASU, Mathura, Uttar Pradesh-281001

2. Professor, Department of Veterinary Anatomy, COVSc, DUVASU, Mathura, Uttar Pradesh - 281001

3. Assistant Professor, Department of Veterinary Anatomy, COVSc, DUVASU, Mathura, Uttar Pradesh-281001

<https://doi.org/10.5281/zenodo.7875455>

Abstract

Body condition score is an important tool used to assess the health and well-being of any animal, and dairy goats are no exception. It is an index of the animal's muscle and fatness, and can be used to assess the current and past feeding programs, as well as the condition of the animals during usual management. It allows producers to assess the nutritional condition of their goats and identify potential health problems before they become too serious. BCS is a numerical score from 1 to 5, with 1 being severely emaciated and 5 being obese.

Introduction

The body condition score (BCS) is an estimation of an animal's muscle and fat development, providing a more accurate measure than body weight alone. It is a subjective assessment of the body fat and muscle composition of a goat, based on visual observation of the animal. It does not require any specialized equipment or testing, and can be performed quickly and easily by anyone familiar with the technique (Reshma *et al.*, 2022). It is a subjective way used to evaluate the nutritional status of a flock, and can help goat owners increase their flock's production efficiency (Özder *et al.*, 1995; Sejian *et al.*, 2010 and Carlson, 2017). Body condition scoring of goats is important before breeding,



during mid-gestation, early lactation, weaning, and sale. Poor body condition may lead to lower conception rates, reduced milk production, and smaller offspring. This can lead to lower production and profits. Animals in an appropriate body condition have enough energy/fat reserves to reach their full genetic potential without excess fat which can impair performance (Kinne, 2012). Goats that are very fat at kidding will result in more health problems. Goats that are very thin in early lactation will not have the energy reserves required to attain high milk production. Thin goats at breeding will also be harder to get pregnant (Koyuncu and Altınçekiç, 2013).

How to perform

The Body Condition Score is determined on a scale of 1.0 to 5.0 with increments of 0.5. A score of 2.0 to 3.5 is considered healthy for sheep and goats. It is important that goats are neither too fat nor too thin (Houghton *et al.*, 1990; Pennington, 2010). An animal with a BCS lower than 2.0 may be facing a health or management problem while a score of 4.5 and higher are rarely seen in a normal management situation. Assigning a BCS requires one to physically feel the animal. With practice, it is possible to accurately evaluate a goat's BCS in about 10-15 seconds. To determine the BCS, the handler uses his/her hands to feel for the fullness of muscle and fat cover in the loin, sternum and rib cage regions.

Regions for evaluation of body condition in goats

1. Lumbar region: The lumbar region is formed by lumbar vertebrae which is located immediately behind the last rib and before the hip bones and covered by loin muscle. Amount of fat and muscle present over and around the vertebrae is used as a criterion for determination of BCS. Lumbar vertebrae have two protrusions, the vertical protrusion called the dorsal *spinous process* and the two horizontal protrusions called the *transverse process*. One should run their hand over this area and try to grasp these processes with your fingertips and hand. The degree of sharpness or roundness of the lumbar vertebrae is assessed and used to assign BCS.

2. Rib cage: The area formed by thirteen pairs of ribs and intercostals muscles. The fat cover on the ribs and intercostal (between ribs) spaces is used for identification of BCS. Touch this area and determine if one can feel each of the ribs.

3. Sternum: The sternum is the third part to assess. In goats it is an important area to assess. The fat cover over the sternum (breast bone) can be pinched and is used for BCS determination in goats.



Scoring of Goat

BCS-1

The goat looks emaciated (very thin) and weak. The spinous process and transverse processes of lumbar region are prominent and sharp and clearly visible. The fingers pass easily under the ends of transverse process which can be easily felt. The backbone is highly visible, hollow flank and clearly visible ribs. The ribs are not covered with fat and intercostals spaces can be felt easily by fingers. Sternal fat easily grasped between thumb and fingers and moved from side to side.

BCS-2

slightly better than BCS-1 but the goat looks thin. The spinous processes of lumbar vertebrae feel prominent but smooth and individual process can be felt. The transverse processes are smooth and rounded and with a little pressure one can pass the fingers under the ends. Backbone is visible with a continuous ridge and ribs can be seen and felt. Only a small amount of fat cover present over inert costal spaces of ribs. Sternal fat wider and thicker than BCS 1, but can still be grasped and lifted.

BCS- 3

the goat looks moderate or normal. In lumbar region the spinous processes are detached only as small elevations, the processes are rounded and smooth and individual process can be felt only by giving pressure. The transverse processes are smooth and well covered. Firm pressure is required to feel over the ends of transverse processes. Backbone is not prominent. Ribs are covered with even layer of fat. Vertebrae are cover by thick tissue layer. Sternal fat is wide and thick. It can be grasped, but has very little movement.

BCS- 4

The goat appears fatty. The spinous processes of lumbar vertebrae can be detected by pressure as a hard line between the fat covered back. The ends of the transverse processes of lumbar vertebrae cannot be felt. The backbone and ribs cannot be seen. Sternal fat difficult to grip and cannot be moved from side to side.

BCS- 5

The goat gives very fatty appearance. The spinous processes cannot be detected even after firm pressure and there is a depression between the layers of fat in the position where the spinopus processes would normally be felt. The transverse processes cannot be detected. There may be heavy



deposition of fat around rump and tail areas. Backbone is buried in fat. Ribs are covered with excessive fat and not visible. Sternal fat extends and covers sternum, and cannot be grasped.

Ideal ranges of BCS for various physiological states:

- i. In healthy physiological stage the BCS ranges between 2.5 to 3.5 but if it ranges 1.0 or 1.5 to 2.0 it has management of health problem.
- ii. In breeding buck, ideal BCS is ranges between 3.0-3.5. The bucks having BCS score less than 2 to 2.5 will not have sufficient stamina and vigor to breed. They should have 3.0 score before start the breeding season. The bucks with BCS > 4 lack sexual desire.
- iii. At the time of mating does should have a score of 3 for optimum result with a range of 2 to 3 being acceptable (Koyuncu and Altınçekiç, 2013).
- iv. In Pregnant doe, ideal BCS ranges between 3.0-3.5. BCS more than 3.5 leads to pregnancy toxemia/ ketosis, retention of placenta, fatty liver, abnormal displacement and dystokia. BCS <2.0 to 2.5 leads to poor kid survivability and milk production.
- v. During kidding ideal BCS ranges between 3.0-3.5 to ensure the adequate production of colostrum and reservoir to support high milk production especially in early lactation.
- vi. In lactating doe BCS should be 2.5-3.0. it should not come below 2.0 to 2.5. Quick drop of BCS during lactation leads to anoestrus, anovulatory oestrous, shorter oestrous, repeat breeding and infertility. During flushing there is no need of flushing if BCS is 3.5 or more. The goats will response to flushing treatment if BCS is 2.0 or less.

Conclusion

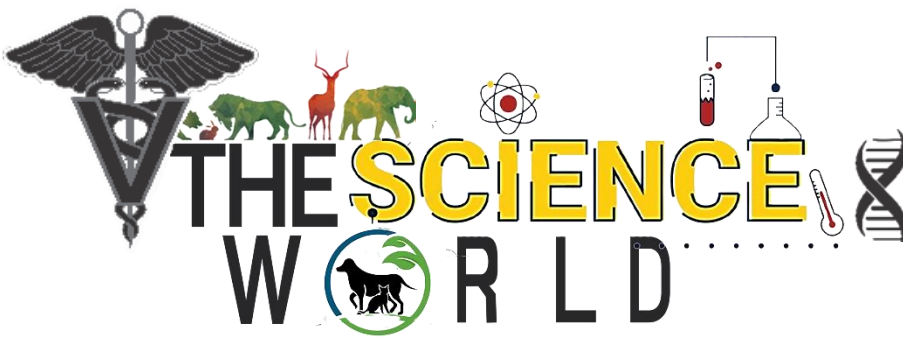
Goat Body Condition Score (BCS) is a method used to measure the amount of body fat and nutritional status of goats. Through a comprehensive score, it accurately reflects the body condition of dairy goats, which is an important indicator for evaluating herd productivity. It is simple to use and can help producers make management decisions about feeding to ensure reproductive performance and reduce costs. Moreover, it is also useful in goat marketing.



References

- Carlson J. (2017). Dairy goat body condition scoring. American dairy goat association and university of California, Davis, Department of Animal Science and School of Veterinary Medicine. <https://adga.org/wp-content/uploads/2017/11/adga-dairy-goat-body-condition-scoring.pdf>.
- Houghton P. L., Lemenager R. P., Hendrix K. S., Moss G. E. and Stewart T. S. (1990). Effects of Body Composition, Pre- and Postpartum Energy Intake and Stage of Production of Energy Utilization by Beef Cows. *J. Anim. Sci.*, **68**: 1447–1456.
- Kinne, M. (2012). The Ins & Outs of Body Condition. <http://kinne.net/ins&outs.htm>.
- Koyuncu M. Altınçekiç and Ş. Ö. (2012). Importance of body condition score in dairy goats. *Macedonian Journal of Animal Science*, Vol. 3 (2): pp. 167–173.
- Ozder M., Yurtman Y. and Koycu E. (1995). Kondüsyon Puanı ve Koyun Yetistiriciliginde Kullanımı. *Hayvansal Üretim Dergisi*, **36**: 1–10.
- Pennington, J. (2010). Body Condition Scoring of Sheep and Goats. University of Missouri, Lincoln University, U.S. Department of Agriculture and Local Extension Councils Cooperating.
- Reshma Ch. V., Anitha A., Jagadeeswara S. and Muralidhar M. (2022). Body Condition Score and its Relation to Body Weight and Measurements of Local Goats of Andhra Pradesh under Field Conditions. *International Journal of Bio-resource and Stress Management*, **13(2)**: 131-136.
- Sejian A., Maurya V. P., Naqvi S. M. K., Kumar D., Joshi A. (2010). Effect of Induced Body Condition Score Differences on Physiological Response, Productive and Reproductive Performance of Malpura Ewes Kept in a Hot, Semi-Arid Environment. *J. Anim. Phys. Nutr.*, **94**:154–161.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 561-564

Popular Article

Artificial Intelligence and Its Potential Impact on Society

Koppu Vasavi^{1*}, Madineni Kavitha², Poloju Deepa³, Vemula Sravanthi Reddy⁴, Ratna Supriya Reddy⁵

^{1,2,3} Ph.D. scholar, ICAR-Indian Veterinary Research Institute, Izatnagar, Bareilly-243 122, Uttar Pradesh, India

^{4,5} Ph.D. scholar, PVNRTVU, College of Veterinary Science, Rajendranagar, Hyderabad -500030, Telangana, India

<https://doi.org/10.5281/zenodo.7875526>

Introduction

Artificial intelligence is influencing practically every sector of human endeavor. With tools like ChatGPT and AI art generators gaining public prominence, it is already the primary force behind developing technologies like big data, robots, and IoT. For the foreseeable future, it will continue to serve as an innovator in technology. It's difficult to keep up with the latest breakthroughs in artificial intelligence, which is why the potential development of AI may appear to be a swiftly shifting landscape. Artificial intelligence has advanced quickly and is no longer simply an idea from sci-fi movies and books, with driverless automobiles and voice automation in houses. In the coming years, artificial intelligence (AI) will permeate every aspect of our life and eventually surpass human intellectual capacity.

The Evolution of AI:

The way AI affects computers is one of the reasons for its impact on technology. Artificial intelligence (AI)-powered computers can access huge quantities of data and use the information they have collected to make the most advanced assessments and discoveries in just a bit of the time than it would take for humans.



The journey towards the development of AI began in the early 1950s with Alan Turing's breakthrough, he developed the Turing Test to assess whether a machine could simulate human thought processes. The invention of the first AI programming language, LISP, by John McCarthy in the 1960s accelerated AI research. Early AI systems emphasized symbolic computation and rule-based systems, leading to the formation of specialized systems in the decades between the years 1970 and 1980. The greater availability of digital data and developments in computing power fueled a shift in emphasis towards machine learning and data-driven approaches in the 1990s. During this time, neural networks and support vector machines were developed, allowing AI systems to learn from data and improve performance and adaptability. AI research extended into new fields throughout the 2000s, such as natural language processing, computer vision, and robotics, setting the path for today's AI revolution.

Definitions of Intelligence:

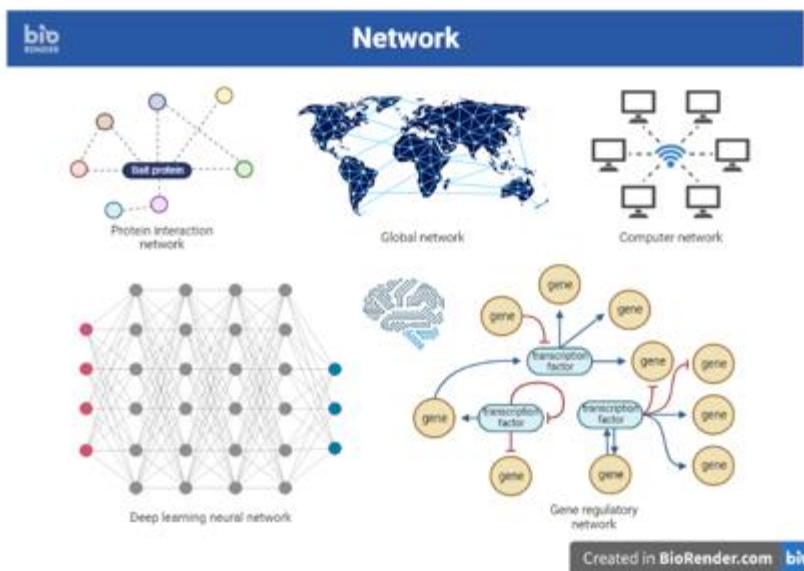
Being intelligent is having the ability to act appropriately when the alternative—doing nothing or not changing one's behavior—would be worse.

Therefore, intelligence calls for

- the capacity to perceive contexts for action;
- the capacity to act;
- the capacity to associate contexts with actions.

Beneficial Effects of Artificial Intelligence on Society

The potential for artificial intelligence to greatly boost workplace efficiency and broaden the spectrum of jobs that individuals are capable of is enormous. Now that AI can perform hard or hazardous tasks, the human workforce may concentrate on jobs for which they are better suited, such



AI and its key role in Modern Networking (picture created in Biorender)



those requiring creativity and sensitivity. People who are employed in more rewarding jobs may be happier and more satisfied with their jobs.

Artificial intelligence can have a significant impact on healthcare by improving monitoring and diagnostic skills. AI can lower operating expenses and save money by enhancing the effectiveness of medical organizations and healthcare facilities. According to a McKinsey estimate, big data might reduce medical and pharmaceutical costs by up to \$100 billion yearly. The care of patients will have the biggest impact. Life-changing opportunities include the potential for customized treatment plans and pharmacological regimes, as well as improved provider access to data from various medical facilities to help guide patient care.

With artificial intelligence, we can better detect illegal activity and solve crimes. As with fingerprints, facial recognition technology is gaining popularity. The application of AI in the legal system offers numerous opportunities to figure out how to make use of the technology successfully without invading someone's privacy.

Your life will be profoundly changed by artificial intelligence unless you decide to live remotely and never want to engage with the modern world. The expectation is that artificial intelligence will generally have a better than the bad impact on society, despite the many learning experiences and obstacles to be encountered as the technology rolls out into new areas.

Will AI Replace Human Jobs??

A report from the World Economic Forum (WEF) estimates that by 2025, enterprises' adoption of emerging technologies will change tasks, employment, and skills. As a result of integrating technology and AI, 43% of the businesses questioned said they plan to reduce their employment, compared to 34% who want to increase it.

Employers anticipate that by 2025, the percentage of "increasingly redundant roles" in the workforce will drop from 15.4% to 9%. However, the number of emerging professions—those that will be newly enabled by emerging technologies will increase from 7.8% to 13.5%.

AI in Health Care

Researchers from Babylon Health and University College London revealed that causal machine learning models currently outperform human doctors' diagnostic accuracy in a peer-reviewed study published last year. When given the task of diagnosing written test cases of plausible



ailments, the researchers discovered that the ML model utilized in the study performed better than 72% of general practitioner doctors.

Other applications of AI include accelerating drug discovery, improving early detection of diseases like cancer and Alzheimer's, and developing precision medicines that could one day revolutionize healthcare by replacing the current one-drug-fits-all approach with personalized, unique drugs and treatments.

Conclusion

Although we often are persuaded to believe it is, artificial intelligence is not as the first or unique in the human experience as we might think and is already affecting society more quickly than we realize. We have previously had our capacities increased, our economics changed, and our social order disrupted generally, though not always for the better by other artifactual entities like language and writing, businesses and governments, telecommunication, and oil. Ironically, the greatest threat we currently face is perhaps also the proof that, on the whole, progress has made us better off for a sustainable living and stemming the loss of biodiversity.

Finally, Artificial Intelligence is rapidly transforming the way we work and live. Tasks are being automated, financial services as well as in healthcare are being improved, and our entertainment and shopping habits are changing. Nevertheless, as technology advances, it's critical to take into account the potential drawbacks, such as job relocation, and to strive towards seeking solutions that mitigate these negative effects. Although AI has a promising future, it is essential to proceed cautiously and make sure that it is utilized in ways that will be advantageous to the world.

References

- <https://builtin.com/artificial-intelligence/artificial-intelligence-future>
- <https://www.springboard.com/blog/data-science/artificial-intelligence-future/>
- <https://bernardmarr.com/what-is-the-impact-of-artificial-intelligence-ai-on-society/>
- <https://iq.opengenus.org/future-of-artificial-intelligence/>
- <https://timesofindia.indiatimes.com/readersblog/shikshacoach/how-ai-will-impact-the-future-of-work-and-life-49577/>
- <https://www.bbvaopenmind.com/en/articles/the-past-decade-and-future-of-ais-impact-on-society/>
<https://metasfresh.com/en/2022/01/12/impact-of-artificial-intelligence-in-the-future/>



Artificial Insemination of Cattle: Current and Future Trends

Dr. Bipasha Goswami

Veterinary Officer, Govt. of West Bengal

<https://doi.org/10.5281/zenodo.7880153>

Introduction

Artificial Insemination (A.I) is an in vivo fertilization process to avoid sexual intercourse or in vitro fertilization. In this process sperm is introduced into a female's cervix or uterine with the help of proper instruments for achieving pregnancy. A.I is used for human, pets, endangered animal species, livestock, animal in zoo etc. Although the A.I is very common for cattle (75% of all inseminations) and swine (85% of all inseminations). Artificial insemination is very much popular among the livestock breeder to improve their herds using the semen of the males having improved and desirable traits. Artificial insemination adoption reduces both genital and non-genital diseases considerably in livestock.

History of Artificial Insemination

The first successful experiment with artificial insemination in animals was performed by Italian physiologist Lazzaro Spallanzani in 1780, who developed a technique for artificial insemination in dogs.

1887- First equine A.I

1949- Semen freezing technique developed.

1960- PVC straws used for storing semen.

1963- First cattle A.I.

1965- Cattle A.I becomes commercially available.

1996- First cloned sheep born.

2000- Sexed semen commercially available for cattle.



Steps of Artificial Insemination of a cattle

a) Proper Positioning of the cattle

The success rate of artificial insemination is greatly increased when the cattle stand on a level surface with relaxation. The cow should not mix with the cows of other groups. The A.I of a cow should be done in an area with which the cow is already familiar with the provision made for food and water.

b) Softening of the Straw

Temperature for softening the straw should be 35 C. The straw should be removed from the flask with forceps and submerged in the water. Leave it in for 20-30sec for a 0.25 ml straw and 40 sec for a 0.5 ml one. The A.I gun should be pre-warmed by rubbing in hands and straw should be placed in it. Gun should be hold vertically and gently press the plunger upwards, until the semen rises to the top.

c) Insertion of palpating arm

Point your fingers and your thumb together and gently insert your palpating hand into the rectum. With your free hand, use a paper towel to wipe the vulva free of any manure in order to avoid bringing in infectious bacteria. In addition, making a fist and applying downward pressure with your palpating hand will cause the vulva to slightly open, allowing for a clean entrance.

d) Insertion of the AI catheter

Insert the AI catheter into the vulva at a slight upward 30-degree angle to avoid inserting the catheter into the urethra and into the bladder.

e) Inserting the catheter into the cervix

After bringing the tip of AI catheter close to the cervix, the next step is to insert the tip of the AI catheter into the opening of the cervix. The vagina forms a blind-ended pocket around the cervix called the fornix vagina. It is common for the tip of the catheter to be in the fornix rather than in the opening of the cervix.

f) Depositing semen

Depositing semen in the correct place is critical. Semen should only be deposited in the uterine body. If semen is deposited in the cervix instead of in the uterus, the vast majority of the sperm cells will actually flow back into the vagina rather than the uterus. To ensure that the AI catheter is in the correct place for depositing the semen, feel for the tip of the catheter with fingers.



Advantages of A.I

1. Disease control. This is accomplished by preventing skin contact such as in natural service. The most important diseases it protects against are transmission of the herpes virus- equine coital exthanema - and contagious equine metritis, which is caused by a bacterium. In addition, antibiotics can be added to the semen at the time of insemination or collection and reduce or totally eliminate breeding the mare with any bacteria at all.
2. Decreases chances of injury. Semen is generally only collected every other day in an AI programme, so there is much less chance for injury. In addition, semen can be collected on a phantom and a mare in heat may not even be needed. Not only does this almost eliminate injury to the mare (if she didn't want to get served) and stallion but also it dramatically reduces the chances of injury to those staff involved in the breeding shed. It may be in future that farms could be in legal trouble when staff are hurt and AI could have been used.
3. Semen can be collected from stallions with problems. Each year stallions are either injured or have trouble breeding due to inherent libido (sexual behaviour) problems. Because semen only needs to be collected every other day it reduces the effects of breeding pressure and injuries.
4. Semen is evaluated each time it is collected. With natural service we are flying a bit blind because it is not until pregnancy rates are established can we assume that the semen was OK at the time of breeding. With AI we can look and measure parameters related to fertility every time we collect. One way to look at reproduction is to say that when we feel the testicles we are "feeling the future" and when looking at semen we are "looking at history" as one represents potential and the other the recent event of semen production.
5. Prevents stallion overuse.
6. Allows more mares to be bred. AI lets us divide the semen up into as many doses as he is capable of giving in an ejaculate. Typically, that is around 10-15 doses on every other day collection schedule.



7. Permits breeding of mares with problems. Each year mares are presented for natural service that may not be psychologically ready for service. Sometimes this is due to the mare's own agitation and sometimes it may be because she has a 'foal at foot' and becomes worried about her foal (foal proud).
8. Permits use of older valuable stallions. As stallions get older their sperm numbers decrease. This typically begins at around 13 years old. Many stallions are already exhibiting quite obvious sperm reduction by the time they are 16 - 17 and many are almost infertile by the time they are 19 - 20 years old. AI allows deposition of the correct number of sperm to be made for each mare and removes the guesswork.
9. Allows mares to be bred at the best time for conception. Because we can store semen either cooled or frozen mares can be bred when they are most suited for conception. In a natural service programme this would necessitate breeding the stallion as many as 5-6 times per day. Most stallions would not handle a breeding schedule like that for very long.

Disadvantages of AI

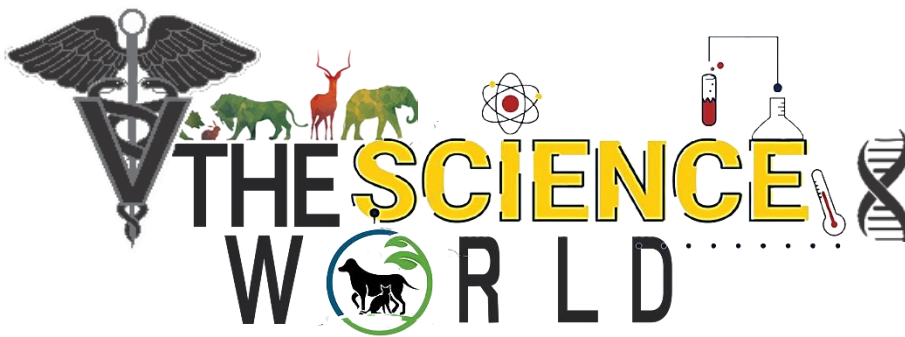
1. Specialized equipment is needed. An artificial vagina (AV), thermometers, warmed containers and equipment non-spermicidal gel and equipment to measure motility (warmed stage microscope) and sperm concentration are all necessary for AI to be practised properly. This is expensive and a well-equipped laboratory may cost in vicinity of \$40 000 just for the equipment (without the building and fittings).
2. Technical expertise is needed. Personnel need to know how to make the AV so that it is right for the stallion and then how to collect and process the semen properly.
3. Incorrectly practiced AI can cause problems. You would be surprised to learn just how often the wrong lubricating gel is used in the AV and that there have been weeks before anyone realised that the pregnancy rates were disastrous.

Future Developments in AI technology



1. **Semen Storage after dilution-** It is observed that the sperm fecundity reduced after dilution of 15-20 hours, so future work should be attempted to prepare some diluents which can sustain sperm fecundity for a longer time after dilution.
2. **Semen Evaluation-** In case of human andrology some procedures are used to evaluate the semen and cell culture may be adopted to evaluate the semen of the animals.
3. **Tom Selection-** Tom selection based on specific polygenic traits such as semen volume will be (or may already be) made on the basis of genetic markers revealed in DNA analysis or biochemical or serological analyses. Selection based on such markers could be performed soon after hatch rather than waiting for the onset of semen production.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 570-572

Popular Article

Physiological Importance of Magnesium in Ruminants

Anil Kumar Banothu¹, Ambica Gadige², Ravi Kumar Yadala³ and Satish Kumar Karlapudi⁴

College of Veterinary Science, PVNRTVU, Rajendranagar, Hyderabad, Telangana.

¹ Assistant Professor, Department of Veterinary Pharmacology & Toxicology

² Assistant Professor, Department of Veterinary Medicine

³ Assistant Professor, Department of Veterinary Pathology &

⁴ Professor & Univ. Head, Department of Veterinary Medicine

<https://doi.org/10.5281/zenodo.7880257>

Introduction

- Magnesium (Mg) is the second most plentiful cation (after K⁺) of intracellular fluids and fourth most abundant cation in the body.
- Mg supplementation has got importance in ruminants

Distribution of Mg:

- Mg represents about 0.05% of the animal body.
- About 60 – 70 % of Mg is present in skeleton and remaining in the soft tissues and extracellular fluid.
- Only about 1% is in the extracellular fluid.
- Acceptable serum Mg level in cattle is 2.0 – 3.5 mg/dl.

Role of Mg:

- It maintains integrity of bones and teeth.
- More than 300 enzyme actions are dependent on Mg. It is an active component of several enzyme systems in which thiamine pyro-phosphate (TPP) is a cofactor.
- It is involved in the metabolism of carbohydrates and lipids as a catalyst.



- It is essential for synthesis of nucleic acids and proteins.
- It is essential for cellular respiration and in certain tissues; it chelates with imp. Intra cellular anion ligands like ATP and ADP.
- Mg has specific action at N-M junctions and cardiovascular system. The electrical property of membranes and their permeability are affected by Mg.

Absorption of magnesium:

- Mg absorption occurs mainly from the fore stomach (Rumen and reticulum), majorly in reticulum in ruminants and from small intestine in simple stomach animals.

Factors affecting Mg absorption:

1. Age:

- Average Mg absorption rate in adult ruminant is about 25% whereas in young animals it is as high as 70%.

2. Na: K ratio in rumen:

- Optimum dietary Na: K ratio for Mg absorption is 5:1
- Increase in Na: K ratio increases Mg absorption.
- Na: K ratio < 3: 1 decreases Mg absorption.
- Young growing grasses are low in Na and high in K and can significantly depress Na: K ratio in rumen fluid.
- Mg is transported across the epithelium of fore stomach by an active Na-linked ATPase dependent transport system

3. Crude Protein:

- Feeding of young grasses and hay high in crude protein leads to increase in ammonia concentration in rumen which intern leads to decreased Mg absorption.

4. Carbohydrates:

- Increase in amount of readily degradable CHO's in diet increases absorption of Mg.
- 5. Low fiber and higher water content of grasses decreases absorption of Mg.
- 6. High level of Ca, P and Al in diet decreases absorption.

Excretion of Mg:

- Magnesium is excreted through both faces and urine and secreted in milk and saliva.



- Urine is the major excretory pathway for Mg after absorption.
- The renal threshold is about 1.8 – 2.0 mg /dl of blood plasma.
- Mg level in milk remains reasonably constant i.e., 12 mg/dl (0.12 g/lit)

Mg homeostasis:

- There is no feedback regulatory mechanism to control concentration of Mg in the body of ruminants.
- Mg concentration in blood and ECF depends upon dietary intake of Mg and loss through milk, urine and faeces.
- Kidney is the major organ of homeostasis and can act to conserve Mg.
- Decreased Mg intake leads to decreased plasma Mg which in turn leads to increased reabsorption from kidney.
- Renal threshold for Mg excretion is particularly under the control of PTH and increased level of PTH will act to conserve Mg.

Requirement of Mg:

- Minimal dietary requirement of Mg for growth of cattle is **0.1%**.
- A dietary concentration of 0.18 – **0.2 %** is necessary for lactating cows.
- The recommended safe concentration of Mg in Pasture is **0.2%**.

Sources of Mg:

- Cereal grains (0.13 – 0.22%) are fair sources of Mg.
- Plant protein supplements (0.28 – 0.62%) are excellent sources.
- Forages are variable in Mg content (0.03 – 0.50%).
- Mg content is **higher in legumes** than grasses.
- Mg content is **more in stems** than leaves.
- Mg content generally decline as the plant matures. However, Mg availability increases with increasing maturity of grasses.



Post Parturient Hypomagnesemia in Ruminants

Ambica Gadige¹, Anil Kumar Banothu², Satish Kumar Karlapudi³

College of Veterinary Science, PVNRTVU, Rajendranagar, Hyderabad, Telangana.

¹ Assistant Professor, Department of Veterinary Medicine,

² Assistant Professor, Department of Veterinary Pharmacology & Toxicology

³ Professor & Univ. Head, Department of Veterinary Medicine

<https://doi.org/10.5281/zenodo.7880299>

Synonyms:

- Lactation Tetany in Cows/ Buffaloes
- Hypomagnesemic Tetany/
- Grass staggers/ Grass Tetany-Due to lush green grass feeding which is Mg deficient
- Wheat pasture poisoning – Wheat feeding causes ↓Mg & Ca but ↑K⁺ - So concurrent hypocalcemia is noticed

Definition:

- It is highly fatal metabolic disease of all classes of ruminants but reaches highest incidence in lactating cows & buffaloes,

Characterized by hypomagnesemia & in few circumstances hypocalcemia

Clinically with tetany, hyperesthesia, tono-clonic muscle spasms and resulting in acute death due to respiratory failure.

- Seen after parturition during 2nd-4th month of lactation

Epidemiology:

1. Incidence: It is a variable (0.1 to 0.3%).

2. Morbidity & Mortality



- Variable 2 – 12%
- CRF is high due to short course of the disease – dairy cattle may go up to 30%

2. Species:

- Ruminants viz. cattle, buffalo, ewes and does are affected.
- Magnesium deficiency is **uncommon** in simple stomached animals and human beings due to **adequate concentration of the element in food.**

3. Breed:

- HF is more prone compared to Jersey
- B. Taurus more prone compared to B. indicus

3. Age: Generally, **4-7 years** group is affected as Mg mobilization from bone decreases with age.

4. Sex: Mostly females are affected.

5. Physiological status:

- Both pregnant and lactating females are affected.
- Common during 2nd-4th / first 2 months month of lactation in cows and 1-4 weeks after lambing in ewes.
- The ewes with twins are more affected than singles.

6. Milk yield: High yielders are more prone to this disorder.

7. Predisposing factor: Exposure to inclement or bad weather viz cold, windy, wet weather

8. Season: Hypomagnesemia is common during cold winter due to depression of appetite and a negative energy balance during bad weather.

It is known as winter hypomagnesemia seen in housed lactating dairy cattle out wintered in bad inclement weather and on poor quality feed

9. Economic importance: Although effective treatment is available, the case fatality rate is high because of short course of the diseases.

Epinephrine release will cause precipitous fall in serum Mg

Etiology:

- This condition is caused by hypomagnesemia and the etiology is multifactorial which is due to -

1. Dietary deficiency of magnesium:



- Grazing on young green grass / lush pasture which is poor in Mg and Na and rich in K and nitrogenous fertilizers causes sudden increase in ammonia, impairing its absorption (Grass tetany).
- Presence of competing cations such as potassium and sodium that affect either herbage magnesium status or magnesium absorption.
- Excess feeding of young green cereal crops which are deficient in Mg and Na and rich in K (Wheat pasture poisoning).
- Forages grown on soil deficient in Mg. Highly leached, acid, sandy soils are usually deficient in Mg where as black and brown soils are rich in Mg.
- Reduced availability of Mg to plants due to high 'K' and 'Al' in acidic soil.
- Heavy application of potash, ammonia and nitrogen rich fertilizers also reduce uptake of Mg by crops.
- Partial or inadequate nutrition or energy intake during dry season.
- Starvation for 24 – 48 hrs. due to bad weather, transportation etc. leads to hypomagnesaemia due to low DM and energy intake.

2. Decreased absorption / unavailability of magnesium:

- Reduced absorption due to digestive disturbances such as diarrhea.
- Presence of chelating agents in diet like alpha ketobutyric acid.
- Diet rich in protein or nitrogen (High Ammonia in rumen – chelation and unavailability).
- High K content of diet reduces availability of Mg to animal.
- Pastures with concentration of K > 30 mg/kg DM and nitrogen > 40 g/kg DM are considered hazardous.
- Increased absorption with readily available carbohydrates
- Increased volatile fatty acids provide active transport of Mg across the rumen wall
- Grasses with high ratio of K : Ca & Mg.

3. Drain of Mg or increased loss of Mg:

- The excess loss of Mg through milk (i.e. 0.12 gm per lit of milk) also results in hypomagnesemia.
- Increased demand of Mg for growth of fetus.



- ❖ *The worst combination of causative factors is low dietary intake (lush pasture) in recently calved cows during a spell of cold windy weather.*
- ❖ Chronic subclinical hypomagnesemia can increase the susceptibility of milk fever and Downer cow syndrome

Pathogenesis

- Clinical cases have Mg conc. less than 1 mg/dL
- Mg has influence on the impulse transmission at the neuro-muscular junction
 - Affects the release of Ach at N-M junctions
 - Affects the sensitivity of the motor end plates
 - Affects the activation of choline esterase system
- Decreased Mg → Inhibit the release & action of PTH → Genesis of concurrent ↓ed Ca leading to tetany & convulsions

Clinical Signs - Disease occurs in three different forms, acute, sub-acute & chronic form

Acute:

- Sudden in onset
- While grazing, animal suddenly ceases to graze & adopts a posture of unusual alertness and appears uncomfortable
- Twitching muscles and ears
- Severe hyperesthesia and even slight disturbances precipitate attacks of continuous bellowing, frenzied galloping, and occasional aggression.
- Staggering gait and the animal falls due to tetany of the limbs and is rapidly followed by clonic convulsions for one minute. During the convulsive episodes there is:
 - Opisthotonos
 - Nystagmus
 - Champing of the jaws
 - Grinding of teeth
 - Frothing at the mouth
 - Pricking of the ears
 - Retraction of the eyelids.



- Between such episodes, the animal lies quietly, however a sudden noise (or) touch may precipitate another attack.
- There will be high rise of temperature (104 – 105⁰F), pulse and respiratory rates
- Increased heart rate with increased absolute intensity of the heart sounds and can be heard from a distance.
- Death usually occurs within 5 mins to 1 hour and death is due to respiratory failure.
- Mortality rate is high because there is no time for therapy
- The response to treatment is generally good, if treatment is undertaken early.

Sub-acute form:

- Onset is gradual or slow over a period of 3-4 days.
- There will be slight inappetence, wild facial expression and exaggerated limb movements.
- Spasmodic urination and defecation are characteristic
- Decreased rumen motility
- Decreased milk yield
- Muscle tremor and mild tetany of hind limbs and tail with an unsteady staggering gait
- Accompanied by retraction of head and trismus/ lock jaw condition.
- But sudden movement/ noise/ restraining/ insertion of needle may precipitate violent convulsions.
- Animal may recover spontaneously within few days (or) progress to recumbency stage.
- Treatment is usually effective but there is marked tendency to relapse/ reoccur.

Chronic form:

- Many animals in an affected herd may have decreased Mg and don't show any clinical signs but may die suddenly
- A few of such cases may show a vague syndrome like dullness, unthriftiness, poor appetite and drop in milk production
- In lactating cows, there may be paresis and a milk fever like syndrome and will be poorly respond to Ca therapy
- This form can also be seen in animals which recover from sub-acute form.

Diagnosis



(i) History:

- Excess feeding of green lush pasture or young cereal forages grown on Mg deficient soil,
- Early lactation, high milk yield and
- Exposure to cold windy weather.

(ii) Clinical signs:

- Hyperesthesia, tetany, convulsions and sudden death in recently parturiated animals.

(iii) Clinical pathology:**a) Serum examination**

Serum Mg	:	Normal levels	- 1.7 – 3 mg/dL
		Sub clinical hypomagnesemia	- 1 - 2 mg/dL
		Clinical/ Tetanic hypomagnesemia	- <0.5 mg/dL
Serum Ca	:	Reduces to	<5 – 8 mg/dL
Serum P	:	May or may not be reduced	Increased
Serum K	:	High (hyperkalaemia).	

b) Cerebro spinal fluid (CSF) Mg concentration

- Useful and reliable than serum conc.
- In normal cases both serum & CSF Mg conc. is same @ 2mg/ dL
- In subclinical hypomagnesemia CSF Mg conc. reduces to 1.84 mg/dL
- But in tetanic cows with hypomagnesemia the CSF conc. reduces to 1.25 mg/dL

c) Urine Mg concentration

- Herd diagnosis is done by estimating urinary Mg conc.
- Urine magnesium concentrations below 1.0 mg/dL indicate danger of tetany
- Qualitative test is done by Xylidyl blue test-based on the reaction of Mg with xylidyl blue-I (as chelator) at alkaline pH, yielding a purple colored complex.

Good and immediate response to Mg treatment is the confirmatory diagnosis

Differential Diagnosis:**In bovines****1. Acute lead poisoning:**

- History of access to lead.



- Blindness
- No response to Mg therapy

2. Rabies:

- History of dog bite
- Ascending paralysis.
- Absence of tetany
- No response to Mg therapy

3. Nervous form of ketosis:

- Absence of tetany
- Hypoglycemia and ketonuria
- Response to glucose therapy

4. Strychnine poisoning:

- History of access to strychnine.
- Rare in ruminants.

5. Chlorinated hydrocarbon poisoning:

- History of access to poison
- No complete response to Mg therapy.

6. Surra:

- Occurrence during monsoon.
- Blood smear positive for *Trypanosoma spp.*
- Response to quinapyramine / diminazene treatment

7. Bovine spongiform encephalitis

- By PCR

In Goats

- Hypocalcemia
- Phlaris poisoning
- Staggers syndrome

Treatment:

- For acute cases, there is no time for treatment, so only sub acute cases may be treated.



Specific treatment:

- The solution containing Ca and Mg gives satisfactory results.
- Safest general recommendation is to use a combination of 25% CBG+ 5% Mg hypophosphite preparation like Mifex/Miphocal/Glamag/Lactomag @ 1 ml/kg body wt. IV for 3 – 4 days is reported to be effective (@ 500 ml i.v for cattle & 50 ml i.v for sheep)
- Followed by s/c injections of concentrated solution of Mg salts like 20% MgSO₄ @ 200 ml for cattle

Direct Mg therapy

- 20% MgSO₄ (@ 200 – 300 ml i.v – Rapid increase in serum Mg within 3-6 hours but over dose has serious side effects like induction of cardiac dysrhythmias/ medullary depression/ respiratory failure (or)
- 3.3% Magnesium lactate @ 200-300 ml i.v (or) s.c – Have prolonged effect & cause less tissue injury (or)
- 15% Magnesium gluconate @ 200-400 ml i.v (or) s.c – slow increase in serum levels and will have sustained release for longer duration
- Rectal infusion of 30 g of Mg Cl₂ dissolved in 100 ml solution has excellent effect dissolved in 100ml water has also good effect
- Rectal infusion of 30g MgCl₂ has good effect

Symptomatic treatment:

- Use of sedatives to control convulsions.
- Inj. Chlorpromazine HCl @ 1 mg/kg body wt i.v.
- Sequil/ diazepam can be advised

MgSO₄ Saturated solution

- Intra venous route – Euthanasia
- Oral administration – Saline purgative
- Topical application – Smoothing agent
- Intra uscular/ Subcutaneous administration – Muscle relaxant

How to manage Mg over dose/toxicity?



- If signs of excessive slowing/ increase in heart rate or respiratory distress then, the injection should be stopped immediately.

If necessary, calcium solution is injected.

How chronic subclinical hypomagnesemia increases susceptibility to milk fever

- **Hypomagnesemia reduces –**
The production and secretion of PTH.
Hydroxylation of vit. D in the liver and
Target organ sensitivity to physiological effects of PTH and 1, 25-DHCC

Control:

- Dietary supplementation as **Mg.oxide** commonly but other salts like **Mg.carbonate/ Mg.sulphate** also can be used.

In lactating cattle during normal periods @ 3g/kg of DM

During danger periods-87% Mg oxide (Magnesite) feeding/ drenching @ 60g/ day

- Daily feeding of Mg. oxide @ 120g is safe & effective but over dose may cause diarrhea with much mucous
- For Sheep @ 7 g daily (or) 14g every second day
- Mg phosphate @ 53g/day is also safe & effective
- But all the Mg supplements are impalatable, so these have to be mixed with molasses in equal parts.

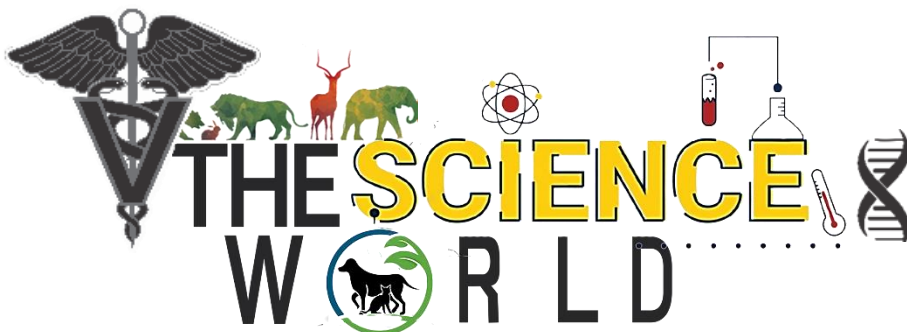
Different forms of Mg supplementation

- Mg & salt blocks
- Spraying of a mixture containing magnesite & molasses on hay. Provide hay along with greens.
- Pellets – Mg rich pellets mixed with other grains/ molasses
- Drenching of Mg oxide/ MgCl₂ by using drenching gun can be practiced in lactating cows before leaving the milking parlor
- Heavy Mg bullets – placed in reticulum which liberates small amounts of Mg @ 1g/day consistently
- 4 bullets at a time can be administered in acute hypomagnesemia



- Top dressing of pasture with magnesium rich fertilizers e.g. calcined magnesite @ 1125 kg / hectare (or) Magnesic lime stone @ 5600 kg/ hectare is satisfactory.
- Foliar dusting & spraying with 2% solution of MgSO₄ at fortnight interval.
- Application of very finely grounded Mg oxide @ 30 kg/ hectare before commencement of grazing – effective in cattle
- Dairy animals should be provided with comfortable shelter during winter.
- Provision in drinking water – 500g MgSO₄ (or) 420 g of Mg chloride hexahydrate to 100L of drinking water during risk period is effective
- Management of Pasture fields
 - Encourage the development of legumes rich in Mg in place of tetany prone pastures
 - Grazing low risk animals on high-risk pastures is recommended
 - Cultivate cool-season grasses with high Mg content like Rye grass/ cultivate Tall fescue
- Provide shelter in order to protect from prevailing winds
- In cadence can be reduced by provision of some grain hay/ roughage grazing
- Periods of fasting during bad weather should be avoided especially in lactating animals to avoid seasonal hypomagnesemia.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 585-588

Popular Article

Glycerol Monostearate (GMS): An Important Agent in Food Industry

Anjali Langeh*, Julie D. Bandral, Monika Sood and Sukomaljot Kour

Division of Post Harvest Management, Sher-e-Kashmir University of Agricultural Sciences and Technology-Jammu, Chatha- 180009, Jammu and Kashmir, India

<https://doi.org/10.5281/zenodo.7881140>

Introduction

Glycerol monostearate, commonly known as GMS, is an organic molecule used as an emulsifier. It is a flaky, white, odorless, slightly sweet powder that is used in the food industry to give whipped and ice cream its texture and body. It also helps thicken products and stabilize gels. It is also used as an anti-staling agent in bread.

Glycerol monostearate is routinely used in foods as an emulsifier. When products contain both water and oil, the ingredients separate. But an emulsifier helps to combine them. It reduces the liquid's surface tension and stabilizes the mixture. It can also interact with other ingredients, inducing air into them and preventing them from crystallizing.

Glycerol Monostearate as a foaming agent

Foam-mat drying is one of the simple methods of drying in which a liquid concentrate along with a suitable foaming agent is subjected to dehydration in the form of a mat of foam at relatively low temperature. Rate of drying in this process is comparatively very high because of an enormous increase in the liquid-gas interface, in spite of the fact that the heat transfer is impeded by a large volume of gas present in the foamed mass. Drying occurs in multiple constant rate periods due to periodic bursting of successive layers of foam bubbles, thus exposing new surfaces for heat and mass



transfer as the drying progresses. This method is suitable for any heat sensitive, sticky and viscous materials which cannot be dried by spray drying. The dehydrated powder/flakes are superior to drum and spray dried products because of its honeycomb structure and better reconstitution properties. The dried product has desired properties such as rehydration, controlled density and retain volatiles that would be lost during the drying of non-foamed materials.

Glycerol monoesters synthesized from glycerol have many applications, such as emulsifying agents in food, pharmaceuticals, cosmetics, or in detergents.

- 1) Monoglycerides are generally obtained from the (i) glycerolysis or (ii) hydrolysis of triglycerides, or (iii) the direct esterification of glycerol with fatty acids.
- 2) The industrial processes involved generally use homogeneous acid or basic catalysts, which lead to a mixture of mono-, di-, and triglycerides in general (40 : 50 : 10) after direct esterification.

Benefits of Glycerol Monostearate

GMS originates from glycerol, which may also be a useful method to help treat a variety of health conditions. It has a slightly different structure, but like GMS, glycerol is used in many different consumer products.

➤ Advances Athletic Performance

In recent years, glycerol monostearate has gained a lot of attention for its benefits to athletes by stimulating hydration and muscle building. For any athlete, a well-hydrated body is key. Most sports enthusiasts know that it is important to drink a lot of water. But during intense workouts, it may be harder to get enough. They may start feeling fatigued, the muscles may start to cramp and the athlete may even be forced to cut the workout short.

However, GMS may be a unique solution to this problem. Glycerol monostearate supplements are hyper-hydrators, forcing muscle cells to absorb more water. This helps athletes maximize performance, preserve energy and build endurance. Increasing blood flow through the body may reduce sore and cramping muscles. Finally, GMS can help an athlete to stay hydrated in heated or intense workouts.

Previously, the World Anti-Doping Agency (WADA) formerly banned glycerol monostearate. However, as of January 1, 2018, the organization now considers it safe for athletes.



➤ **Maximizes Muscle Growth**

Bodybuilders may benefit from GMS because its hydrating properties stimulate more blood flow to the muscles. This process is called hyperemia. Increased blood flow also sends more nutrients throughout the body and helps the body absorb other supplements that the athlete may use. Besides the physical benefits, many athletes may enjoy the feeling of fuller muscles that results from increased blood flow.

With increased blood flow comes muscle growth and not only does the blood carry nutrients, but it also removes lactic acid and carbon dioxide waste products. The process also creates more blood vessels to stimulate further growth.

➤ **Improves Food Production**

Glycerol monostearate is routinely used in foods as an emulsifier. When products contain both water and oil, the ingredients separate. But an emulsifier helps combine them. It reduces the liquid's surface tension and stabilizes the mixture. It can also interact with other ingredients, inducing air into them and preventing them from crystallizing.

GMS is a flaky, white, odorless, slightly sweet powder that the food industry uses to give whipped and ice cream its texture and body. It also helps thicken products and stabilize gels. In baked products, GMS helps improve the texture of bread and cakes and keeps them from going stale.

➤ **Emulsifies Industrial Products**

Glycerol monostearate emulsifies waxes, oils and solvents. It is also used as a plastic lubricant, an anti-static component for plastics and an anti-fogging ingredient. Some manufacturers also use hygroscopic GMS with polyethylene because it may slow deterioration from air humidity and help boost insulation.

Side Effects of Glycerol Monostearate

The U.S. Food and Drug Administration (FDA) labels GMS as generally safe. However, inhaling pure glycerol monostearate is toxic and it may irritate the skin, eyes and respiratory and digestive tracts.

Although it is generally safe, overusing glycerol monostearate may cause side effects. Because it draws fluid from the brain and eyes into the muscles and other parts of the body, excessive



amounts of GMS may cause headaches or blurred vision. Some other side effects of glycerol may include:

- Excessive thirst
- Diarrhea
- Vomiting
- Dizziness
- Bloating
- Stomach pain
- Inflammation in the GI tract

Conclusion

Glycerol monostearate (GMS) is one of the most value-added products employed in industrial applications in the food industry, pharmaceutical, and non-ionic surfactants. Thus, glycerol monostearate is a high economic value product and has a bright market prospect in this globalization era.

References

- Hart MR, Graham RP, Ginnette LF, Morgan AI. Foams for foam-mat drying. *Food Technol.* 1963;17(10):90–92.
- Morgan AI, Graham RP, Ginnette LF, Williams GS. Recent developments in foam-mat drying. *Food Technol.* 1961;15(1):37–39.
- Berry RE, Bissett OW, Lastinger JC. Method for evaluating foams from citrus concentrates. *Food Technol.* 1965;19(7):144–147.
- Kudra T, Ratti C. Foam-Mat drying: Energy and cost analysis. *Can Biosyst Eng.* 2006; 48:3.27–3.32.



Techniques for rapid generation advancement in crops

Deepshikha Sharma¹, Ayyagari Ramlal³, Sanjay Kumar Lal¹, Dandapani Raju², Manisha Saini¹, Akshay Talukdar¹, Ambika Rajendran^{1*}

¹Division of Genetics, ICAR- Indian Agricultural Research Institute (IARI) Pusa campus, New Delhi, India 110012

²Division of Plant Physiology, ICAR- Indian Agriculture Research Institute (IARI) Pusa campus, New Delhi 110012

³Universiti Sains Malaysia, Georgetown, Penang, Malaysia 11800
<https://doi.org/10.5281/zenodo.7881294>

Abstract

Crop improvement refers to the genetic alteration of plants. With the increase in global population and the changing environment at an alarming rate, there is an urgent need to increase food production at the same rate or even faster to fulfil the food and nutritional requirements. Improvement of cultivated plants depends on introducing natural variability through traditional and biotechnological breeding techniques. These technologies empower breeders to keep the pace with increasing food demand by developing more productive and robust varieties sooner.

Key words: Speed breeding, Embryo rescue, Double haploid breeding, Shuttle breeding

Introduction

Plant breeders need to focus on development of new varieties with increased productivity as well as ability to tolerate various biotic and abiotic stresses. Besides, recent climate change and global warming demand climate-smart agriculture with new crop varieties that can minimize crop loss due to adverse conditions and emergence of new pests and diseases. Sustainable food production will remain a preminent challenge in the decades to come. Breeding techniques enables researchers to grow up to 4–6 generations per year instead of 1–3 generations in the field or under regular glasshouse conditions.

In this article, strategies for rapid generation of crops are discussed, along with the opportunity to integrate technologies to further accelerate the rate of genetic gain in crops.

Techniques for rapid generation in crops:

- Speed breeding
- Embryo rescue
- Double haploid breeding
- Shuttle breeding

Speed breeding

Traditional or conventional breeding methods will not be sufficient to meet the demands of future generations, so breeders and cultivators are constantly under pressure to improve crop production and develop new varieties of crops that are of higher quality. However, a process known as 'speed breeding' for rapid generation advancement has been successfully implemented in agricultural plants to achieve rapid rates of crop improvement. Speed breeding has the ability to develop crop varieties in a smaller duration of time. This technique involves extending photoperiod and controlled conditions such as temperature, soil media and appropriate spacing in glasshouses to shorten breeding cycle. With speed breeding, almost three to nine generations can be grown in a year, as compared to one to two generations per year in case of conventional method. Speed breeding techniques have been well-established in many plant species, including long-day plants, day-neutral plants, and a limited number of short-day plants. Speed breeding can be used to achieve up to 6 generations per year for spring wheat (*Triticum aestivum*), durum wheat (*T. durum*), barley (*Hordeum vulgare*), chickpea (*Cicer arietinum*) and pea (*Pisum sativum*), and 4 generations for canola (*Brassica napus*), instead of 2–3 under normal glasshouse conditions. Growing crops in a speed breeding-specific growth chamber speeds up research on adult plant phenotyping, crossing, mutants, and transformation.

Embryo rescue

Embryo rescue is an *in vitro* culture technique used to assist in the development of an immature or weak embryo into a viable plant. The embryo rescue technique plays an important role in modern plant breeding. The culture of immature embryos is used to rescue those embryos that would normally abort or that would not undergo the progressive sequence of ontogeny. Embryo rescue technique has been successfully applied in grapes, mango, papaya, olive, tomato, capsicum,



chillies, okra and radish. The production of soybean seeds for breeding purposes is usually constrained by a long reproductive phase. One possible way to shorten soybean reproduction cycle is through immature embryo culture. This technique has also proved to be valuable tools for maize improvement, since they allow reducing the duration of the generation cycles for speed breeding. The technology has been used in about 100 different species from both temperate and tropical climates, comprising crops, fruit, and forest trees as well as wild species.

Doubled haploid breeding

Doubled haploids are haploids that are produced after chromosome duplication. DHs shorten the time required to produce homozygous plants in comparison with the conventional breeding which requires several generations of selfing. Double haploid is a rapid method of producing pure lines. DHs have several advantages, such as shortening the breeding cycle by immediate fixation of homozygosity, offering high-selection efficiency. The doubled-haploid (DH) breeding technique is now widely used in Maize, Brassica, *B. napus* and *B. juncea* breeding programs.

Shuttle breeding

It is an off-season field-testing technique whereby genetic material is grown in contrasting environments to turn over two plant generations per year. The strategy was first developed by Norman Borlaug at the International Maize and Wheat Improvement Centre (CIMMYT) Mexico in 1946. Currently the shuttle breeding approach is being used to develop improved varieties of wheat-maize, and rice. By implementing this effective technique, breeders have successfully reduced the time required to complete a breeding cycle by 50%.

Conclusion

Crop production must increase by 50% by 2050 to meet the future demand for food. To feed the world's ever-growing population, food security in a changing environment is a serious concern. The rapid development of better plant varieties is one strategy to alleviate food scarcity issues and increase food security. Speed breeding provides various advantages over conventional approaches, including the ability to accelerate backcrossing, pyramiding characteristics, and transgenic pipelines. Embryo rescue technique is particularly interesting in the development of genetically modified plants, considering the need to stabilize transgenes to achieve homozygous lines before phenotypic evaluation. These breeding techniques are a form of protocol that can be used to increase agricultural yield by reduce plant production times, altering the light duration, intensity, and

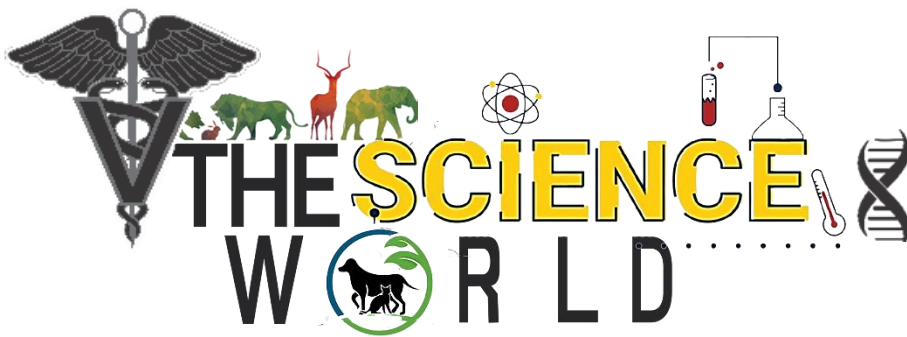


temperature-controlled zone and help research to meet rising demand.

References

- Begna, T. (2022). Speed breeding to accelerate crop improvement. *Int J Agric Sc Food Technol*, 8(2), 178-186.
- Borlaug, N. E. (2007). Sixty-two years of fighting hunger: personal recollections. *Euphytica*, 157, 287-297.
- Ghosh, S., Watson, A., Gonzalez-Navarro, O. E., Ramirez-Gonzalez, R. H., Yanes, L., Mendoza-Suárez, M., ... & Hickey, L. T. (2018). Speed breeding in growth chambers and glasshouses for crop breeding and model plant research. *Nature protocols*, 13(12), 2944-2963.
- Kumari, P., & Thaneshwari, R. (2018). Embryo rescue in horticultural crops. *Int J Curr Microbiol App Sci*, 7(6), 3350-3358.
- Liotino, M. S., Varangot, A., Beznec, A. Y., Auteri, M. T., Bossio, A. E., Lewi, D. M., & Faccio, P. D. (2019). Shortening of generation cycles in inbred lines of maize (*Zea mays* L.) through embryo rescue technique.
- Pramanik, K., Sahoo, J. P., Mohapatra, P. P., ACHARYA, L. K., & JENA, C. (2021). Insights into the embryo rescue-a modern in-vitro crop improvement approach in horticulture. *Current Trends in Plant Health Management*.
- Watson, A., Ghosh, S., Williams, M. J., Cuddy, W. S., Simmonds, J., Rey, M. D., ... & Hickey, L. T. (2018). Speed breeding is a powerful tool to accelerate crop research and breeding. *Nature plants*, 4(1), 23-29.
- Wijayanto, T., Sadimantara, G. R., Suaib, N. A., Boer, D., Erawan, D., Nuryeni, N., & Haq, M. (2016). Immature Embryo Culture Accelerates Soybean Reproductive Phase: A Potential Biotechnology Approach for Shortening Breeding Cycle. *International Journal of Biosciences*, 9(2), 37-48.
- Haslam, T. M., & Yeung, E. C. (2011). Zygotic embryo culture: an overview. *Plant embryo culture: methods and protocols*, 3-15.





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 593-598

Popular Article

Repeat Breeding and Its Therapeutic Management in Dairy Cow: A Review

Swati Thakur¹, Souvik Dhara^{2*} and R Huozha³

¹PhD Scholar, Department of Veterinary Physiology, LUVAS, Hisar, Haryana.

^{2*}PhD Scholar, Department of Animal Reproduction, Gynaecology & Obstetrics, Assam Agricultural University, Khanapara, GHY- 781022, Assam

³Assistant Professor, Department of Veterinary Physiology, G. B. Pant University of Agriculture & Technology, Pantnagar-263145, Uttarakhand
<https://doi.org/10.5281/zenodo.7881394>

Abstract

Repeat breeding is a major reproductive disorder in dairy animals and its incidence varies among different management systems, environments and regions. Fertilization failure and early embryonic mortality are main causes of repeat breeding leading to delayed age at first calving in heifers, the intercalving interval is extended causing lowering of calf crop. Incidence of repeat breeding is low in buffalo (8.68%) than cattle (18.79%). It can be reduced by improving their conception rate through careful handling of genitalia during insemination to avoid acquired abnormalities, appropriate treatment of uterine infections, administering hormone therapy to improve fertilization success and lower embryonic mortality

Introduction

Animal's reproductive ability is one of the key elements of a dairy herd. Production of one calf crop every year provides good profit to the dairy farmers. Good reproduction and production are two sides of a coin for a profitable dairy enterprise. The productive life of a cow starts with parturition which is a main event of reproduction. After that cow needs regular cycles of conception and calving to begin resultant lactation which is an important component of her productive life. So, for a successful dairy farming reproductive performance of the dairy animals play a very crucial role. Therefore, the reproductive problems that lead to reproduction failure need to be diagnosed and



treated for better production and profit of the farm (Abdisa *et al.*, 2018). One of the major reproductive problems in dairy cattle is repeat breeding. A repeat breeder is a cow that has nearly normal estrus cycle, is free from palpable clinical abnormalities, has no abnormal vaginal discharge, is less than 10 years old, has calved at least once but fails to conceive after three or more consecutive inseminations (Singh *et al.*, 2017). The repeat breeding cows come to heat regularly but fail to conceive after successful mating. Repeat breeding causes financial loss in terms of repeated inseminations, treatment, cost of feeding without production, production loss due to delayed conception. In practice, some will have been inseminated at the wrong time, others may have pathological changes in the bursa or oviduct that are difficult to palpate, or undiagnosed uterine infections (Singh *et al.*, 2008).

Repeat breeders can be divided into two groups

1. Early repeaters

Cow that come into heat within 17-24 days after artificial insemination (AI). In these animals the luteal function has been shorter than normal or typical for the physiological estrus cycle in non-bred cow. In these cows the most probable event is either failure of fertilisation (delayed ovulation, poor semen quality etc.) or early embryonic death (delayed ovulation, poor embryo quality, unfavourable uterine environment, precocious luteolysis).

2. Late repeaters

Cows that come into heat later than 25 days after AI. In these animals the luteal function was maintained for longer than the physiological luteal phase in non-bred cows. Fertilisation and initial recognition of pregnancy probably took place but for some reason (inadequate luteal function, inadequate embryo signaling, infectious diseases, induced luteolysis) luteolysis was induced and pregnancy lost.

Causes

1. Anatomical causes

The anatomical causes of repeat breeding include congenital as well as acquired defects. Congenital cause includes persistent hymen which is rare. Acquired causes include cervical problems, ovaro-bursal adhesions, fibrous fallopian tubes and uterine adhesions. The treatment of anatomical causes of repeat breeding is difficult.



2. Functional causes

The functional causes of repeat breeding mainly include delayed ovulation, anovulation and luteal insufficiency. These occurs mainly due to endocrine defects of hypothalamus and anterior pituitary gland.

3. Infectious causes

Many specific and non-specific uterine infections are associated with fertilization failure and early embryonic mortality. In repeat breeders, clinical and sub-clinical endometritis are main causes. Incidence of uterine infections are higher in buffaloes than in cows. The possible factors involved in the development of endometritis are retentions of fetal membrane, injury to the reproductive tract due to difficulty in calving, at the time of breeding and uterine treatment.

4. Managemental causes

These include female and male factors, technical and nutritional factors. Female factors include non-observed estrus or improper estrus detection. Male factors include poor semen quality. Technical factors include improper timing of AI, faulty AI technique, improper handling and thawing of straw, AI in early pregnancy showing gestational estrus and vigorous handling of genitalia leading to acquired anatomical defects. Nutritional factors include vitamin A, D, E deficiency. Among minerals phosphorous deficiency is an important cause of infertility followed by copper and magnesium. Deficiency or surplus of carbohydrates, imbalance of carbohydrates and proteins and excessive feeding of proteins are also the contributing factors. Higher level of urea in diet affects reproduction due to high level of nitrogen in uterus. These causative factors also occur in combination. Genital infections and hormonal aberrations together are major contributing followed by combination of anatomical defects and hormonal aberrations and genital infection and anatomical defects.

Incidence and risk factors

The incidence of repeat breeding is low in buffaloes than in cows. A large number of factors predispose for repeat breeding which include parity, periparturient diseases, season, herd size, lactation and poor fertility. Seasonal suppression of fertility during hot summer months in buffaloes is common, so such considerations should be limited to breeding season only. Reproductive disorders are common in buffalo during summer and rainy season, and significantly higher incidence of repeat breeding during autumn season (Wodaje *et al.*, 2016).



Repeat breeding has a higher predisposition to stress, as evidenced by increased production of cortisol from adrenal glands. Adrenal progesterone in stressed cows reaches suprabasal levels. Thus, stress can be considered as potential cause (Saraswat *et al.*, 2016).

Economic implication of repeat breeding

The economic success of dairy industry depends upon proper and optimal reproductive rhythm of individual animal of herd within normal physiological range. Repeat breeding syndrome is responsible for long service period, dry period and intercalving interval causing low milk yield, calf crop and additional cost of management resulting into greater economic losses to dairy industry.

Treatment

Treatment of repeat breeding in cow is completely depended upon diagnosis of actual causes. There are two main causes of repeat breeding i.e. failure of fertilization and early embryonic death and treatment is given considering these causes.

Treatment of anatomical causes

Treatment of anatomical causes of repeat breeding is difficult. However, about 28.6% conception rate was achieved in dairy cattle suffering from cervical fibrosis or partial obstructions through natural service or artificial insemination (AI) with increased concentration of spermatozoa. Similarly, insemination on unaffected uterine horn side can treat the unilateral salpingitis, though the conception chances are very low.

Treatment of functional causes

For treatment of functional causes of repeat breeding in dairy cattle various hormonal protocols have been developed. In prolonged estrus exhibiting repeat breeder cattle, the use of single insemination along with administration of buserelin acetate, a GnRH analogue, is sufficient. However, in the absence of hormonal treatment, the use of double insemination at 24 hour interval also gives optimal results. Moreover, in repeat breeder cattle, GnRH administration at estrus or during luteal phase (between day 11-14 post-insemination) increases plasma progesterone and delays luteolytic response and enhance embryo survival rate. Treatment of repeat breeder cattle with 10.5 mcg GnRH analogue or hCG on day 12 post-AI lead to an improvement in conception rate (Singh *et al.*, 2017). Another option for improving the conception rate in dairy cattle with functional form of infertility is the use of ovulation induction protocol. Ovsynch protocol improved the conception rate. However, there was no impact of other protocols like double synch and heat synch on fertility



improvement (Singh *et al.*, 2017). Nevertheless, pre-synchronization with prostaglandin F_{2α} (PGF_{2α}) followed by administration of GnRH analogue along with AI at 60 hour post-PGF_{2α} improved conception rate in repeat breeder cattle .

For the treatment of repeat breeding from uterine infections need proper selection of antibiotics to prevent development of resistant strains of microbes and to eliminate infection as quickly as possible. A study suggested that systemic, rather than intrauterine, treatment achieves adequate concentration of an antibiotic in blood serum and endometrial tissue that is particularly necessary in cases of septic metritis. Systemic administration eliminates the risk of damage to genital tract and the risk of introducing new microorganisms. For the management of suspected fungal endometritis, 0.1% lugol's iodine is a successful and inexpensive therapeutic option (Ahmed *et al.*, 2014). Ciprofloxacin and Tinidazole combination are effective to control incidence of repeat breeding caused due to uterine infection (Kumar *et al.*, 2012).

Treatment of repeat breeding due to managerial problems

It is controlled by actual detection of heat, proper handling of semen as well as timing of AI.

Ethno-veterinary practices

For the treatment of repeat breeding in cow some livestock owners use (Sharma *et al.*, 2019)-

- (i) 250 gm overnight soaked ajwain (*Trachyspermumammi*) to animal for five days.
- (ii) Mixture of 1 kg crushed lod (*Symplocosracemose*) and 1 kg desi sugar. Both mixed well divided into four equal parts and one-part mix in water and fed to animal all four portions continuous for four days.
- (iii) 250 gm of saunf (*Foeniculumvulgare*) after mixed with water fed to animal for four days.
- (iv) 1 kg of moth (*Vignaaconitifolia*) continuous for five days.
- (v) 50 gm of haldi powder (*Curuma longa*) with 100 ml til oil in 10 equal doses.
- (vi) Khejri (*Prosopis cineraria*) leaves after soaked in whey (butter milk) for 10 days.
- (vii) 20 gm fitkari (Alum) for 3 days.
- (viii) Decoction of 5 kg root of ber (*Zizipusmaurtiana*) with 10 litter water for continuous 10 days.
- (ix) 300 ml of desi ghee per day for continuous 10 days.

Conclusion

The ultimate goal in dairy farm should be to shorten calving interval of cow, decrease the number of services per conception thereby increasing farm production. But reproductive health disorders such as repeat breeding affect reproductive performance of dairy animals.



To reduce the negative effects of repeat breeding nutritional supplementation can be used to restore imbalances at herd level. 8-12 days before estrus, diets containing high level of inorganic iodine improve stimulation pituitary gland. Vitamins A, D, E and phosphorus, copper and magnesium supplementation can improve fertility. Awareness of farm owner and attendants about proper feeding, accurate heat detection, timely AI and hygiene can reduce this problem.

References

- Abdisa, T. *et al.* (2018). Review on reproductive health problems of dairy cattle. *Journal of Dairy and Veterinary Science*. 5(1)
- Singh, M., Sharma, A., Sharma, A. and Kumar, P. (2017). Repeat breeding and its treatment in dairy cattle of H.P.(India)- A review. *Indian journal of Animal reproduction*. 38(2)
- Singh, J., Dadarwal, D., Honparkhe, M. and Kumar, A. (2008). Incidence of various etiological factors responsible for repeat breeding syndrome in cattle and buffaloes. *The International Journal of Veterinary Medicine*. 6(1)
- Wodaje, H.B. and Mekuria, T.A. (2016). Risk factors in repeat breeding. *Advances in Biological Research*. 10(4): 213-221.
- Saraswat, C.S. and Purohit, G.N. (2016). Repeat breeding: incidence, risk factors and diagnosis in buffaloes. *Asian Pacific Journal of Reproduction*. 5(2): 87-95.
- Singh, M., A. Sharma, A. Sharma and P. Kumar. (2017). Repeat Breeding And its Treatment in Dairy Cattle of Himachal Pradesh (India) – A Review., *Indian Journal of Animal Reproduction* 38 (2): December 2017.
- Faisal Omer Ahmed and Adil Salim Elsheikh. (2014). Treatment of Repeat Breeding in Dairy Cow with Lugol's Iodine., *IOSR Journal of Agriculture and Veterinary Science (IOSR-JAVS)* e-ISSN: 2319-2380, p-ISSN: 2319-2372. Volume 7, Issue 4 Ver. I: 22-26 www.iosrjournals.org.
- Rajesh Kumar and *et. al.* (2012). Clinical Management of Repeat Breeding Syndrome in Bovines. *Intas Polivet*, vol. 13 (I): 23-25.
- Sharma NK, Garg SL, Rajput DS, Mishra P. (2019). Ethno Veterinary Practices of Repeat Breeding and Anoestrous with their Extent of Use Followed By Livestock Owners in Western Zone of Rajasthan. *Indian Research Journal of Extension Education*. 2019 Jan 4;19(1):52-5.



African swine fever: A threat to Indian pigs

Vikram Singh Gurjar¹ and Rashmi Singh²

¹Department of Animal Husbandry, Rajasthan

²Department of Veterinary Medicine, PGIVER, Jaipur

<https://doi.org/10.5281/zenodo.7881515>

Abstract

Introduction

Rural livelihoods and the growth of the nation's economy depend on the livestock and animal husbandry sectors. India has one of the world's largest livestock wealth, with the livestock industry accounting for one fourth of agricultural GDP. Pig is an important livestock species because it is raised by socioeconomically weaker members of society. Pigs have a larger potential than other livestock species to help farmers achieve faster economic returns because of their inborn traits, which include high fecundity, high feed conversion efficiency, early maturity, and short generation intervals. In 2019, there were 9.06 million pigs in the country, and decreases 12.0% from the previous Livestock Census (2012). Pigs make up around 1.7% of all livestock.

African swine fever (ASF) is a virus that kills farm and wild pigs with a high fatality rate that frequently exceeds 100%. This illness can affect pigs of all ages. The main clinical symptoms include blue-purple cyanosis of the snout, ears, tail, and lower legs, a high temperature, and a huge amount of discharge from the eyes and nose. The World Organization for Animal Health (OIE) classifies ASF as "notifiable diseases."

2. History

The sickness caused by this virus was initially detected in Kenya in 1920. The disease later invaded Europe (Portugal) in 1957 and was successfully controlled, but it re-entered Portugal in 1960

and spread throughout the Iberian Peninsula and the rest of Europe. Furthermore, it expanded to the Russian Federation in 2007 and to China in 2018, after which it reached Vietnam, Myanmar, and finally India.

On May 21, 2020, the OIE reported a total of 11 outbreaks in the Indian states of Assam and Arunachal Pradesh, where 3701 pigs died from ASF (India report the first outbreak). The disease has spread to Northeastern states by June 2021, including Meghalaya, Mizoram, Manipur, and Nagaland, which had a high death rate among pig producers. A recent outbreak was found in some district of Rajasthan in February 2023.

3. Epidemiology

In Africa, Europe, and Asia ASF has a distinct pattern of transmission and spread. Three ASF epidemiological cycles, including the sylvatic, tick-pig, and domestic cycles, are described below:

In the sylvatic cycle, the virus is transmitted from warthogs to soft ticks without the warthogs being sick.

In the tick-pig cycle, Ticks act as a biological reservoir for the virus and infectious agents are transmitted among domestic pigs. Such cycles were observed during the Iberian Peninsula outbreak in the 1960s and 1970s as well as in other sub-Saharan regions of Africa.

In the domestic cycle, Natural reservoirs are not important but domestic pigs or pig products responsible for disseminate the virus in domestic herds.

The hypothesized wild boar-environment cycle, a novel and fourth cycle of transmission described in some regions of Europe, involves Eurasian wild boar, its habitat, and their carcasses. ASF outbreaks in the domestic cycle are also linked to pig husbandry's social and economic characteristics.

4. Etiology

The virus that causes ASF is ASFV, a member of the family Asfarviridae and genus Asfivirus. On the basis of its morphology, it was initially categorised within the family "Iridoviridae," but subsequently, as a result of changes in its mechanism of replication and DNA structure, it was classified independently as the only member of the family Asfarviridae.

ASFV is a large ds DNA virus that multiplies in the cytoplasm of cells. Asfarvirus virions have a complex icosahedral capsid that measures 180 nm in diameter and enveloped is 175-215 nm in diameter. The virus's genome is a single molecule of linear, ds DNA that is between 170-190kbp



in size, with covalently closed ends, inverted terminal repeats, and hairpin loops. It codes for between 150kbp and 167kbp proteins, including those necessary for viral replication. (Dixon et al., 2013). Macrophages are the primary cell type for ASFV replication. For the pathogenic and immune evasion strategies, the virus must modify macrophage activity. It is well known that the virus is highly resistant to low temperatures, At 56°C for 70 minutes or 60°C for 20 minutes, ASFV becomes heat inactivated. In addition, it is inactivated by pH 11.5 in serum-free medium.

5. Host Range

African swine fever is an OIE listed transboundary disease that infects members of Suidae family such as domestic and wild boars (*Sus scrofa ferus*), feral pigs, bush pigs (*P. porcus*), warthogs (*Potamochoerus aethiopicus*), forest hog, and *Ornithodoros* ticks (Soft ticks *Ornithodoros moubata* in Africa and *Ornithodoros erraticus* in Europe).

6. Transmission

ASF can spread not only through direct contact but also through eating meat from infected pigs (Wilkinson, 1984), being bitten by infected ticks (*Ornithodoros* spp.), and coming into contact with bedding, feed, equipment, clothing, and other items that have been contaminated with biological material that contains viruses, such as faeces, urine, or saliva from infected pigs.

Although warthogs are thought to be the virus's natural hosts, it has been shown that they are unable to directly transfer the virus to domestic pigs. After feeding on the viremic pig, the ASFV is kept in biological vectors (soft ticks), where it can spread the virus to other pigs. Depending on the virus, the host, the dosage, and the route of exposure to the virus, the death rate ranges from 0 to 100% (Costard et al 2013).

7. Pathogenesis

ASFV has an incubation period of 4 to 19 days (Arias and Sánchez-Vizcaíno 2002). The digestive tract is the primary natural route of infection, although there are also additional pathways such as the respiratory system, skin injuries, and insect bites. When viruses enter the body, they first multiply in mononuclear phagocytic cells, primarily on monocytes, however macrophages can also infect endothelium and hepatocyte cells. After then, viruses move through the blood and lymph, causing primary viremia within 8 hours of infection in the case of newborn piglets, and secondary viremia to happen between 15 and 24 hours later, when they further spread to practically all tissue from the primary sites. After 30 hours of post infection, it can move to the target organs, such as the spleen, bone marrow, liver, lung, and kidney, producing significant bleeding after damaging the



macrophages. One day after infection, the virus can be detected in the blood's circulating leukocytes, tonsils, and mandibular lymph nodes (Heuschele, 1967). Active molecules such as cytokines, complement factors, and arachidonic acid metabolites are released, which mostly responsible for organ damage (Penrith *et al.*, 2004). Infections that are acute and subacute can cause thrombocytopenia (Blome *et al.*, 2013).

8. Clinical Signs

The disease might manifest as acute, subacute, chronic, or peracute sickness and some animals may seroconvert to ASF without developing symptoms:

8.1 Peracute Form: Sudden deaths with few lesions (peracute cases) may be the first sign of an infection in some herds.

8.2 Acute Form: High fever, anorexia, lethargy, weakness, recumbency, and cutaneous hemorrhages are symptoms of acute instances (redness of skin on ears, abdomen and legs). There have been reports of neurological symptoms, nasal and conjunctival discharges, and respiratory symptoms (including dyspnea). Pigs may also vomit or have diarrhea, and pregnant animals commonly have abortions. Death usually happens within 7 to 10 days. The mortality rate might reach 100%.

8.3 Subacute Form: Subacute African swine fever is similar to acute form, but with less severe clinical signs. Occasionally, the emergence of this type is detected by an abortion. Typically, affected pigs pass away or recover in 3 to 4 weeks.

8.4 Chronic Form: Pigs with the chronic form have nonspecific signs such as an intermittent low fever, appetite loss and depression but some pigs develop respiratory problems and swollen joints. There has been evidence of intermittent vomiting, diarrhea, and frequent coughing.

9. Post Mortem Lesions

Depending on the strain and species of pig affected, post-mortem lesions for African swine fever might include bluish coloring of the skin with bleeding, bloody froth from the nose and mouth, discharge of pus from the eyes, and signs of bloody faeces.

ASF-specific lesions are seen, particularly in the acute phase, when petechial hemorrhages are evident on various internal organs, including the spleen, lymph nodes, kidney, heart, and bladder. Splenomegaly is also present, and hemorrhages are also evident on the dura mater in the brain and in the pleura. Subacute infection makes kidney hemorrhage more obvious than acute infection does. In its chronic phase, necrotic skin is seen. (Wozniakowski *et al.*, 2016).



10. Diagnosis

The clinical signs of African swine fever resemble to classical swine fever extremely closely, diagnose the two illnesses using a laboratory test.

Clinical symptoms and laboratory testing are used to make the diagnosis. Identification of the agent by isolation in cell cultures demonstrating hemadsorption and antigen detection. By using a fluorescent antibody test (FAT), antigens can be detected. The viral genome may be detected using polymerase chain reaction methods, which are especially helpful when samples may not be acceptable for virus isolation or antigen detection due to putrefaction. For diagnosis, serological tests such as the Enzyme-linked immunosorbent assay (ELISA), which is the standard test for global trade, the indirect fluorescent antibody (IFA) test, and the Immunoblotting test can be utilised.

11. Differential diagnosis

It is critical to distinguish between African Swine Fever and other septicaemic diseases like Pasteurellosis, Erysipelas, Salmonellosis, Aujeszky's disease (pseudorabies), Porcine Reproductive and Respiratory Syndrome (PRRS), Classical Swine Fever (Hog Cholera), Porcine Dermatitis and Nephropathy Syndrome (PDNS), Porcine Reproductive and Respiratory Syndrome (PRRS) and toxicity.

12. Prevention and Control

Interrupting the mechanisms of viral transmission is the main goal of ASF prevention. First, to prevent direct contact transmission, practice good farm biosecurity measures to prevent contact between any infected and susceptible swine. This should involve keeping infected pigs apart from the herd, avoiding interaction between pigs and feral or wild hogs, housing pigs indoors where practical, and quarantine the new herd for at least 30 days to ensure health

I. Strict import regulations for animal products: must be put in place to prevent the introduction of infected live pigs or pork products into areas that are clear of ASF. Animal imports from countries with ASF contamination may be subject to limitations or outright bans in the wake of the discovery of tainted meat. Look into polluted regions before importing any potentially dangerous items.

II. Proper disposal of all food waste from aircrafts or ships coming from infected countries. Furthermore, no human food waste should be provided to pigs.

III. Efficient sterilization and disposal of garbage: Swill feeding should be avoided (i.e. garbage feeding). Catering waste feeding is a high-risk activity; if the food waste contains ASF, it can infect a healthy herd. Do not leave food trash out for wild swine species to eat. Carcasses, wasted



components from butchered pigs, and food waste should be properly disposed of.

IV. Rapid slaughtering of all pigs, infected or not (stamping out): Animals that have recovered or survived are viral carriers for the rest of their lives. As a result, it is safer to butcher both diseased and possibly infected pigs to avoid spreading the disease and preventing recurrence. Stamping out the illness is frequently a temporary solution. However, it is often the most cost-effective strategy that enables farms to be free from ASF in the shortest time.

V. Strict on-farm biosecurity: By following biosecurity regulations, such as thoroughly cleaning clothing and footwear, and by avoiding from introducing pig products that have not undergone the appropriate heat treatment into a farm, viruses and germs may be kept out. Farms should have a special pair of shoes and outfit that is only worn on the farm.

VI. Controlled animal and human movements: People, tools, and vehicles are all ASF targets. Make sure anyone entering the farm hasn't interacted with any pigs in the last 48 hours. Visitors to the farm who have been through ASF-positive nations must quarantine at least five days before to enter. Before entering the building, vehicles and equipment should be thoroughly cleaned and sanitized.

VII. Disease surveillance and monitoring: This is crucial for shipping live pigs and items containing pork. Pig farms should also have a strict program for health monitoring. The presence of ASF should be checked on all ill or deceased pigs. Pigs killed for in-house eating should be examined by a veterinarian to spot ASF early.

VIII. Effective and early diagnosis of the virus by laboratory testing: As soon as you see any symptoms of ASF, contact your veterinarian and get your pigs tested.

13. Control

General approach to control ASF disease

- ASF must be contained at the site where it is detected and eradicated as quickly and effectively as possible so that it cannot be reintroduced.
- Early identification of clinical symptoms indicative of African Swine Fever (ASF) and fast reporting to enable diagnosis as soon as ASF reaches the nation.
- Reduce the risk of further spread of ASF from premises associated with or near the infected premises.
- Prior to easing restrictions, conduct risk assessments, and prior to lifting restrictions, conduct surveillance for signs of additional disease.
- Comply with existing national laws as well as international trade obligations under the OIE disease control codes.



Control strategy

The proposed control strategy divides the pig population of the Country in 3 different subpopulations –

- Infected zone (IZ) – 1 Km radius of infected premises (IP)
- Intermediate/ Surveillance zone (SZ) – 10 Km radius from the infected premises (9 km outside the IZ)
- Disease Free zone/ non-Infected area (FZ) – Area outside the SZ

14. Disinfection

Since many common disinfectants are ineffective, care should be taken to use a disinfectant specifically approved for the virus. Disinfection of equipment, vehicles, and personal protective equipment is essential when there has been exposure to an area with suspicion or confirmed diagnosis of ASF. ASFV is reportedly destroyed on some nonporous surfaces by sodium hypochlorite, citric acid (1%) and some iodine, and quaternary ammonium compounds.

15. During an outbreak

1. Infected and suspected infected animals must be placed under quarantine.
2. No movement of pigs or any products of pig origin should be allowed.
3. All infected and in-contact pigs must be humanely slaughtered.
4. Carcasses, animal products and bedding must be burnt or buried deeply on site.
5. Vehicles should be disinfected on entering and leaving farms.
6. Personnel should ensure that shoes, clothes and equipment are disinfected between farms.

16. Vaccines

There are no commercially accessible vaccinations at present. Over the past 40 years, several approaches have been employed in the development of an efficient vaccination against this condition, but the complexity of the virus and the host immune system's evasion by its numerous proteins make the creation of vaccines against ASF challenging. Lack of permanent cell lines that can support the ASFV's multiplicity and large-scale production is another barrier to its propagation. In a population, DNA vaccinations using ASFV genome constructs lacking CD2v, p54, and p30 provided only little protection.

Traditional vaccine preparation involves killing or inactivating the pathogen in various ways to render it non-virulent but immunogenic, resulting in the production of protective antibodies. However, because these vaccines do not activate killer T cells, they do not protect pigs against intact forms of ASFV. The use of live vaccines can increase T cell activation and antibody production without harming the inoculated animal. Both gene-deleted (genetically modifying the virulent forms of the virus by removal of sequences the code for lethal proteins) and naturally attenuated variants of ASFV fall under this classification.



17. Biosafety and Biosecurity Measures

Implementing suitable import policies and biosecurity precautions are essential parts in minimizing an outbreak. ASF-free areas must be protected from the introduction of infected live pigs or pork products.

Biosafety at farm level is to be practiced. People or workers handling diseased pigs should follow all biosafety procedures, including using protective clothing such as aprons, glasses, gloves, and gumboots, and avoiding going near other sheds. Gumboots should be cleaned with 2% sodium hydroxide right away after usage, and there are several commercial disinfectants on the market.

18. Eradication

Successful eradication is accomplished by rapid diagnosis, depopulation and proper disposal of all infected or in-contact swine on the infected premises. Disposal of carcasses will be necessary and must follow animal health official guidelines. Additionally, measures to ensure proper carcass disposal, sanitation/disinfection, movement controls and quarantines, and the prevention of contact with wild suids must be taken.

19. Public health risk

African swine fever virus does not cause disease in humans, so it is not a risk to human health.

20. Treatment

There is no treatment. Upon detection of the virus, all affected animals must be segregated and culled immediately.

21. Conclusion

ASF is a highly infectious disease of pigs and wild boars that results in 100% mortality and causes significant financial loss to pig producers. There is no commercially available vaccine. Pigs that have been exposed and are affected must be killed and buried underground. Restocking can begin four months after the diseased areas have been properly cleansed and disinfected. This should be done from known sources of healthy farms. The ASF has been reported from neighboring countries in India's north eastern states and can enter at any time and persist in our pigs. As a result, one must be attentive and alert.

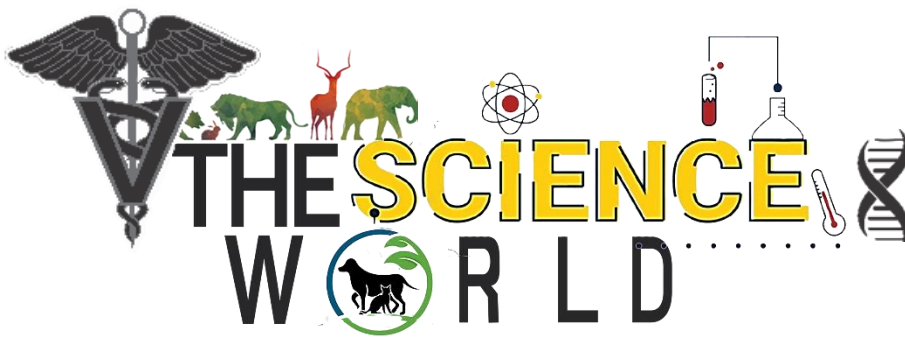
22. References

- Abedin, S. N., Baruah, A., Bora, A., Dutta, D. and Dutta, A. J. P. I. (2020). African swine fever (ASF) outbreak in India: A review of literature about the virus and its control measures. *Pharm Innov*, 9(7), 298-304.
- Arias, M. and Sánchez-Vizcaíno, J.M., 2002. 4.1 African Swine Fever. *Trends in emerging viral*



- infections of swine, p.119.
- Blome, S., Gabriel, C. and Beer, M., 2013. Pathogenesis of African swine fever in domestic pigs and European wild boar. *Virus research*, 173(1), pp.122-130.
- Costard, S., Mur, L., Lubroth, J., Sanchez-Vizcaino, J.M. and Pfeiffer, D.U. (2013) Epidemiology of African swine fever virus. *Virus Res.*, 173(1): 191-197.
- Dixon, L.K., Chapman, D.A.G., Netherton, C.L., Upton, C. (2013). African swine fever virus replication and genomics. *Virus Research* 173, 3-14.
- Food and Agriculture Organization. (2018) African swine fever threatens Peoples Republic of China. Animal Health Risk Analysis, Assessment No. 5. Food and Agriculture Organization, Rome, Italy.
- Galindo, I. and Alonso, C. (2017). African swine fever virus: a review. *Viruses*, 9(5), 103.
- Gallardo, M. C., de la Torre Reoyo, A., Fernández-Pinero, J., Iglesias, I., Muñoz, M. J., & Arias, M. L. (2015). African swine fever: a global view of the current challenge. *Porcine Health Management*, 1(1), 1-14.
- Heuschele, W.P., 1967. Studies on the pathogenesis of African swine fever I. Quantitative studies on the sequential development of virus in pig tissues. *Archiv für die gesamte Virusforschung*, 21(3-4), pp.349-356.
- <https://www.oie.int>
- Jubb, Kennedy and Palmer's Pathology of Domestic Animals, edited by Grant Maxie (2015) 6th Edition, Saunders Ltd.
- Livestock Census. (2019) Department of Animal Husbandry Livestock Census. (2019) Department of Animal Husbandry.
- Patil, S. S., Suresh, K. P., Vashist, V., Prajapati, A., Pattnaik, B., & Roy, P. (2020). African swine fever: A permanent threat to Indian pigs. *Veterinary World*, 13(10),
- Penrith, M.L., Thomson, G.R., Bastos, A.D.S., Phiri, O.C., Lubisi, B.A., Du Plessis, E.C., Macome, F., Pinto, F., Botha, B. and Esterhuysen, J. (2004). An investigation into natural resistance to African swine fever in domestic pigs from an endemic area in southern Africa. *Rev Sci Tech*, 23(3), 965-77.
- Veterinary Pathology by Ronald Duncan Hunt, Thomas Carlyle Jones and Norval W. King, 6th Edition (1 March 1997) Wiley-Blackwell.
- Wilkinson, P.J., 1984. The persistence of African swine fever in Africa and the Mediterranean. *Preventive Veterinary Medicine*, 2(1-4), pp.71-82.
- World Organization for Animal Health. (2020) African Swine Fever (ASF) Report No. 52: August 21- September 03, 2020. World Animal Health Information Department, World Organization for Animal Health, Paris, France.
- Woźniakowski, G., Frączyk, M., Niemczuk, K. and Pejsak, Z., 2016. Selected aspects related to epidemiology, pathogenesis, immunity, and control of African swine fever. *Journal of Veterinary Research*, 60(





A Monthly e Magazine
ISSN:2583-2212
April, 2023; 3(04), 608-610

Popular Article

Feeding of Livestock During Scarcity Period

Dr. A. Abinaya* and Dr. R. Eazhisai

* Assistant Professor, Department of Animal Nutrition,
Veterinary College and Research Institute, Udumalpet – 642 126.

<https://doi.org/10.5281/zenodo.7881637>

Abstract

Shortage of feed and fodder is more common in drought prone areas of our country due to acute crop failure in dry seasons. The scarcity of fodder brings misery to the population of livestock affecting its overall health and production and leading to nutritional deficiencies and other diseases. There is even scarcity for drinking water which further aggravates the situation.

Introduction

The main focus on feeding livestock during drought or fodder scarcity periods is to meet out the nutrient requirements of the animals and preventing nutrient deficiency, thereby maintaining production. To ensure that the animals must have adequate energy, protein, minerals and vitamins. Secondly, these nutrient requirements must be met by the available feed during the scarcity period.

Most important nutrients to be taken care of during a drought

Energy

Energy is the most limiting nutrient for grazing animals during scarcity period. Alternative energy rich feed resources must be included to feed the animals to meet out the energy requirements. Hay, grain and crop processing byproducts can be used to supply energy. Poor quality forages can be processed and various physical, chemical and biological methods can be adopted to improve the nutritive value and digestibility of low-quality forages.

Protein



Under drought condition, the pastures and forages are may be deficient in protein. In case of deficiency of protein, reduction in pregnancy rate may occur and also decrease the production of the lactating animals. This can be corrected by supplementing protein in the form of protein-rich feed resources or by supplying nitrogen in the form of non-protein nitrogenous feed resources. Urea is one of the most widely used non-protein nitrogen sources used for improving the crude protein level of the poor-quality roughages.

Minerals

The requirement of minerals and salt is same for the animals in drought as during the normal conditions. However, during drought the requirement of phosphorus is increased and more critical. A mixture of 50 % trace mineralized salt and 50 % DCP can be supplied free of choice to meet out the demand. The salt mixture is placed closed to watering locations.

Vitamin A

Vitamin A is the most common deficient vitamin among the animals that were grazing on the drought affected pastures during the dry season. Animals should receive vitamin A and vitamin D supplements for proper maintenance and production.

Feeding technologies that can be employed in scarcity periods

1. Use of sugarcane bagasse

Bagasse is a byproduct of sugar factories that can be used as livestock feed during scarcity. Though it is unpalatable, it can be treated with urea-molasses mixture to improve palatability, digestibility, energy and protein content of the feed. The mixture can be sprayed over the bales of bagasse or watering can also be used. Proper mixing and soaking are to be ensured.

2. Urea treatment of crop residues like straws, gotars, sugarcane residues can be followed.

Urea supplementation at 2 – 4 % of straws can improve palatability, digestibility and its nutritive value. Straws like rice, wheat, ragi, jowar, bajra can be used.

3. Urea molasses liquid feed

Liquid molasses containing 2 to 3 % uniformly mixed urea fortified with minerals and vitamins.

4. Uro-mol Brick feeding

It plays an important role in drought-prone areas by supplying nitrogen to the microbes in the rumen and improving digestibility. It can also be packed and transported easily to the areas of



necessity.

5. **Uromin lick** It is also called “Pashu Chaat” that contains urea, molasses and minerals and certain fillers like de-oiled rice bran, maida and feed binder.
6. **Top feed resources** such as tree leaves, pods, bark etc. play an important role in drought conditions. Tree leaves are good source of protein, calcium and vitamin A. it is palatable and can replace green fodder to meet out the nutrient requirements.
7. **Vegetable leaves** like cabbage, potato, cauliflower and fruit wastes like apple pomace, citrus peels, banana peels, mango kernel, coconut pith can also be used in livestock feeding.
8. **Paper waste**

Paper waste made of cellulose (70%) helps in filling up the stomach and satisfy the hunger cravings. Complete feeds can be prepared by including other concentrates to maintain the animal during scarcity.

9. Complete fed blocks

The blocks are made with concentrates like wheat bran, rice bran, mustard or groundnut cake supplemented with urea, molasses, minerals and salt. The blocks can be prepared and stored during the drought.

10. Aquatic plants

Various types of aquatic plants like water hyacinth, water chestnut, stalks and leaves of lotus plant, hydrilla, aquatic weeds are may be used for livestock feeding of farm animals. They are readily available in water logging areas and during floods and are rich sources of carotenes.

11. Creation of feed and fodder bank:

To meet the needs of livestock during adverse condition of scarcity, it is essential to create feed and fodder banks. Grasses and crop residues from forest area, harvesting lands or waste lands can be collected, preserved and stored as hay.

Conclusion

The natural calamities play a havoc in the health of animals and in livelihood of farmers. Adopting newer strategies and promoting unconventional feeds in feeding livestock is the most ideal choice of mitigating the unfavorable circumstances.





THE SCIENCE WORLD



A Monthly e Magazine
ISSN:2583-2212



Visit official Website
<https://www.thescienceworld.net>

Vol.3 Issue 5

May 2023