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Popular Article

Use of Indigenous Traditional Knowledge in IPM

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Introduction

Indigenous Traditional Knowledge is knowledge, know-how, skills and practices that are developed, sustained and passed on from generation to generation within a community, often forming part of its cultural or spiritual identity. (WIPO, 1971)

How Indigenous traditional knowledge differs from Indigenous technical Knowledge

When these Knowledge are developed using certain scientific principle that can be applied in day-to-day life then Indigenous traditional knowledge is termed as Indigenous technical Knowledge

Indigenous technical Knowledge

Sum total of Knowledge and practices which are based on people's accumulated experiences in dealing with situations and problems in various aspects of life are special to particular culture (wang, 1983)

Unique Traditional local language existing within and developed around a specific condition of particular area (Greiner, 1998).

ITK- An Introduction.

Dynamic system

Ever charming, adopting and adjusting to local situations

Based on locally available materials

Covers wide range of subject matters ranging from Crop production, livestock rearing, natural resource management, food preparation, health care, insect pest management and many more.

Special features of ITk's

Local in that it is rooted in a particular community and situated within broader cultural traditions; it is a set of experiences generated by people living is those communities. Separating the technical from the non-technical, the rational from the non-rational could be problematic. Therefore, when transferred to other places, there is a potential risk of dislocating indigenous knowledge.

Tacit knowledge and, therefore, not easily modifiable

Transmitted orally, or through imitation and demonstration. Codifying it may lead to the loss of some of its properties.

Experiential rather than theoretical knowledge. Experience and trial and error, tested in the rigorous laboratory of survival of local communities constantly reinforce indigenous knowledge.

Learned through repetition, which is a defining characteristic of tradition even when new knowledge is added. Repetition aids is the retention and reinforcement of indigenous knowledge.

Constantly changing, being produced as well as reproduced, discovered as well as lost; though it is often perceived by external observers as being somewhat static.

Need for ITk's

Great deal of knowledge is being rapidly lost as most of the ITK are disappearing from their traditions due to influence of modern era

Documentation of ITK provides an opportunity to evaluate efficacy of the existed ITK and to implement the same in our day-to-day life

Growing awareness about indiscriminative use of pesticide createsa an avenue to think about ITK

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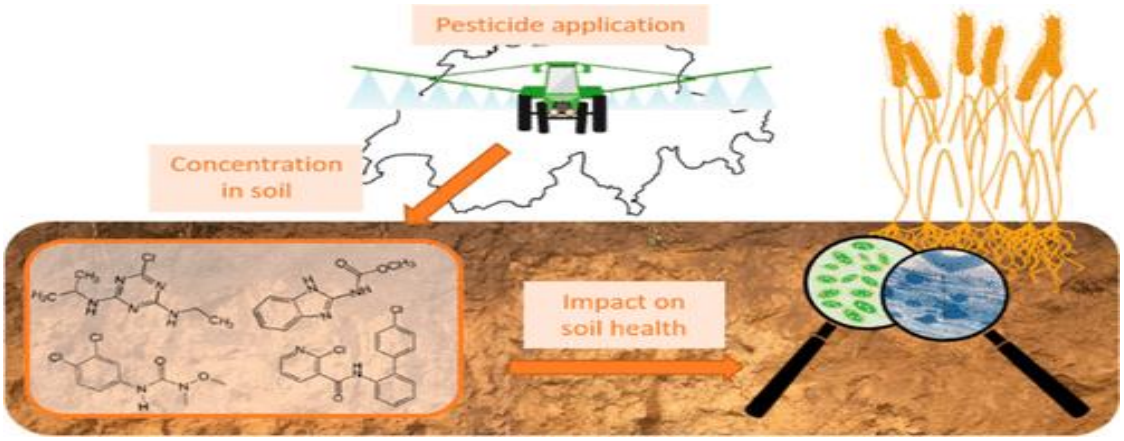
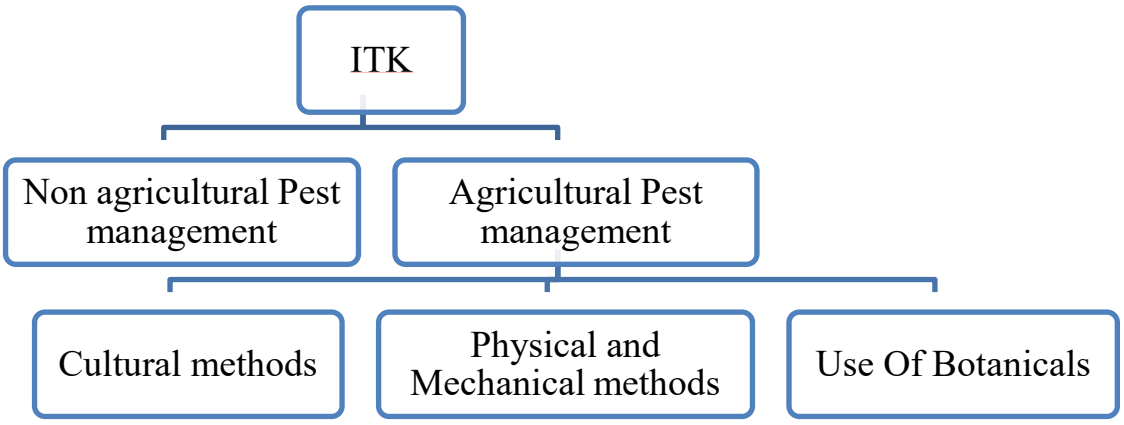
Offers high potential alternate to conventional pesticides



ITK and pest Control

Current pest control measures are leading towards food poisoning, soil, water and environmental pollution and majorly contributing towards the development insect resistance hence ITk play an important role in controlling pest by overcoming all these lacunas.

In Indian Context first record of using ITk in pest management is mentioned in Vrukshayurveda scripture where cow urine was used to manage various pest.



1. ITK in non-Agricultural Pest Management:

a. Diya

From the ancient days Indians have the culture of lightening the Diya in front of the house entrances during the evening hours. In ancient times Diya was lighted using the Pongamia oil which contains several terpenoids upon burning these terpenoids get evaporated and brings slight fumigation conditions during the evening hours at the entrance of the doors which will avoid the entry of mosquitoes into home.

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b. Incense stick

In India Incense sticks will be lighten inside the house to get fumigation action to avoid house hold pests.

c. Turmeric

The entrance doors of the house are coated with Turmeric at regular intervals to avoid infestation of termites to wooden doors.

d. Slaked lime

During early days houses were built using soil which have highly prone to termites' infestation hence they will be coated with slaked lime to avoid infestation as calcium act as insect repellent.



e. Urine Urine

Cow urine has unique property of pest repellent due to their phenolics content, hence from time memorial hairs are washed with cow urine to avoid the infestation of head louse and it also found effective against dandruff.

2. ITk in Agricultural Pest Management

(a) Cultural practices: Generally cultural practices enhance the "belowground biodiversity" which concurrently contribute to "aboveground biodiversity" and make the habitat more diverse for sustenance of natural enemies. The cultural practices (field sanitation; proper seed and variety selection; proper seedbed preparation; planting date; row spacing; seeding rate; fertilization; water management; crop rotation; planting of trap crops and hedge rows; companion planting; and intercropping) contribute to prevent, suppress, or eradicate pest build-up by disrupting the normal relationship between the pest and the host plant and thus make the pest less likely to survive, grow, or reproduce. Most of these practices are well experimented and practiced by the farmers. However, some strategies to grow ground cover crop and windbreaks are required to reduce dust because dust can interfere with natural enemies and may cause outbreaks of pests such as spider mites. Similarly

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there is a need to avoid excess fertilization and irrigation, which can cause phloem-feeding pests such as aphids to reproduce more rapidly than natural enemies.

(b) Physical or mechanical control: It includes proper land preparation; hoeing; weeding, bagging of fruits; baits and traps; row covers; mulching; handpicking; and pruning, etc. Among the above practices traps and baits can be indigenously prepared using locally available resource for better monitoring and control of insect pests. A few examples are cited below;

Trapping rhinoceros beetles (RB) in coconut: a mud pot with three quarters of it is to be filled with water and to this 250 g of powdered castor cake is added. The pot is then buried in the soil with its mouth in level with the soil. The smell of the cake attracts the beetles which fall into the water. Just 2-3 such pots in one hectare of plantation can clear beetles from the area. Slices of pine apple are also used to attract RB. In a cylindrical plastic container 2 slices of pineapple are taken and an exit hole is made to allow the rain water to drain. The trap is hung near the crown of the coconut tree. The beetles are attracted to wards the pineapple and get trapped.

Trapping red palm weevil (RPW) in coconut: The mid rib of coconut leaf is cut into small pieces and crushed, place it in an earthen pot either with 1 lit of water 100 g jaggery and 10 g tobacco powder or with sugarcane molasses 2½ kg or toddy 2½ litres acetic acid 5 ml yeast 5 g. Another pot with hole at its bottom is placed over it. This arrangement is made at 3-4 corners of the coconut orchard to attract and trap the beetles. The mixture of jaggery, tobacco and water are to be added once in a month in case the former bait is choosen.

Trapping fruit flies: Fruit fly *(Dacus dorsalis* and *D. cucurbitae)* incidence is normally seen in mango and cucurbits. A low-cost fruit fly trap to combat this insect pest can be made as follows;

(a) 20 g of *Ocimum sanctum* (holy basil) leaves are crushed and the extract along with the crushed leaves are placed inside a coconut shell, which is then filled with 100 ml water. To increase the keeping quality of the extract, 0.5 g citric acid is added and the extract is then poisoned by mixing

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0.5 g carbofuran 3G. The traps are suspended from mango tree branches at a rate of 4 traps per tree. The fruit flies feed on the ocimum extract and are killed.

(b) Make a trap using a 2-liter disposable water bottle: Two holes at a height of 5cm from the bottom of bottle are made and for hanging the trap, use a string which is pushed through a hole drilled in the centre of the cap from inside. The attractant mixture for fruit flies is then prepared by mixing 1 cup of vinegar, 2 cups of water and 1 tablespoon of honey and shakes this well before use. Fill the trap with this mixture up to the level of holes and hang the container about 5 feet high. Flies will enter the container and fall into the attractant.

Traping sucking insect pests: Bright yellow sticky traps are used for monitoring/controlling aphids, thrips and whiteflies. While, bright blue traps can exclusively be used for monitoring thrips and bright white sticky traps for flea beetles (Bissdorf, 2008). Set up sticky traps for monitoring whitefly, thrips etc. @ 10 traps per ha. Locally available empty tins can be painted yellow / coated with white grease / vaseline / castor oil. Place traps near the plants, preferably 25 cm away from the plant to ensure that the leaves will not stick to the board, but not facing direct sunlight. Position the traps at 50-75 cm above the plants. Alternatively, yellow water pans traps also proved useful for simple population counts of alate aphids based upon which insecticidal control can be initiated.

Trapping blister beetles: Blue containers, filled with water with little detergent are claimed to attract blister beetles.

rapping moths: Mix 500ml of aloe extract 1 kg of castor cake and add latex as adhesive. Put this mixture in a wide opened disposable container. Place in locations of the field @12 / ha (Bissdorf, 2008).

Control of Slugs in Kitchen Garden: Set the rinds of grapes with a little pulp left inside with upside down (like an igloo-style) in kitchen garden. The slugs will hide underneath the grapefruit and die.

Other Mechanical control practices:

Attracting birds: Erection of bird perches @ 25/ha facilitates predation of larval stages of insects.

Bait for Ant: Ants often protect honeydew producing organisms such as aphids, mealybugs, and scales from attack by natural enemies. Sometimes ants move these honeydew-producing insects from plant to plant. Control of ants often leads to more effective biological control of sucking pests. The bait can be made by dissolving 1 teaspoon powdered boric acid and 10 teaspoons sugar into 2 cups of water; this mixture can then be absorbed into cotton balls which are left near ant trails.

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Gundhi bugs in rice: Fix dead crabs, frogs or even pieces of jackfruit (*Artocarpus heterophyllas*) to bamboo sticks and place them in rice fields before milky stage. This will attract gundhi bugs and keep them busy till the dough stage is over.

Rats: Boil 10 kg of wheat seeds in water with two large pieces of the bark from the *Gliricidia* tree. Then use the boiled wheat seeds in the field or in stores where rat menace exists. Mexican farmers grind the bark or leaves, mix it with wet wheat seeds or smear it on banana slice and use it for rat killing purpose. In Panama, a mixture of cereals and ground leaves of *Gliricidia* is allowed to ferment and then this is used as a rat killer. *Gliricidia* is a rat killer as it contains coumarin which gets converted to anticoagulant dicoumerol by bacterial fermentation. This reduces the protein Prothrombin to cause death in rats due to internal bleeding

Fruits of *Mucuna pruriencs* Back (Fam: Papilionaceae) are kept in the active rat burrows. When the rodent enters into the hole, it collides against the hairy fruits with irritating hairs and leaf the spot with irritation.

A mixture containing 90% sesame or g.nut or niger flour with 5% thick sugar crystals and 5% powdered bulb or tube is placed in a bowl near rat holes and when rats feed these mixtures they die within a week.

Inserting 10 – 12 inches long fresh pieces of stem of Jatropha plant into active rat holes makes the field rat free (Kanojia, *et al*.,2005)

(c) Use of botanicals:

Botanicals are readily available than commercial products as they grow in the local environment. Reviving and modernizing age-old farmer practice through the optimization of ethnobotanicals has shown that farmers are more comfortable using plant materials than commercial synthetics and those botanicals can offer a similar level of control when certain guidelines are followed to their use (Belmain, 2002).

Aloe (*Aloe barbadensis*; Fam: Aloeaceae) vitex (*Vitex negundo*; Fam: Verbenaceae) extract: Soak vitex leaves

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(5kg) in 10 liters water. After boiling for 30 minutes cool the extract and then strain. Remove the outer part of the aloe leaves (2 kg) and grind in water to get the extract. Mix the two extracts and dilute in 50-60 liters of water to cover 0.4 ha area. Add 50-60 ml soap in the mixture and spray early in the morning or late in the afternoon. This Aloe vitex extract is reported to control armyworm, hairy caterpillar, rice leaf folder, rice stem borer, semi-looper, bacterial and fungal diseases (Bissdorf, 2008).

Coriander (*Coriandrum sativum*) for spider mite control: Coiander acts as a repellent and to prepare the extract boil 200 grams of crush seeds in 1 liter of water for 10 minutes. Dilute extract with 2 liters of water. Spray early in the morning on infested plant parts to control spider mites (Bissdorf, 2008).

Marigold and chilli extract: Chop 500 g of whole plant and 10 hot chilli pods; Soak them overnight in 15 liters of water. Dilute the filtrate with water at 1:2 ratios and add soap @ 1tsp per liter of extract. This controls most agricultural pests (Bissdorf, 2008).

Turmeric (*Curcuma domestica*) : Soak shredded rhizome (20g) in 200ml cow urine. Dilute the mixture with 2-3 liters of water and add soap (8-12 ml) and spray. The extract controls aphids, caterpillars, red spider mites and powdery mildew (Bissdorf, 2008).

Indian privet tree (*Vitex negundo*; Verbenaceae): Soak 2kg vitex leaves overnight in 5liters of water and boil the mixture for 30 minutes. Add 10 liters of water and soap (10ml) and spray. This controls DBM, hairy caterpillars, rice leaf folder, rice stem borer and semilooper (Bissdorf, 2008).

Neem leaf extract: Pound 1kg neem leaves and place it in a pot with 2liters of water.Cover the mouth with cloth and leave it as such for 3 days. Dilute the extract at 1:9 with water and add 100 ml of soap before spraying. This controls aphids, grasshoppers, leaf hoppers, plant hoppers scales thrips weevils and beetles (Bissdorf, 2008).

Calotropis gigantean: Leaves are preserved in big earthen pot filled with water for two weeks. The water is applied @ 0.5 l / tree to control termites. The leaves are replaced after 2 months.

(d) Other pest control formulations based on ITK:

Placing Honey bee colonies- Honey bee colonies are kept around the field found hung and are connected to each other by a means of thread to scare away the elephants. When elephants found entering the field, they touch the rope and disturb the colonies thus honey bees attack the elephants and scare away them.

Spreading cutting shop hairs around the field- By spreading the cutting shop hairs around the field will avoids the bore entry to the field, as bores usually enters the field by smell, when they continuously inhale the smell from the ground the hairs enters the nostrils and get irritated and run away from the field.

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Fermented curd water – In some parts of central India fermented curd water (butter milk) is used for the management of white fly, jassids aphids etc.

Cow milk: Cow's milk was reported to acts as an excellent sticker and spreader due to presence of casein protein has excellent spreader and sticker property. It can be used @ 10% aqueous suspension for effectively controlling powdery mildew. Milk sprays induced systematically acquired resistance in chilli against leaf curl, a viral disease (Arun Kumar *et al.,* 2002).

Cow urine and dung: Cow urine diluted with water in ratio of 1: 20 is not only effective in the management of pathogens and insects, but also acts as a growth promoter of crops.

Cow urine have been found effective against mealy bugs, thrips and mites (Peries, 1989) and against post flowering insect pests of cowpea (Oparaeke, 2003).

Crush 5 kg neem leaves in water, add 5lit cow urine and 2 kg cow dung ferment for 24 hrs with intermittent stirring, filter the extract and dilute it in 100 lit of water for spraying over one acre. This extract is useful against sucking pests and mealy bugs.

In brinjal, application of cow urine10% starch 1% (Pradhan, 2011) either alone or alternatively with chlorantraniliprole 18.5 SC (Sakhinetipalli, 2012) was found to be cost effective.

Botanicals fermented in cow urine/cow dung: The cow urine decoctions of botanicals have been reported as effective against the various insect pests without noticeable detrimental effect on their natural enemies (Poonam, 2003; Gupta, 2005).

Cow urine 5% with neem seed kernel extract 5% and cow dung 5% showed anti-feedent and anti-ovipositional effects against *Helicoverpa armigera* (Sadawarte and Sarode, 1997; Boomathi *et al.,* 2006).

Among 14 cow urine mixed botanical extracts tested *Lantana camara* Linn. and *Vitex trifolia* were reported effective against aphid, *Lipaphis erysimi* (Shreth, *et al*., 2009).

Crude extract of *Datura alba* (20%) cow urine (20%) was effective against stem borer and leaf folder in Basmati rice (Aswal *et al.,* 2010).

Barapatre and Lingappa (2003) also documented the effectiveness of cow urine along with various botanicals *viz*., NSKE, *Pongamia*, *Vitex* and *Aloe vera* against *S. litura* and *H. armigera* in groundnut and chickpea, respectively

Combination of cow urine with NSKE and *Vitex* reduced the shoot fly infestation in sorghum (Vijayalaxmi, *et al*., 1996; Mudigourdra, *et al*., 2009).

Cow urine fermented karanj leaves (10%) / neem leaves (10%) were ideal in respect of marketable fruit yield (135.5-141.7 q / ha) and benefit: cost ratio (38.20:1 – 42.68:1) despite of their ineffectiveness against the shoot and fruit borer in brinjal (Shailaja, *et al*., 2012).

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Ash: A thick layer of ash is either spread on the soil around plants or sprinkled on foliage to protect it against a variety of pests. Besides acting as a physical poison ash on crop foliage interferes in the chemical signals emanating from the host plants thus obstructing the initial host location by pests. Ashes from burnt palm frond and bunches have been traditionally used in the eastern parts of Nigeria to dust the leaves of okra to protect against leaf eating beetles, *Podagrica* spp. (Oparaeke, *et al*., 2006). Application of ash @50kg/ha kerosene5% and spinosad 45SC generated maximum benefit cost ratio of 4.8:1in brinjal (Sakhinetipalli, 2012).

Kerosene: It is readily available with the farmers and can be used with soap instantly to suppress the insect pests at the beginning of outbreak situation and subsequently the desired/recommended strategies may be followed. The use of Kerosene-soap-water emulsion has earlier been reported as a contact insecticide for piercing and sucking insects (Jex-Blake, 1950). Similarly, the usefulness of this emulsion against scale insects, bugs, mites, aphids and leaf miners has been documented by Van der Werf (1985). Oparaeke, *et al.* (2006) reported the effectiveness of SABRUKA (a mixture of soap, water and kerosene) against insect pests of cowpea in the northern Guinea Savanna. Kerosene exhibits phytotoxicity at higher concentrations and therefore, its use as foliar spray should be restricted up to 1 or 2%. Prepare a 4 lit. stock solution of soap kerosene mixture in the below given proportion; 3.5 lit.Water 48 g soap (1.2%) 500 ml kerosene (12.5%). Before spraying dilute 250 ml of this mixture with 4 liters of water.

Oils may also repel some pests, but the problem of phytotoxicity cannot be ignored. Visible leaf damage, or more subtly reduction in yield could be possible. Bi-weekly oil applications reduced whitefly counts on tomato leaves by two thirds, but yield on the oil-treated plants was also reduced compared to untreated plants (Stansly *et al.,* 2002). Five oil sprays controlled powdery mildew in grapes but reduced sugar levels (Northover, 2002).

Indian farming, which is going through a transition phase, is slowly but surely adopting the ways and means of pest management for sustainable agriculture (Dhandapani *et al.*, 2003). Adoption of ITK based crop protection measures as an alternative to pesticides might help in restoring the biodiversity of natural enemies, but as IPM is a knowledge-based and farmer driven approach, education of farmers on alternatives to pesticides must be given a priority.

Other <u>Operation-Wise ITK</u>

Storage Pest Control

Drying seeds and grains of all the crops on the new moon day before storing to avoid pest attack.

Store seed materials in earthen pots which are kept on the 'Paran' directly above the furnace in kitchen. The smoke acts as a repellent.

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Grains, trees etc. harvested on full moon day are raqre prone to storage pest attack.

Mixing the dried leaves of neem with seeds while storing them.

Mixing the dried leaves of notchi (*Vitex negundo)* with seeds while storing them.

Storing the seeds after mixing with pungam *(Pongamia pinnata)* leaves.

Mixing 1 kg. of Vasambu *(Acorus calamus)* powder with 50kg. of grains for storage even for one year.

While storing the seeds of food crops, they are filled in a container to its 3/4" height, covered with a rough cloth on which leaves of neem, pungam and notchi are placed to the remaining volume and finally covered with sand up to its mouth.

Grains are filled in earthen pot to its 3/4" height and the remaining volume with dried cow dung. Then the cow dung is set on fire and mouth of the pot is tightly covered so that fire puts off and carbon monoxide formed inside kills the pests.

Pulses and food grains are stored in gunny bags, which are previously wet with 10% salt solution and dried, in order to avoid storage pest attack.

Generally seeds stored with their outer coat/shell escape from storage pests.



Pest Control Measures

Small lamps are placed on either side of the house entrance and light from the lamps acts as*a* light trap and the farmers are able to identify the pest outbreak.

To prevent the attack of aphids and mite flies, sorghum or pearl millet is grown very closely in 4 rows around the fields to act as a shelter so that these pests can not enter the fields.

Growing Thangarali' T*tecoma stands)* and 'Sevvarali' *(Nerium oleander)* as border crops, which act as trap crops and control the insect liest.

Thiruneeru' (Sacred ash) is dusted on the crops to reduce pest attack.

Kitchen ash is applied to control aphids.

To control the sucking pests, 5 kg. of tobacco powder is soaked in a mixture of 10 lit. of cow urine and 5 lit. of water for 5 days. Then it is filtered and diluted with 80 it of water and sprayed.

Mixing cow urine, neem oil and tobacco decoction together and spraying on crops controls sucking pests.

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Leaves of *Calotropis gigantea* and *Strychnos nux-vomica* and neem cake are soaked in water in a mud pot and fixed in the field. Moths are attracted towards the smell, fall inside and die.

Leaves of notchi (*Vitex negundo)* and pungam *(Pongamia pinnata) are* also used to control moths.

About 5 kg. of Calotropis leaves is soaked in a mixture of 10 lit. of cow urine and 5 lit. of water for 5 days. Then it is filtered and diluted with 80 li. of water and sprayed to control defoliation.

Spraying sarvodaya soap solution to control mealy bugs.

To control nematodes, pungam *(Pongamia pinnata)* or iluppai *(Bassia latifolia)* cakes are /applied.

Cow dung, Cow urine, calotropis leaves and neem cake are put in a pit near the irrigation channel. After decomposing, it is mixed with irrigation water.

Grinding the leaves of *Calotropis gigantea* with the fruits of *Datura metal,* soaking in water for 15 days, filtering and spraying to control all the pest.

Two handsful each of leaves of thumb (*Leucas aspera),* kuppaimeni *(Acalypha indica),* thulasi*(Ocimum canum). Datura metal,* neem, nochi (V/tex *negundo), 5* fruits of *Datura* mefa/and handful each of neem cake and lluppai *(Bassia latifolia)* cake are pounded together and soaked in water in earthen pot for 10 days. Then it is filtered, diluted (100ml./lit.) to which 100ml. of sarvodaya soap solution and 100 ml. of neem oil added and sprayed to control all insect pests.

Leaves of *Ocimum canum,* seeds of *Nerium oleander and* fruits *Datura metal* are taken in equal quantities, powdered and soaked in cow urine for 10 days. Then it is filtered and diluted 100ml./lit.) to which 100 ml. of neem oil is */added* and sprayed to control all insect pests.

Neem oil and neem seed kernel extract are the general organic pesticides used to control many pests.

During the night time on full moon day of Tamil month 'Karthigai' (Nov.-Dec.) 'Chokkapanai' (Community firing) is performed as a part of celebrations in a common place in the village by which the pests get attracted and killed. Ash from this fire is dusted on the crops to control ' sucking pests.

Crop wastes are burnt and its ash is dusted on the fields to control diseases.

One kg. of leaves of seemai karuvel *(Prosopis juliflora)* is pounded and diluted with water and sprayed to control yellow mosaic virus.

Spraying cow urine to control many pests.

A mixture of extracts of garlic and neem cake is *sprayed* to control aphids.

Planting 'Pirandai' *(Cisssus quadrangularis)* vines around fields to protect against termites.

Grow castor on the fields to control termites.

Spread neem leaves over the nursery to control termite damage.

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Putting neem cake inside a gunny bag and placing it in the irrigation channel controls mites.

Termites destroy the seedlings in nursery grown in dry land condition. To control these termites, apart from putting the neem leaves, sheep wool and human hairs are also put. Termites eating these hairs die.

Pouring decoction of finger millet roots on the root zone of crops to control termites.

Before planting tree seedlings, dried leaves and trashes are burnt in the pits to protect the seedlings against termite attack.

Dusting ash in the pits before planting tree seedlings also helps to prevent termites.

Sprinkling 5% common salt solution to reduce termite attack on the trees.

After the harvest of tobacco leaves, their stems and roots are ploughed in-situ to control the termites

Tobacco soaked water is poured on the ant mounds to control them.

Any spraying is to be done in the early morning.

Take 30gm. of gounded nirium seed in 10 li. of water for 1 hour and mix with khadi soap and spary to control thrips, aphids, whiteflies and leaf eating caterpillars.

Threats to ITK

Rapid urbanization has affected the lives of indigenous community.

Indigenous communities use oral communication and hands-on experience to preserve and transmit their knowledge

Till date, ITK knowledge survival is through words only preservation of indigenous knowledge is critical, because it ensures the continuation of community and its knowledge

If indigenous knowledge is not documented and preserved, the knowledge will be lost through death of elders and traditional leaders; and will remain inaccessible to other communities, scholars and other developmental workers and researchers

Conclusion

ITKs are organic in nature, the documented.ITKs may be useful for extension personnel in planning and executing various IPM modules. ITKs are environmentally safe and easily adopted by farmers. It provides valuable inputs to make efficient use of natural resources. Hence, it can be concluded that the ITKs, which are prevalent among the farmers from the time immemorial, if organized and used scientifically may help in insect pest management and reduce the indiscriminate use of chemical insecticides

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