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Popular Article

Ganoderma induced Basal Stem Rot disease: a cancerous silent killer in oil palm

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Abstract

Basal Stem Rot (BSR) disease in oil palms is a significant concern in the agricultural landscape. Caused by *Ganoderma* sp, it poses a growing economic threat within the industry. The imperative shift is now towards preserving existing palms rather than replacing them, crucial for sustaining productivity and profitability. The challenge lies in the persistent, asymptomatic nature of the disease and the monocropping practices. Detecting BSR early is essential for effective management due to the alarming rise in its incidence. Integrated approaches, encompassing cultural practices, chemical control, and biological agents, are vital to combat this formidable pathogen and ensure the longevity of oil palm plantations.

Keywords: Basal Stem Rot, Oil palm disease, *Ganoderma spp*, Integrated disease management

Introduction

Oil palm, scientifically known as *Elaeis guineensis*, stands as a pivotal global crop renowned for its economic significance. With origins in West Africa, it has become a cornerstone in the agricultural landscape, providing a versatile source of edible oil, widely used in the food industry. The economic importance of oil palm extends beyond edible oil, encompassing various by-products utilized in sectors such as cosmetics and biofuels, contributing substantially to the livelihoods of communities and nations alike. However, the industry faces a formidable challenge in the form of Basal Stem Rot (BSR) caused by the pathogenic fungus *Ganoderma* sp. This disease has emerged as a major economic constraint, spreading alarmingly within oil palm plantations (Jazuli *et al.*, 2022). Recognizing the urgency to sustain productivity and profitability, a shift towards preserving existing palms has become imperative. Integrated management strategies, combining cultural practices, chemical control, and biological agents, are crucial to effectively combat the pervasive nature of *Ganoderma*-induced BSR, ensuring the long-term health and sustainability of oil palm cultivation.

Basal Stem Rot

Basal Stem Rot disease stands as a critical threat in the realm of agriculture, particularly impacting oil palm cultivation. The disease, primarily caused by the pathogenic fungus *Ganoderma* sp, has escalated to become a significant economic concern. With a stealthy and asymptomatic nature, BSR poses challenges to timely detection and effective management. Its prevalence has risen alarmingly, necessitating urgent attention to safeguard the productivity and economic viability of oil palm plantations. Understanding the complexities of this affliction is vital for devising strategic interventions that can mitigate the adverse effects of Basal Stem Rot and sustain the health and longevity of oil palm crops. If the pathogen is not detected early and control measures are not taken, the infected palm may be dead within six to 24 months in immature palms and one to two years in case of mature palms after the appearance of visual symptoms.

Symptoms

Disease manifests insidiously in oil palms, primarily characterized by subtle symptoms that make early detection challenging. This fungal infection, orchestrated by *Ganoderma* sp, often conceals its presence, presenting a latent threat to the structural integrity and overall health of the palm. Ganoderma manifests in three stages *viz*., an asymptomatic, a benign ambiguous foliar abnormality and finally a recalcitrant malign phase. Indications of *Ganoderma* Basal Stem Rot in oil palm trees include signs of water stress, uneven mottling of the canopy, flattening of the crown, the emergence of multiple unopened spears, snapping of petiole, skirting, drying of lower leaves and the formation of basidiocarps. Appearance of visual symptoms in the form of brackets is considered as the penultimate stage that is irrecoverable and irresponsive to any management practices. Refer to Figure 1 for visual representation of these mentioned symptoms.

Figure 1. Basal Stem Rot symptoms in oil palm

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***Ganoderma* fungus**

Belonging to the class Agaricomycetes and the family Ganodermataceae, the white-rot fungus *Ganoderma* is recognized for its distinctive characteristics is a notable member. *Ganoderma* sp is believed to predominantly generate inoculum through basidiospores, a mode of dispersal facilitated by wind or various animal vectors.. This family encompasses fungi known for their bracket-shaped fruiting bodies and wood-decaying properties. *Ganoderma* species are characterized by tough, woody conks that often display unique colours and textures. Widely distributed in various ecosystems, these fungi play a crucial ecological role in the decay process of wood, and some species, such as *Ganoderma lucidum*, hold cultural and medicinal significance.

Epidemiology

The epidemiology of BSR unveils a complex interplay between *Ganoderma* sp. and oil palm plantations. This fungal disease's spread and impact involve factors such as environmental conditions, host susceptibility, and the presence of inoculum sources. Understanding BSR epidemiology is vital for devising effective control strategies (Wong *et al.*, 2012). As BSR incidence continues to rise, unravelling the intricate dynamics of its epidemiology becomes crucial in mitigating the economic and ecological consequences in oil palm cultivation. Ganoderma infection in oil palms happens naturally when healthy roots come in contact with diseased tissues in the soil. Even when only one palm is infected, the disease spreads to neighbouring palms by root contact and airborne basidiospores. Despite its gradual progression, infectivity and damaging potential of the disease escalates from one planting cycle to the next. The unremoved infected dead palm and sporophores of *Ganoderma* on stumps and trunks of coconut palms and palmyra palms act as primary source of inoculum. Similarly, other inoculum containing partially degraded FYM and mulching material can add to the inoculum load. Flood irrigation and rain water as well as intercultivation help in dissemination of inoculum from one palm to another. Use of infected palm materials for mulching and fresh cow dung or partially decomposed FYM can also aggravate inoculum load in the soil.

Light red sandy soils favour the pathogen’s activity: Coconut palms show vulnerability to the disease. Disease incidences are seen more in March to August months. Palms under moisture stress are more vulnerable to the disease. Ill-drained soil and water-logged soil during the rainy season are more prone to disease perpetuation. Ganoderma prefers acidic pH ranging from 3.7-5.0. It is the high inoculum load of pathogen in the form of organic debris and affected stumps left over by previous crop are the actual deciding factors. Soil moisture stress during summer can aggravate the disease.

Management:

Effectively managing Basal Stem Rot (BSR) caused by *Ganoderma* is crucial for preserving oil palm plantations and sustaining the industry's economic viability. Integrated management strategies, incorporating cultural practices, chemical control, and biological agents, form a multifaceted approach to combat this destructive pathogen.

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(i) ***Cultural practices:*** Cultural practices play a pivotal role in tackling down the inoculum density in the field. Sanitation by removing aged trees, diseased and decayed stumps and roots, fruiting bodies, from the field, windrows, soil mounding, isolation trenches, surgical removal of infected tissue, wound dressing, growing intercrops like banana, following drip irrigation instead of flood irrigation are the major practices followed and can only keep the pathogen at a bay, rather than destroying it (Lakshmi, et al., 2023).

(ii) ***Fungicide management:*** Fungicides can be delivered through various mechanisms like soil drenching, trunk injection, root feeding and wound dressing. Initially, Bordeaux mixture, Triadimefon, Tridemorph, Cyproconazole, Carboxin-quitozene, captafol, benomyl and Thiram were found potent enough to impede the growth of the pathogen and this protecting the plants. Soil fumigant, Dazomet were used for stump treatment to eradicate the pathogen. Recent past has witnessed many new generation fungicides belonging to triazole and strobilurins chemical groups that are found to be effective. Soil drenching with Hexaconazole/Propiconazole 0.2% (2 ml/litre) is advised at three-month intervals. However, this approach faces challenges due to the pathogen's resilient nature and environmental concerns. Lately, Chitosan-Hexaconazole/dazomet nanoparticles have shown with enhanced lethality in long term management of BSR with nil residues (Lakshmi et al., 2023).

(iii) ***Biocontrol management:*** Biological control methods harness the power of antagonistic microorganisms to suppress *Ganoderma*. Different species of Trichoderma as single or consortium have demonstrated potential in inhibiting the growth of *Ganoderma* and enhancing plant resistance. Moreover, several bacterial endophytes belonging to *Bacillus* and *Pseudomonas* are excellent in BSR suppression, growth promotion and imparting disease resistance. Application of Arbuscular mycorrhiza along with *Trichoderma* spp. in the nursery and main field was proved to be efficient in boosting the root proliferation and it positively influenced the mitigation of *Ganoderma* disease incidence in oil palm. Prophylactic bio stimulant application 200 g *Trichoderma*, Arbuscular Mycorrhiza (100 g), *Azospirillum* (200 g), *Azotobacter* (200 g), Phosphobacteria (200 g) per palm is essential for preventing BSR infestation. Basin application of *Trichoderma* spp.- enriched farm yard manure at the rate of 5-15 kg per palm or Trichoderma fortified

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neem cake at the rate of 5 kg per palm is recommended at quarterly intervals. Integrated use of these biological agents alongside other management practices contributes to a more sustainable and comprehensive approach.

Conclusion:

Basal Stem Rot caused by *Ganoderma* spp poses a significant threat to oil palm plantations, impacting the global palm oil industry. The disease, characterized by water stress, canopy mottling, and basidiocarp production, persists asymptomatically, hindering early detection. Effective BSR management necessitates integrated strategies involving cultural practices, chemical control, and biological agents. Timely interventions through regular monitoring and advanced detection methods are vital for mitigating economic losses. Sustainable solutions, including diverse crop rotations and soil health improvement, are crucial for the long-term resilience of oil palm cultivation against *Ganoderma*.

References:

Jazuli, N. A., Kamu, A., Chong, K. P., Gabda, D., Hassan, A., Abu Seman, I., & Ho, C. M. (2022). A Review of Factors Affecting Ganoderma Basal Stem Rot Disease Progress in Oil Palm. Plants (Basel, Switzerland), 11(19), 2462. https://doi.org/10.3390/plants11192462

Wong L.C., Bong C.F.J., Idris A.S. Ganoderma Species Associated with Basal Stem Rot Disease of Oil Palm. (2012) Am. J. Appl. Sci.;9:879–885. doi: 10.3844/ajassp.2012.879.885.

Zakaria L. (2023). Basal Stem Rot of Oil Palm: The Pathogen, Disease Incidence, and Control Methods. Plant disease, 107(3), 603–615. https://doi.org/10.1094/PDIS-02-22-0358-FE

Lakshmi, M. A., Suresh, K., Ajesh, B R., Keerthana S (2023) Panoramic Overview of advancements in the arena of detection and management of basal stem rot of oil palm caused by Ganoderma spp. The Andhra Agric.J 70(1):001-017

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