

Diseases of Cocoa and Their Management

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Introduction

Cocoa (Theobroma cacao) is a valuable tropical crop, primarily grown for its beans, which are used to produce chocolate and other cocoa products. The global cocoa industry is worth billions of dollars and provides livelihoods for millions of smallholder farmers in developing countries. However, cocoa production is severely impacted by various diseases that can significantly reduce yield and quality, leading to economic losses for farmers and the industry as a whole. Effective disease management strategies are crucial for sustainable cocoa production. This article discusses the major diseases affecting cocoa, their causal organisms, symptoms, etiology, factors affecting disease development, and management approaches.

Black Pod Rot Black pod rot

It is one of the most devastating diseases of cocoa, causing significant yield losses worldwide. The disease is caused by several species of Phytophthora, including P. palmivora, P. megakarya, and P. capsici.

Symptoms of black pod rot

This include brown, circular lesions on pods that rapidly expand, causing the pods to turn black and mummify. The beans inside infected pods are destroyed, rendering them unsuitable for processing. The disease is spread through rain splash and insects, and infection can occur at various stages of pod development. Factors that contribute to disease development include high humidity, rainfall, poor air circulation within the canopy, and the presence of inoculum from previous infections.





Management strategies for black pod rot

It involve a combination of cultural practices, chemical control, and resistance breeding. Cultural practices include pruning to improve air circulation and reduce humidity within the canopy, proper shade management to minimize disease severity, and regular removal and disposal of infected pods. Chemical control using copper-based fungicides and phosphonates can be effective when applied at the appropriate time and frequency based on disease pressure. However, the use of chemicals should be minimized to reduce environmental impact and prevent the development of fungicide resistance. Breeding for resistance to black pod rot is a long-term strategy that involves identifying and selecting cocoa genotypes with natural resistance to the disease.

Witches' Broom Disease

Witches' broom disease is another significant constraint to cocoa production, particularly in South America. The disease is caused by the fungus Moniliophthora perniciosa, which infects meristematic tissues of cocoa plants. Symptoms of witches' broom disease include abnormal shoot proliferation, resulting in a broom-like

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appearance, swollen shoots and stems, and reduced pod production and bean quality. The disease cycle begins with the infection of meristematic tissues by basidiospores, followed by systemic colonization of the host plant. High humidity and temperature, along with the presence of infected plants in the vicinity, favor disease development.





Management of witches' broom disease

This involves a combination of cultural practices, chemical control, biological control, and the use of resistant varieties. Cultural practices include pruning and removal of infected tissues to reduce inoculum levels and improve air circulation. Fungicides, such as copper-based compounds and triazoles, can be used to control the disease, but their effectiveness may be limited. Biological control using Trichoderma species has shown promise in reducing disease severity. The development and deployment of resistant cocoa varieties is a sustainable long-term approach to managing witches' broom disease.

Frosty Pod Rot

Frosty pod rot, caused by Moniliophthora roreri, is a devastating disease that affects cocoa production in Central and South America. The disease is characterized by white, powdery fungal growth on the pod surface, giving it a frosty appearance. As the disease progresses, infected pods become brown and necrotic, and the beans inside are damaged, making them unsuitable for processing. The pathogen spreads through wind and rain, and disease development is favored by high humidity, temperature, dense canopy, and poor air circulation.





Management strategies for frosty pod rot

Removal and burial of infected pods to reduce inoculum levels, application of copper-based fungicides, and implementation of quarantine measures to prevent the spread of the disease to new areas. Proper pruning and maintenance of cocoa trees to improve air circulation and reduce humidity can also help minimize disease severity. Research efforts are ongoing to identify and develop resistant cocoa varieties as a sustainable long-term solution to frosty pod rot.

Vascular Streak Dieback

Vascular streak dieback is a disease caused by the fungus Ceratobasidium theobromae, which affects cocoa production in Southeast Asia and Melanesia. Symptoms of the disease include leaf chlorosis and necrosis along the veins, defoliation, and dieback of branches, which can lead to the death of young trees. The disease is caused by the infection of leaves and stems by basidiospores, followed by systemic colonization of vascular



tissues. Stress conditions, such as drought and poor nutrition, and the presence of infected plant material contribute to disease development.

Management of vascular streak dieback

Rremoval of infected branches to reduce inoculum levels and the use of resistant cocoa varieties. Maintaining proper plant nutrition and avoiding stress conditions can help minimize the impact of the disease. Quarantine measures may be necessary to prevent the introduction of the pathogen to new areas.

Cocoa Swollen Shoot Virus Disease

Cocoa swollen shoot virus disease is a significant viral disease affecting cocoa production in West Africa. The disease is caused by the Cocoa swollen shoot virus (CSSV), which belongs to the genus Badnavirus. Symptoms of the disease include swelling of shoots and roots, leaf mosaic, and chlorosis. Infected trees decline in productivity and eventually die. The virus is transmitted by mealybug vectors, resulting in systemic infection of the plant. The presence of infected plants, mealybug vectors, and susceptible cocoa varieties contribute to disease development.





Management strategies for cocoa swollen shoot virus disease

Removal of infected trees to reduce inoculum levels and the control of mealybug vectors using insecticides. The development and deployment of resistant cocoa varieties is a long-term approach to managing the disease. Quarantine measures and the use of virus-free planting material are essential to prevent the spread of the virus to new areas.Other Diseases In addition to the major diseases discussed above, cocoa is also affected by several other diseases of varying importance, depending on the region and environmental conditions.

These include:

- 1. Phytophthora pod rot (caused by Phytophthora species)
- 2. Lasiodiplodia pod rot (caused by Lasiodiplodia theobromae)
- 3. Ceratocystis wilt (caused by Ceratocystis cacaofunesta)
- 4. Phytophthora root rot (caused by Phytophthora species)
- 5. Cocoa necrosis virus disease (caused by Cocoa necrosis virus)

Management of these diseases involves a combination of cultural practices, chemical control, biological control, and the use of resistant varieties, depending on the specific disease and local conditions.

Conclusion

Effective cocoa disease management requires an integrated approach combining cultural practices, judicious chemical control, biological methods, and resistant varieties. Cultural methods like pruning and sanitation reduce disease spread, while careful fungicide use prevents resistance. Biological controls suppress pathogens naturally, and resistant varieties offer sustainable solutions. Ongoing research and global collaboration are crucial for developing improved strategies to ensure cocoa production's long-term viability and resilience.

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