

Pigeon Pea Cultivation, Insect Pests, and Disease Management

Krishna J

National Bureau of Agricultural Insect Resources, Bengaluru

Introduction

Pigeon pea (*Cajanus cajan*) is a leguminous crop widely cultivated in tropical and subtropical regions of the world, valued for its high protein content, resilience, and multiple uses in food, fodder, and soil fertility restoration. Known for its drought tolerance and ability to fix nitrogen, pigeon pea plays an essential role in smallholder farming systems. However, its cultivation faces several challenges, particularly from insect pests and diseases that can severely affect yield and quality. Managing these pests and diseases is crucial for ensuring optimal production, especially in the context of climate change, which further exacerbates pest and disease dynamics. This article delves into the cultivation practices of pigeon pea, identifies the key insect pests and diseases that affect the crop, and explores integrated pest and disease management strategies that enhance sustainable pigeon pea production.

Pigeon Pea Cultivation

Pigeon pea is grown primarily as a rainfed crop in regions with moderate to high temperatures. The plant is typically grown in well-drained, sandy-loam soils but can tolerate a range of soil types. Pigeon pea is often intercropped with other crops like sorghum, maize, and cotton, improving land use efficiency and reducing the risk of pest

outbreaks. The crop has a growing season that varies from 6 to 12 months, depending on the variety and environmental conditions, with some drought-tolerant varieties being able to withstand prolonged dry spells.

The selection of pigeon pea varieties is an essential factor in ensuring high productivity. There are different types of pigeon pea cultivars, including short-duration varieties that mature in 120 to 150 days and long-duration varieties that require 180 to 240 days to reach full maturity. The choice of variety depends on the climatic conditions and the intended use of the crop (grain, green peas, or fodder). For successful pigeon pea cultivation, it is important to choose varieties that are resistant to common pests and diseases.

Pigeon pea is usually sown at the beginning of the rainy season, with planting depths of about 3 to 5 cm. The seeds are often planted in rows with a spacing of 30 to 40 cm between rows and 10 to 20 cm between plants. Adequate spacing allows for proper air circulation and reduces the likelihood of disease spread. Fertilization is another important aspect of cultivation. While pigeon pea can fix nitrogen, the use of organic or chemical fertilizers can boost growth and yield, particularly in soils that are low in nutrients.

Irrigation management is essential in regions where rainfall is insufficient or erratic. Drip irrigation and micro-sprinklers are commonly used methods to ensure uniform water distribution, especially during the flowering and pod-setting stages. Proper water management prevents waterlogging, which can promote fungal diseases and root rot.

Insect Pests Affecting Pigeon Pea

Insect pests are one of the most significant threats to pigeon pea production. They can cause substantial damage to crops by feeding on plant tissues, transmitting diseases, and reducing both yield and quality. The most common insect pests in pigeon pea cultivation include the following:

1. Pod Borer (*Helicoverpa armigera*): The pod borer is one of the most damaging pests of pigeon pea, causing significant losses in yield and seed quality. The larvae of this pest feed on the flowers, buds, and developing pods, resulting in damaged and deformed seeds. Infestations are particularly severe during the flowering and pod-setting stages. Integrated pest management (IPM) strategies, such as the use of pheromone traps to monitor pest populations, biological control using natural predators like Trichogramma species, and the application of appropriate insecticides, are commonly used to manage pod borers.

2. Aphids (*Aphis craccivora*): Aphids are sap-sucking insects that infest the leaves, stems, and pods of pigeon pea plants. They cause direct damage by feeding on plant sap,

weakening the plant and leading to stunted growth, yellowing of leaves, and reduced yield. Aphid infestations also facilitate the spread of viral diseases, such as the pigeon pea sterility mosaic virus (PPSMV). The control of aphids typically involves the use of insecticidal soaps, natural predators like ladybugs and lacewing larvae, and the application of systemic insecticides when necessary.

3. Whiteflies (*Bemisia tabaci*): Whiteflies are another major pest of pigeon pea, particularly in tropical and subtropical regions. They feed on the undersides of leaves, causing chlorosis and leaf distortion. Whiteflies can also transmit various plant viruses, including the pigeon pea yellow mosaic virus (PPYMV), which causes significant yield losses. Controlling whiteflies often involves the use of reflective mulches to reduce the insect's attraction to the crop, as well as the application of insecticides and the introduction of natural enemies like parasitic wasps.

4. Termites (*Microtermes* spp.): Termites are subterranean insects that can damage the root systems of pigeon pea plants, weakening the plants and making them more susceptible to other stressors. Termites are particularly problematic in areas with dry soils or in regions where water scarcity prevents effective pest management. Control methods include soil treatments with termiticides, the use of baiting systems, and biological control using nematodes.

5. Thrips (*Frankliniella* spp.): Thrips are small, slender insects that cause damage to pigeon pea by feeding on flower and fruit tissues. Infested plants often exhibit silvering or streaking on leaves and deformed flowers and pods. Thrips can also act as vectors for plant viruses. Thrips control typically involves the use of insecticidal sprays, neem-based products, and cultural practices such as crop rotation and proper field sanitation.

Disease Management in Pigeon Pea

Pigeon pea is susceptible to a variety of diseases, which can reduce yields and degrade seed quality. The management of these diseases often involves a combination of cultural, chemical, and biological control methods.

1. Pigeon Pea Sterility Mosaic Disease (PPSMD): This viral disease, caused by the pigeon pea sterility mosaic virus (PPSMV), is one of the most widespread and damaging diseases in pigeon pea cultivation. Infected plants show symptoms such as stunted growth, leaf mosaic patterns, and infertility, leading to reduced pod formation and yield. The disease is transmitted by aphids and other sap-sucking insects. Control measures for PPSMD include the use of resistant varieties, the elimination of infected plants, and the control of aphid populations using insecticides or natural predators.

2. Pigeon Pea Yellow Mosaic Disease (PPYMD): This is another significant viral disease caused by the pigeon pea yellow mosaic virus (PPYMV). The disease results in

yellowing and mosaic patterns on the leaves, stunted growth, and reduced yield. The main vector of this disease is the whitefly. Management of PPYMD involves controlling whitefly populations, using resistant pigeon pea varieties, and removing infected plants from the field.

3. Fusarium Wilt (*Fusarium oxysporum*): Fusarium wilt is a soil-borne fungal disease that affects pigeon pea plants, particularly during the flowering and pod-setting stages. The disease causes yellowing of the leaves, wilting, and root rot, leading to reduced plant vigor and yield. Fusarium wilt can be managed through the use of resistant pigeon pea varieties, crop rotation, proper irrigation practices, and soil fumigation in cases of severe infestation.

4. Alternaria Leaf Spot (*Alternaria alternata*): This fungal disease causes dark, circular spots on the leaves and can lead to premature leaf drop. Alternaria leaf spot is managed through the use of fungicides, resistant varieties, and cultural practices such as proper spacing and pruning to improve air circulation in the field.

5. Root Rot (*Rhizoctonia solani*, *Phytophthora* spp.): Root rot diseases caused by various soil-borne pathogens can severely affect pigeon pea production. Symptoms include yellowing, wilting, and root discoloration. The disease is particularly problematic in poorly drained soils. Managing root rot involves ensuring proper drainage, practicing crop rotation, and using resistant varieties. Fungicide application can also help in controlling soil-borne pathogens.

Integrated Pest and Disease Management Strategies

Effective pest and disease management in pigeon pea cultivation requires an integrated approach that combines various methods to minimize the impact of pests and diseases while reducing the need for chemical inputs. The following strategies are commonly used:

1. **Cultural Practices:** Cultural practices, such as crop rotation, proper spacing, and the removal of infected plant debris, are essential for preventing pest and disease outbreaks. Crop rotation with non-leguminous crops helps break the pest and disease cycle. Proper spacing ensures good air circulation, reducing the likelihood of fungal diseases, and minimizing the risk of pest infestations.

2. **Biological Control:** Biological control involves the use of natural predators, parasites, and pathogens to control pests and diseases. For example, releasing beneficial insects such as *Trichogramma* spp. (parasitoid wasps) for pod borer control or using neem-based biopesticides for aphid and whitefly management can help reduce the reliance on chemical pesticides.

3. **Resistant Varieties:** The development and use of pigeon pea varieties resistant to common pests and diseases are key strategies for sustainable pest management. Resistance can be achieved through conventional breeding methods or biotechnological approaches. The use of resistant varieties can significantly reduce the need for chemical interventions.

4. **Chemical Control:** While chemical pesticides are used to control pests and diseases, their application should be judicious to minimize environmental impact and the development of resistance. Systemic insecticides and fungicides are often applied at the first sign of pest or disease infestations. However, integrated pest management emphasizes the need to use chemicals as a last resort, ensuring that other methods are prioritized.

5. **Monitoring and Early Warning Systems:** Regular monitoring of pest and disease levels in the field is crucial for effective management. Farmers can use traps, visual inspections, and even remote sensing technologies to track pest populations and disease symptoms. Early detection allows for timely intervention and minimizes crop loss.

Conclusion

Pigeon pea is a vital crop for food security, particularly in tropical and subtropical regions, but its productivity is often threatened by a range of insect pests and diseases. Effective management of these challenges is crucial for maximizing yields and ensuring the sustainability of pigeon pea cultivation. Integrated pest and disease management, which combines cultural, biological, and chemical control methods, offers a balanced approach to managing pests and diseases in pigeon pea fields. The adoption of resistant varieties, improved pest monitoring systems, and environmentally sustainable practices will be key to the long-term success of pigeon pea cultivation,

especially as the impacts of climate change continue to shape agricultural systems worldwide.

References

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