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Diseases of Chickpea and its Management

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Abstract:

Chickpea (Cicer arietinum L.) is a vital legume crop globally, contributing significantly to both human and animal nutrition. However, its cultivation is often threatened by various diseases that can cause substantial yield losses. This abstract provides a concise overview of the major diseases affecting chickpea and explores effective management strategies employed by researchers and farmers. The diseases discussed encompass a spectrum of pathogens, including fungi, bacteria, and viruses. Ascochyta blight (caused by Ascochyta rabiei), Fusarium wilt (Fusarium oxysporum f. sp. ciceris), and Botrytis gray mold (Botrytis cinerea) are among the most economically damaging fungal diseases, affecting various parts of the plant during different growth stages. Bacterial blight (Xanthomonas axonopodis pv. ciceris) and viruses like Chickpea chlorotic dwarf virus pose additional threats to chickpea cultivation, manifesting in diverse symptoms such as leaf spots, wilting, and stunted growth. Effective disease management is crucial for sustaining chickpea production, and integrated approaches have gained prominence. Crop rotation, resistant varieties, and biological control agents have shown promise in mitigating the impact of these diseases. Additionally, cultural practices, such as timely sowing, balanced fertilization, and sanitation measures, play pivotal roles in disease prevention. Genetic resistance remains a cornerstone in disease management strategies, with ongoing efforts to develop chickpea varieties with enhanced resistance to multiple pathogens. This abstract also highlights the importance of early disease detection through advanced diagnostic techniques, facilitating timely intervention and minimizing losses. Furthermore, the role of agronomic practices,

including the use of fungicides and biopesticides, is examined in the context of sustainable disease management. The challenges associated with climate change and evolving pathogen populations underscore the need for ongoing research and adaptive strategies to ensure the resilience of chickpea cultivation systems.

Fusarium wilt: *Fusarium oxysporum f.sp.ciceri*

Disease Symptoms:

- Chickpea (Cicer arietinum L), wilt caused by *Fusarium oxysporum f.sp. ciceri* wasfirst reported from India in 1918.
- Yellowing and drying of leaves from base upward, drooping of petioles and rachis, improper branching, withering of plants, browning of vascular bundles and finally wilting of plants .
- Diseased plants showed stunting also.
- The initial symptom of the disease to be acropetal vein clearing of leaves.
- Physiological changes taking place in leaves infected by the pathogen. The number of chloroplasts and starch formation in the mesophyll cells decreased following infection by the pathogen

Pathogen

The fungus produces hyaline to light brown, septate and profusely branched hyphae. Microconidia are oval to cylindrical, hyaline, single celled, normally arise on short conidiophores. Macroconidia which borne on branched conidiophores, are thin walled, 3 to 5septate, fusoid and pointed at both ends. Chlamydospores are rough walled or smooth, terminal or intercalary, may be formed singly or in chains.

Favourable conditions

• High soil temperature (above 25˚C).

• High soil moisture.

Disease cycle

The disease is seed and soil borne. The primary infection is through chlamydospores in soil, which remain viable up to next crop season. The secondary spread is through irrigation water, cultural operations and implements.

Management

- Deep summer ploughing.
- Follow crop rotation measures continuously.
- Always use disease free seeds.
- Avoid sowing when temperatures are high.
- Follow 6-year crop rotations with sorghum.
- Apply FYM 10-15 cart load/ha.
- Seed treatment with *T. viride* @4g/kg or *P. fluorescens* @ 10g/ kg of seed or Thiram 2g/kg of seed.

- Spot drenching with Carbendazim 1g/lit or *P. fluorescens* / *T. viride* 2.5 kg/ha with 50 kg FYM.
- Seed treatment with Carbendazim at the rate of 1g/kg of seed.
- Seed treatment with Thiram + Carbandizm @ 1g+2g per kg of seed.

Ascochyta blight: *Ascochyta rabiei*

Disease Symptoms

- All above ground parts of the plant are infected. On leaf, the lesions are round or elongated, bearing irregularly depressed brown spot and surrounded by a brownish red margin.
- Similar spots may appear on the stem and pods.
- The spots on the stem and pods have pycnidia arranged in concentric circles as minute block dots.
- When the lesions girdle the stem, the portion above the point of attack rapidly dies. If the main stem is girdles at the collar region, the whole plant dies.

Pathogen

The fungus produces hyaline to brown and septate mycelium. Pycnidia are sphericalto sub-globose with a prominent ostiole. Pycnidiospores are hyaline, oval to oblong, straight or slightly curved and single celled, occasionally bicelled.

Favourable conditions

- High rainfall during flowering.
- Temperature of 20-25˚C.
- Relative humidity of 60%.

Disease cycle

The fungus survives in the infected plant debris as pycnidia. The pathogen is also externally and internally seed-borne. The primary spread is from seed-borne pycnidia and plant debris in the soil. The secondary spreads is mainly through air- borne pycnidiopores (conidia). Rain splash also helps in the spread of the disease.

Management

- Remove and destroy the infected plant debris in the field.
- Treat the seeds with Thiram 2g or Carbendazim 2 g or Thiram + Carbendazim(1:1 ratio) at 2 g/kg.
- Exposure of seed at 40-50˚C reduced the survival of *A. rabiei* by about 40-70 percent.
- Spray with Carbendazim at 500 g/ha or Chlorothalonil 1kg/ha.

Botrytis gray mold (BGM): *Botrytis cineria*

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Disease symptoms

- Symptoms of BGM usually become apparent following crop canopy closure. BGM often appears first as water-soaked lesions on the stem, near ground level, that extend along the stem, and lead to infection of other stems.
- Branches break off at the rotting point and the affected leaves and flowers turninto a rotting mass.
- Initially, the disease is randomly distributed within a crop, with infected plants being scattered, with yellowing or dying branches, or if the lesions are at ground level, as scattered dead plants
- Grey fungal growth and profuse sporulation will occur if conditions within the canopy are moist or humid and rapidly spread through the canopy resulting in patches of dead plants.
- Flower drop is common leading to poor pod formation and low grain yields andthis is often undetected unless the crop is closely monitored.
- Depending on the site of infection, mature seeds from diseased plants may be shrunken, dark coloured or, when the fungus has invaded the pod, the seeds are covered in a white/grey fungal mat.



Disease Cycle

- The fungus survives on infected seed, as a saprophyte on decaying plant debris and as soil-borne sclerotia.
- The disease is often established in new areas by sowing infected seeds,. Masses of spores are produced on infected plants.
- These fungal spores can be carried from plant to plant by air currents and spread the disease rapidly. Once a crop has become established, the warm, humid conditions under the crop canopy provide ideal conditions for infection and spread of the disease.

Host range

- *Botrytis cinerea* is a non-specialised pathogen well known for its global distribution and extensive host range of more than 100 plant species.
- The host range includes species such as black gram, strawberry, grapevine, apple, cabbage, carrot, cucumber, eggplant, lettuce, lentil, mungbean, mustard, paddy, pea, pepper, pigeonpea, squash, tomato, chrysanthemum, dahlia, lily, rose, gladiolus, and tulip.
- *B. cinerea* isolated from chickpea, infected 8 crops and 21 weed species under artificial inoculation conditions

Management

- Avoid excessive vegetative growth.
- Intercrop with linseed.
- Avoid excessive irrigation. Use compact varieties.
- Deep summer ploughing Reduce plant density and increase in air passage between the plants.
- Seed treatment with Carbendazim + Thiram (1:1) @ 3g/kg of seed is

recommended or Spray the crop with Captan 5 - 6 kg/ha at 15 days interval./ Spray of Carbendazim @ 1.5g/lit of water is recommended./Spray Mancozeb @3 g/lit of water.

Conclusion

In conclusion, the management of diseases affecting chickpeas is a multifaceted challenge that demands a comprehensive and integrated approach. Chickpea cultivation faces significant threats from a variety of pathogens, including fungi, bacteria, and viruses, each capable of causing substantial yield losses. The proactive identification and understanding of these diseases have paved the way for innovative management strategies. The development and deployment of chickpea varieties with enhanced resistance to multiple pathogens stand out as a crucial component of disease management. Genetic advancements, coupled with traditional breeding techniques, offer promise in creating resilient chickpea cultivars capable of withstanding diverse pathogenic pressures. Integrated pest management practices, such as crop rotation, early planting, and balanced fertilization, further contribute to reducing disease incidence. Effective disease management also involves the judicious use of agrochemicals, including fungicides and biopesticides, while emphasizing sustainable and environmentally friendly approaches. Timely and accurate diagnostic tools facilitate early detection, allowing for prompt intervention and limiting the spread of diseases. As global agriculture contends with the challenges of climate change and evolving pathogen dynamics, continuous research and adaptive strategies remain imperative. The collaboration between scientists, farmers, and policymakers is essential for developing resilient chickpea production systems that ensure food security and economic stability for communities dependent on this vital legume crop. Through these concerted efforts, we strive to fortify the foundations of chickpea cultivation, promoting sustainable practices that will benefit current and future generations.

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