

Diseases of Chickpea (*Cicer arietinum* L.)

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Abstract

Chickpea (*Cicer arietinum* L.) is one of the most significant cool-season food crops in the world, mostly farmed in arid regions. The crop is affected with severe illnesses that harm it at every stage of growth. Fungi, bacteria, viruses, nematodes and mycoplasma are some of the diseases that can harm chickpeas, which cause significant yield and economic losses. Fungi are the biggest of them and maybe chickpea pods as well. This article gives information on the disease, distribution, and economic significance of chickpeas. It will be helpful to farmers and extension workers.

Keywords: Chickpea, disease, symptoms, causal organism, controls, disease cycle

Introduction

The earliest farmers to cultivate the chickpea (*Cicer arietinum* L.) were Neolithic farmers. Even today, field pea (*Pisum sativum* L.) and dry bean (*Phaseolus vulgaris* L.) are the top two producers of grain legumes, with chickpea (*Cicer arietinum* L.) coming in third. With a little amount of automation, chickpea was farmed in India, Iran, Bangladesh, Pakistan, Mexico, and Ethiopia. In nations like Turkey, Canada, and Australia, output of chickpeas has increased due to advancements in varieties, agronomy, production technology, and new export market prospects.

Wilt

In India, Iran, Pakistan, Nepal, Spain, and Tunisia, the chickpea (*Cicer arietinum* L.) is susceptible to the soil-borne illness fusarium wilt. Production of chickpeas is severely hampered in California and the Mediterranean region by the illness. India was first mentioned by Butler from Bihar in 1918. Depending on the intensity of the disease and the stage of infection, it reduces crop output by 20% to 100%. In dire circumstances, losses might reach 60% to 70%. Compared to seed from healthy plants, seed from wilted plants is lighter, rougher and duller.

Symptoms

Plant drooping in the field is the first sign of the illness, which is followed by rapid plant death. Additionally, the leaves become yellow and drop off too soon. The wilting plants' collar sections have necrosis and discolouration. whether it is easier to remove the sick plants from the ground than the healthy ones. The fungus may have invaded the majority of the lateral roots of the wilting plant. Transverse slices of the basal stem or the roots show masses of fungal hyphae in the vascular bundles and vascular cell discolouration under the microscope.



Causal organism

The pathogen is a member of the kingdom fungi and the phyla ascomycota, subphylum pezizomycotina, class sordariomycetes, order hypocreales and family nectriaceae. The fungus is caused by *Fusarium oxysporum* f. sp. Ciceri. The fungus appears infected tissue as hyphae both intracellularly and intercellularly. In contrast to the micro-conidia, which are one or two celled, thin walled, elliptical and hyaline, the macro-conidia are sickle-shaped, pointy at both ends, septate and hyaline.

Disease cycle

The fungus is a facultative parasite, living saprophytically on soil organic matter. When the crop is harvested, the diseased roots are left over in the soil and the fungus survives on the host, root for several years. It produced chlamydospores which are resting spores that can withstand adverse soil condition. Optimum temperature for the fungus infection is around 25 oC. The alkaline soil favour the incidence of wilt.

Control

- 1) Changing the planting dates to grow the crop between November and February can assist to lessen the severity of the illness.
- 2) By boosting antagonistic microorganisms, the addition of substantial amounts of organic matter to the soil would reduce the pathogen's activity.
- 3) Planting resistant strains of seeds, such as Gaurav, Udai, Awrodhi, Phule G-95007, Phule G-5, Phule G-114, BG-224, BG-212, BG 246, BG-261, JG-315, JG-74, WR 315, CPS 1, ICC 1611, H 86-72, H 86-18, BDNG 233, ICC 32, AND JG-12
- 4) Because the fungus lives in the soil, soil applications of *Trichoderma viride* and *harzianum* @ 1 kg + 25 kg are necessary. FYM/ acre are spread one week before sowing is more effective than seed treatment in reducing wilt of chickpea.
- 5) *Trichoderma harzianum* at 4 grammes per kilogramme with carbendazim at 1 grammes were applied to the seeds.
- 6) Linseeds intercropped at a 2:1 ratio are successful.
- 7) Include sorghum in a 6-year crop rotation.
- 8) Spot soaking with 50 kg FYM and either 1.0 gram/lit of carbendazim or 2.5 kg/ha of *P. fluorescens/T. viride*.

Botrytis grey mould

A fungus is the source of this illness. The second most significant disease affecting chickpeas is grey mould, which can affect plants at any stage of growth. The disease may spread extensively and completely destroy a crop under the right circumstances. Disease is more prone to spread in chickpea genotypes with rapid seedling development, early canopy closure, and early flowering than in other kinds. If seed is not treated with a fungicide, the use of seriously contaminated seed can cause a crop to fail completely. The biggest agricultural losses occur during wet seasons, especially when crops have extremely dense canopies.

Symptoms

The terminal branches of a crop frequently droop as one of the earliest signs of illness. Yellow areas in the crop may indicate diseased clusters of plants. The telltale sign is a grey fuzz that appears on flowers, stems, dead leaves, and petioles when there is significant humidity. Although lesions can appear anywhere along the stem, they are typically initially noticed on the lower section of the stem, frequently beginning at the leaf axial. Typically, infected seeds are smaller than normal and frequently have white to grey fungal growth on them.

Causal organism

The pathogen is a member of the kingdom fungi, the ascomycota subphylum, the pezizomycotina class, the leotiomycetes order and the helotiales family. *Botrytis cinerea* Pers. Ex Fr. is the disease's primaryculprit. It is a serious disease that affects pulse crops, especially chickpea. Dark brown to black sclerotia are produced. Mycelium is septate, white to grey, with thin, branching juvenile hyphae, and hyaline conidiophores that are lighter in colour than the hyphae. The pathogen was created on infected dead tissues and has the ability to produce spores on the surface of those tissues. The sclerotia often form after the stem dies and are more rounded. When the canopy of a badly diseased tree is opened, a cloud of spores is visible. The "fuzz" is hardly noticeable in dry weather, but it reappears when rainy weather returns. Moderate temperatures (20–25 oC), frequent rainfall, and high relative humidity are favourable to the pathogen. Infected seeds, infected stubbles on other hosts, dead plant tissue, and sclerotia are all places where it can live.

Disease cycle

In the absence of a chickpea crop, the virus can persist in nature from season to season in a variety of ways. Infected or contaminated seeds, plants, and other hosts allow fungi to live by feeding saprophytically or parasitically on dead material, or by invading an inactive stage of the life cycle or a dormant resting structure (sclerotia). When the crop canopy is completely grown during flowering, the disease is typically visible. Disease development is favoured by excessive vegetative growth brought on by too much irrigation or rain, by close spacing, and by types with a spreading propensity. Disease development is favoured by temperatures between 20 and 25 C, high humidity around flowers and the podding season.

Control

- 1) Burning and destroying agricultural residue after harvest.
- 2) Certified seed has to be planted.
- 3) Thiram-based fungicides or Thiram + Thiabendazole should be applied at a rate of 2 grammes per kilogramme of seed.
- 4) Crop should be displayed in a line format to highlight the effects of improved crop airflow and decreased canopy humidity.
- 5) The resistance cultivars Pant G 144, C-235, and BG-261 should be shown.
- 6) Mancozeb @1.0-2.0 kg/ ha and Carbendazim 500ml/ha should be sprayed on standing crops.

Ascochyta blight

In the majority of chickpea-growing regions of the world when chilly, gloomy, and humid weather prevails during the crop season, ascochyta blight is a very troublesome and dangerous disease. In India, states like Punjab, Haryana, Himachal Pradesh, Jammu and Kashmir, Delhi, and portions of Uttar Pradesh and Rajasthan are affected severely by this illness. Ascochyta blight can lower seed quality and has been known to completely limit production.

Symptoms

The disease's early signs first develop at the tops of leaves and the tips of budding shoots. At any stage of plant development, the fungus can damage any above-ground plant component, including leaves, stems, and pods, although plants are most vulnerable to disease during blooming. On the leaves and pods, there are pale green yellow, round, depressed lesions; on the petioles and stem, there are elongated lesions. Stem lesions frequently encircle the plant's stem, making it weaker and more likely for it to fall off. These lesions may develop pycnidia, which often appear in concentric rings. Pycnidia may be found on infected seeds, and they may also be discoloured and shrivelled.



Causal organism

Ascochyta rabiei is the culprit for ascochyta blight. The pathogen is a member of the Pleosporales Order, Class Dothideomycetes, Order Ascomycota, Sub Phylum Pezizomycotina, Kingdom Fungi and Family Didymellaceae. The septate mycelium has a hyaline to brown colour. On the afflicted tissues, the fungus produces Pycnidia in shapes ranging from spherical to pears. Inside the Pycnidia, the conidia are carried by short conidiophores. They are pinkish in mass, oval to oblong, one to two celled, and hyaline. On the infected host tissues, the perithecial stage also develops. The globose, dark-colored perithecia are home to asci that generated eight ascospores. The ascospores are two-celled, elliptical, thin-walled and hyaline.

Disease cycle

Both inside and externally, this illness is transmitted via seed. A source of major inoculum for the virus is contaminated or infected seed, infected plant residues left behind in fields, and other host plants. Additionally, it was discovered that ascospores contribute to the start of outbreaks of illness. Conidia and ascospores, which can be transferred by contaminated machinery, wind and water movement, and rain splashes, are the primary means of secondary disease transmission. When daytime temperatures are around 20 °C, nighttime temperatures are around 10 °C and rain is followed by cloudy days, the illness quickly builds up and spreads. Blight development is also favored by excessive canopy growth.

Control

- 1) Plant resistant cultivars such as Pant 114, C-235, C-8, HOO-02, HOO-126, HOO- 249, HO- 1-80, ICC 607, ICL 4475, ICL 6328, BG 267, FLIP 97-132, FLIP 98-226, FLIP 98-231, FLIP 91-24 C, FLIP 84-92 C, JM-595, and BG-267.
- 2) Adhere to crop rotation.
- 3) Choose seed from a crop free of illness.
- 4) Intercrop of wheat, barley, and mustard is seeded.
- 5) Apply Carbendazim + Thiram (1:1) At 3.0 gram/kg seed to the seed.
- 6) Spray Carbendazim @ 0.15% twice, separated by 10 days, on standing crops, or apply wettable sulphur @ 2.3 gram/lit of water.

Root rot

Both leguminous and non-leguminous hosts are affected, causing serious harm. The fungus is widespread and may be found anywhere this crop is heavily farmed. Symptoms

The damaged leaves show signs of yellowing and may drop over the course of the following two to three days. When the stem is closely inspected, black lesions may be observed on the bark at the ground level. The plant may have withered within a week. The primary roots and the base stem may exhibit indications of dry rot. Weekend tissues are readily broken off.

Causal organism

A fungus called *Macrophomina phaseolina* (Maubl.) Thirum is the culprit behind the illness. A member of

the Kingdom Fungi, Phylum Ascomycota, Class Dothideomycetes, Order Botryosphaeriales, and Family Botryosphaeriaceae, the fungus is classified as a fungus. Invasion by the fungus occurs both intra- and intercellularly in the host. It quickly spreads throughout a large portion of the host tissues before quickly destroying them. It produces thick-walled, single-celled, hyaline Pycniospores in pycnidia.

Disease cycle

The fungus may live saprophytically on decomposed organic tissues as a facultative parasite. Sclerotial bodies are produced by it. When the air temperature is over 300 °C, pycnidia are generated and Pycniospores can live for more than a year.

Control

- 1) The pathogen is carried via soil. The condition is challenging to manage. Bordeaux combination or other powerful fungicides applied to the damaged plants and contaminated soil may assist to reduce the inoculums.
- 2) Field sanitation ought to be required. Remove weeds and agricultural wastes before planting and after harvest.
- 3) Two to three years should pass between crops in a rotation.
- 4) Deep ploughing has to be done in the summer.
- 5) Prevent seeding during periods of excessive wetness.
- 6) Excessive wetness should be kept away from seedlings.
- 7) Before preparing the soil, any undecomposed materials should be removed from the field.
- 8) Treatment of seeds with *Pseudomonas fluorescens* at 10 gram/kg of seeds, *Trichoderma viride* at 4 gram/kg of seeds, or carbendazim at 2.0 gram/kg of seeds.

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