CURRENT STATUS OF PIGEON PEA (cajanus cajan) WILT DISEASE IN INDIA AND THEIR MANAGEMENT

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Received: Jun 14, 2022; Accepted: Jun 28, 2022

Introduction

Pigeon pea (Cajanus cajan (L) Mill sp.) is one of the major tropical and sub-tropical grain legumes crop those accounts for about 5% of world legume production. India is the largest producer, where the dried pea is mainly favored choice for making Dhal. It is also known by different dialects and trade names viz; red gram, tur, Angola pea, Congo pea, yellow dhal, and oil dhal. Because of its unique optimal nutritional profile and subsistence tolerance level, it is considered the favorite crop of smallholder dryland farmers. Pigeon pea is the richest source of protein so the consumption in a balanced diet with cereals is recommended specially to fill the nutritional gap for proteins (green seed- 21%, mature seed- 18.8%, and dhal- 24.6%) among the poorer section of the population. Besides its nutritional value, pigeon pea also possesses medicinal properties due to many polyphenols and flavonoids that are known to prevent and cure human ailments such as cough, soreness, bronchitis, pneumonia, respiratory infections, dysentery, menstrual disorders, wounds, abdominal tumors, and diabetes. The large number of diseases that attack the pigeon pea crop is perhaps the main constraint to imposing significant yield decline and overall quality deterioration. More than 50 diseases caused by fungi, bacteria, viruses, nematodes, etc have been reported to affect pigeon pea crops. This chapter has been prepared to assist in the field diagnosis of pigeon pea diseases and categorization according to the kind of damage they cause. Furthermore, symptomatology, distribution, economic importance, epidemiology, and control measures are included to make the handbook more useful to farmers (growers), scientists, scholars as well as extension practitioners.
Wilt / Fusarium wilt

Introduction and economic importance

Wilt or Fusarium wilt is a major and serious disease of pigeon pea caused by the fungus *Fusarium udum* (Perfect stage-*Gibberella indica*) which is both soil and seed-borne and caused severe and impactful yield losses in susceptible varieties. Incidence of the disease is more prevalent during the blossom and pod formation stages of the crop.

Symptoms

Patches of an infected and dead plant during flowering and pod filling are considered the primary indication of wilt disease symptoms. The fungus enters the host vascular system through wounds formed at the root tip and starts invading the xylem vessel. The symptom starts with loss of leaf turgidity and interveinal chlorosis of leaves and branches. Black dark purple bands and streaks are formed on the stem surface due to the collapse of the vascular and root system which extended from the base to the upward portion of the crop. The fungus also attacks the crop at the seedling stage while the symptom becomes more prominent during the mature stage due to a shortage of water or low soil moisture.

![Characteristics symptom of Fusarium wilt of Pigeon pea](image)

**Fig 1:** Characteristics symptom of Fusarium wilt of Pigeon pea

In humid conditions, pinkish or whitish mycelial growth is observed at the basal part of the stem, and intense black mycelium growth is found in the xylem when the stem split longitudinally.

Disease Cycle

*Fusarium udum,* saprophytically overwinters in soil or infected plant parts and survives in various forms of spores *viz;* chlamydospore, macroconidia, and microconidia. While in the infected seed the pathogen stays dormant in the form of chlamydospores.
Under the congenial conditions, the spores start germinating and gradually penetrate the host root tissue or onto the epidermal layer and later move to the xylem tissues and invade the xylem vessels. The infection spread in the whole plant due to the rapid and extensive multiplication of fungal mycelium which response to gums production and blockage of the xylem vessels resulting in complete wilting of the plant. Infected plant parts and seeds get incorporated as residue into the soil and the resting spores continue the cycle further for subsequent infection. The chlamydospores remain viable for about 10-20 years in the field.

*Causal organism: Fusarium oxysporum* f.sp.udum(Perfect stage- *Gibberella indica*).

*Epidemiology*

The pathogen is soil and seed-borne and can survive in infected plant debris in the soil for about 3 years. The disease is prevalent in vertisol soil. Early sowing of seeds, and proper weeding practices favour the progress of the disease. Wilt is also favoured by the continuous growth of pigeon pea on the same land (monocropping) over the years. The soil temperature of 17-25°C facilitates the germination of the spores. Intercropping with sorghum reduced the incidence of wilt disease.

*Host plant resistance and genetic base*

There is a complex relationship between a pathogen (fungal) and its host (plant) in which both plant defense gene and fungal pathogenesis-related genes are expressed. Such a relationship results in either resistance or susceptibility or the development of disease in the plant system. To understand the role and mechanism of different defense-related genes and enzymes like glucanases, chitinases, and proteases upon Fusarium infection in various plant species are now cloned and characterized. The genetics of Fusarium wilt resistance is even unclear but much more genes are said to be involved defense pathway either by a single dominant gene to two complementary genes or even by the involvement of multiple genetic factors.

*Management*

1. Proper soil sanitation practices, destruction of infected and residual plant parts along with seeds to reduce inoculum.
2. Crop rotation with tobacco and sorghum castor for three years completely eradicates the pathogen from the field.
3. Mixed cropping with sorghum is preferred over mono-cropping.
4. Soil solarization in summer reduces the inoculum.
5. Treat the seeds with Thiram @0.3% or Carbendazim @0.2%.

6. Seed treatment with *Trichoderma viridae* @ 4 gm/kg.

7. The implication of varieties like Maruthi, Durga, Pusa-9, and Sharad or genotype resistance to the pathogen and effectually measure control of the disease.

**Conclusion**

Earlier, research was conducted mainly focusing on resistant sources and chemicals for the control of diseases. Nowadays identification, evaluation, and integrated location-specific BM package for disease control. This package for pulse crops is completely refined and validated. Despite the development of various BM packing models, to handle dreaded diseases of pulse crop, a skilled knowledge gap persists between the researchers and farmers, especially in developing countries. So, the promising approach is to harness all available measures and deploy them in an integrated manner. Host plant resistance (HPR), fungicides, natural plant products, bio fungicides, botanicals, and agronomical practices will remain the potential option for BM for pulse crops.

**References**


