



# MAJOR DISEASES OF LENTIL: EPIDEMIOLOGY AND DISEASE MANAGEMENT-A REVIEW

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Pluses constitute an important part of human food. Pulses are valued for their high protein content and protein quality and thus, supplement the cereal based diets. The protein content of most pulses ranges from 17-24 per cent which is almost 2-3 times more than that found in cereals. Pulses play an important role in the food and farming economy of our country. Lentil (*Lens culinaris* Medic.) is one of the oldest known protein-rich food legumes grown in India. It is cultivated throughout Northern and Central India. It is one of the oldest crops that originated in near east and Mediterranean region. Masur or lentil is a bushy, annual shrub plant that is popular for its lens shaped seeds, which are consumed as food in stew or other forms all over the world. These seeds have a vast range of colors from yellow to red-orange to green, brown and black and also have second highest levels of proteins and fiber after soybeans. The area under lentil in India is around 1.59 m. ha with a production of 0.94 m. t and productivity 697 Kg/ha (Anonymous, 2011). Lentil seed has a relatively higher protein, carbohydrates and calories compared to other legumes and its high average protein content and fast cooking characteristics make this crop as the most desired in many lentil producing regions (Muehlbauer *et al.*, 1985). Owing to biotic and abiotic stresses, the crop yield is below attainable levels. Among the biotic factors, diseases are serious threat to lentil production. Lentil suffers from a number of diseases which are caused by fungi, bacteria, viruses, nematodes and plant parasites (Khare *et al.*, 1979). The diseases of lentil not only reduce yield but also deteriorate seed quality. The main factors which is responsible for low yield of lentil are the bioaggressors as fungal diseases of

lentils are the most important biological constraint to productivity. Wilt, Rust, Botrytis Grey mold and Ascochyta blight are the major diseases responsible for hampering the production of lentil.

## Wilt :

Among the diseases, *Fusarium* wilt caused by *Fusarium oxysporum* f.sp. *lentis* is the most important biological constraints to productivity of lentil worldwide (Bhalla *et al.*, 1992). In India lentil wilt was first reported from undivided Bengal in 1934. The pathogen causes serious disease and is widespread in India. It is a soil borne, root pathogen colonizing the xylem vessels and blocking them completely to cause wilting.

## Symptoms:

The disease appears in the field in patches at both seedling and adult stages. Seedling wilt is characterized by sudden drooping, followed by drying of leaves and seedling death. The roots appear healthy, with reduced proliferation and nodulation and usually no internal discoloration of the vascular system. Adult wilt symptoms appear from flowering to late pod-filling stage and are characterized by sudden drooping of top leaflets of the affected plant, leaflet closure without premature shedding, dull green foliage followed by wilting of the whole plant or individual branches. Seeds from plants affected in mid-pod-fill to late pod-fill are often shriveled.

## Epidemiology:

The fungus is soil borne, which can survive in the soil

and plant debris in the absence of its host for a period of 3-4 years. The disease is favoured by low soil temperature, 30 per cent soil water holding capacity and increasing plant maturity. Yield losses depend on the stage at which the plant wilts; it can be 100 per cent when wilt occurs at pre pod stage, about 67 per cent when it occurs at the pre harvest stage.

#### Management:

Successful attempts to control the disease involve.

- The best method of controlling lentil wilt is to use resistant varieties, a number of which are now available as Pant L-4, Pant L-6, Pant L-8 and Noori.
- Seed treatment with benomyl (0.3%) or thiram + benomyl (1:1, 0.3%) reduces wilt incidence and increases grain yield.
- Soil amendment with organic matter enhances antagonism with other soil microflora.
- Ploughing of the field during summer.
- Following crop rotation with cereal crops which are not affected by wilt pathogen.
- Using antagonistic microflora like *Bacillus subtilis*, *Trichoderma harzianum*, *T. viride* @ 4 g/kg seed etc.

#### Botrytis grey mold:

Botrytis grey mold (BGM) of lentil is caused by the fungus *Botrytis cinerea*, is a serious but sporadic disease. *Botrytis cinerea* has also been isolated from lentil seed in India. The pathogen causes heavy losses particularly in North Indian conditions and also in several parts of Australia, Argentina, Nepal, Mymar, Bangladesh and Pakistan, causing 70-80% yield losses under favorable conditions (Haware and McDonald, 1992).

#### Symptoms:

All aboveground plant parts of lentil can be affected by botrytis grey mould. The disease first appears on the lower foliage as discrete lesions on leaves which are initially dark green, but turn grayish-brown, then cream as they age, that enlarge and coalesce to infect whole leaflets. Severely infected leaves senesce and fall to the ground. Lesions girdle the stem and cover it with a furry layer of grey mold, eventually causing stem and whole plant death.

#### Epidemiology:

There are several main sources of inoculum of botrytis grey mould, these include; seed-borne inoculum, sclerotia, mycelium in old infected trash, and alternate host plants. High humidity and moderate temperatures with high moisture favours the diseases. Environmental conditions and canopy density have also been shown to be primary factors that influence the development of botrytis grey mould epidemics in lentil crops. Temperatures ranging from 15-25°C and RH>

95% have been found to be optimal for initiation and development of disease particularly at flowering and after canopy closure.

#### Management:

- Practices that have been effective in crop canopy management can be used.
- Seed treatments with fungicides such as benomyl, carboxin, chlorothalonil (0.1%) or thiabendazole can reduce seed-borne inoculum levels.
- Lentil varieties Pant L-639 and Pant L-406 are resistant.

#### Rust:

Rust, caused by fungus *Uromyces viciae-fabae* is regarded as the most important foliar disease of lentil. Complete crop failures can occur due to this disease. Rust disease is a potential threat to lentil cultivation and causes substantial yield losses ranging from 60-69 per cent (Sepulveda, 1985). In 1978 severe outbreak of lentil rust was recorded in the Narmada Valley of Madhya Pradesh during 2008-09 in Uttarakhand state resulting in yield losses upto 100 per cent. In *tarai* region of Uttarakhand state and its surrounding areas, rust has been a major constraint affecting yield adversely. In the past, disease has appeared in almost epiphytotic form in this area (Khare and Agarwal, 1978).

#### Symptoms:

Rust pustules can be seen on leaf blade, petiole & stem. Rust starts with the formation of yellowish-white pycnidia and aecial cups on the lower surface of leaflets and on pods, singly or in small groups in a circular form. Later, brown uredial pustules emerge on either surface of leaflets, stem and pods. Pustules are oval to circular and up to 1 mm in diameter. They may coalesce to form larger pustules. In severe infections leaves are shed and plants dry prematurely, the affected plant dries without forming any seeds in pods or with small shriveled seeds.

#### Epidemiology:

The disease generally starts from low-lying patches in the paddock and radiates towards the border. Rust is an autoecious fungus, completing its life cycle on lentil. High humidity, cloudy or drizzly weather with temperatures 20 to 22°C favour disease development. The disease generally occurs during the flowering /early podding stage.

#### Management:

- Use of foliar fungicides as Hexaferb and Dithane M-45 give best control.
- Fungicides as Mancozeb (0.2% a.i.), Bayleton (0.05% a.i) and Calixin (0.2% a.i.) are found effective against the pathogen.
- Foliar spray of benomyl, carboxin, metalaxyl, oxycarboxin,

thiram, triadema-fon either alone or in combination of Dithane M-45 are also effective.

– Lentil varieties Pant L-639, Pant L-406, Pant L-6, pant L-7 and Pant L-8 are resistant.

#### **Ascochyta Blight :**

Ascochyta Blight is caused by fungus *Ascochyta lentis* which is able to attack all aboveground plant parts at any growth stage under favorable conditions. The disease causes reduction in yield and seed quality.

#### **Symptoms:**

The symptoms of the disease include lesions on leaves, petioles, stems and pods. The irregular shaped lesions on leaves, petioles and stem are tan and darker brown on pods and seeds. In severe infection, lesions can girdle the stem, leading to breakage and subsequent death of all tissues above the lesion. Affected crops under severe infection may be blighted and seed may become shriveled, reduced in size, and discolored. Flowers and pods could abort, leading to yield loss.

#### **Epidemiology:**

*Ascochyta lentis* is seed-borne and seed-transmitted (the disease is transmitted from infected seeds to seedlings). Disease is favored by cool, moist weather. An extended period of leaf wetness is required for disease development, with maximum disease developing occurring after 24 to 48 hours of leaf wetness. Temperatures between 50°F and 68°F are highly favorable for disease development, and maximum disease development occurs at approximately 59°F.

#### **Management:**

The most economical and sustainable strategies to control ascochyta blight are through resistance breeding along

with cultural practices.

- Crop rotation (growing lentils only once in four years)
- The use of certified, disease-free seed will help to minimize the disease.
- Early sowing to escape moist weather at harvest can minimize disease.
- Fungicides as benomyl, carbendazim, carbathiin, ipodion and thiobendazole @ 0.1% (Mertect) are effective.

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