DISEASES OF SESAME

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Abstract. *Diseases of sesame have been reviewed and observations given on the incidence of some of them on* 3 *varieties of this crop grown in PFI Peshawar in* 1978. *Cercospora leaf spot was common on all the* 3 *varieties. Peshawar local was moderately susceptible to phyllody whereas Calinda and Punjab* 37 *were not attached.*

Introduction. Sesame, an ancient cultivated tropical oil plant, is grown in many Asiatic and African countries. In more recent times it has been introduced into Mexico, Central America, South America and the U.S.A. The acreage of the crop is on the increase as its seeds are eaten and also used for expressing cooking oil. In Pakistan, sesame covers about 34242 ha showing an increase of 14.3 %over previous year's final estimates of 29946 ha (Weather and Crop Report, 1978). This necessitated investigations on the diseases of the crop. Available information on the subject was, therefore, reviewed and observations were recorded on the crop grown at the Forest Institute's Campus, Peshawar.

Review of Literature. Nisikado et al (1951) tested the effectiveness of some fungicides against sesame leaf spot caused by *Helminthosporium oryzae* and found Bordeaux mixture quite effective at a concentration of less than 0.25%.

Sundram (1961) recorded *Leveillula taurica* on sesame leaves. The infected leaves showed irregular pale yellow discolouration on the upper surface with whitish growth of the fungus on the corresponding lower surface.

Khan and Kamal (1963) recorded *Cercospora sesami* Zimm., for the first time, on *Sesamum indicum* from the Sind region of Pakistan.

Satpatty et al (1963) found 20 homozygous sesame selections comprising four groups, characterized by different length of the period from sowing to flowering, in relation to the incidence of phyllody and yield. The incidence of phyllody generally increased with the duration of the crop; varieties flowering within 41-50 days after sowing and having duration until maturity of 12-30 weeks gave the best yield and produced seeds with very high oil contents upto 62%.

Singh et al (1963) reported that accidental introduction into India of Nicotiana Virus 10 with a collection of sesame seeds from Sudan resulted in the general infection of 121 sesame varieties, with the leaf curl virus. In Africa, Nicotiana Virus 10 was found not

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only causing leaf curl disease in tobacco but also effecting sesame. Only 5, out of the varieties tested, proved to be sufficiently resistant to the virus; one of these was also drought resistant.

Leppik and Sowel (1964) found that among several seed borne fungi responsible for diseases of sesame, *Alternaria sesami* was probably the most destructive. Its attack was generally observed on the stems, leaves and green pods of mature plants causing considerable damage. It was occasionally also observed on seedlings and young plants. It was first described from the Caucasus region and is probably endemic in a large part of Asia, but has been distributed all over the world with seed shipments. No effective field control methods were available except the use of healthy seed to prevent its further spread.

Jain and Kulkarni (1965) studied *Macrophomina phaseoli*, the cause of root and stem rot in sesame, under laboratory as well as field conditions. The optimum temperature for the growth of the fungus was found to be 25 to 30°C and for maximum sclerotial formation, 35°C. Growth of the fungus increased with an increase in soil moisture content upto field capacity. The fungus was able to survive the heat of summer in the soil. A varietal trial showed that 2 out of 13 strains were fairly resistant to the disease.

Montilla and Nava (1966) reported a serious wilt and stem rot disease of sesame caused by *Phytophthora* sp. Affected plants showed progressive wilt ending in death; its direct effect was a wet root rot. Humid weather, humid soil and a large daily temperature amplitude were found favourable for development of the disease.

Sanet (1967) recorded two types of leaf spots caused by a bacterium, *Xanthomonas sesami*, on sesame in Sudan. The symptoms of one found on top leaves and capsules were dark red brown to black somewhat translucent spots 2-4 mm in diameter with sharply defined margins. The infected tissues later dried up and become brittle. The second type found on the basal leaves had grey to lightbrown usually opaque spots 4-14 mm in diameter; affected tissues becoming wrinkled before drying up.

Singh and Srivastava (1967) reported a new leaf spot disease of *Sesamum orientale* caused by *Myrothecium roridum.*

Tondon and Banerjee (1968) conducted trials with eleven insecticides applied at weekly intervals, starting two weeks after sowing, to control phyllody and leaf curl of *S. orientale*. Phorate applied as granules at 10-30 lbs/acre at sowing and after six weeks gave the best control. This treatment combined with weekly spraying with endrine was recommended for the control of both virus diseases.

Poehlman and Bortharkur (1969) recorded phyllody, leaf curl, leaf spot (*Cercospora sesami*), anthracnose (*Colletotrichum* sp.), Fusarium wilt (*Fusarium vasinfectum*), root rot and stem rot (*Macrophomina phaseoli*) and bacterial leaf spot (*Pseudomonas sesami*) on sesame. In U.S.A., bacterial leaf spot resistance has been reported but it broke down with the appearance of a second race of the *P. sesami*. The variety Early Russian, however, showed resistance against race 2. Attempts were also made in India to transfer resistance

to phyllody, from *S. prostratum*, to the cultivated sesame 10. The wild species *S. prostratum* was also resistant to the pest such as leaf roller, *Antigastra catalaunalis*.

Belalcazar and Barcena (1970) studied sesame wilt in Columbia. The disease was found to be caused by a fungus, *Macrophomina* sp. (probably *M. phaseoli*). Healthy plants inoculated with the fungus, isolated from the diseased material, produced symptoms of the disease within 36 hours. Some of the introduced varieties were highly resistant to the disease but yielded less than local ones. Some lines selected from local varieties also showed resistance and yielded more than 1000 kg/ha. Among the other plants, safflower and cowpea were susceptible to the disease when inoculated.

El-Ghany et al (1970) found a root rot wilt disease in sesame caused by 3 fungi: *Fusarium oxysporum*, *Rhizoctonia solani* and *Sclerotium bataticola*. Infection was found to increase with frequent irrigations. Irrigation, at two weeks intervals, gave a higher yield than at shorter or longer intervals. More frequent irrigation caused severe infection and less frequent decrease in yield due to water stress.

Gemawat and Verma (1971) studied the effect of soil amendment on the control of charcoal rot. Mustard cake at a rate of 1-10 for soil reduced the infection of plants by *Macrophomina phaseoli* considerably viz. 16.6% infection against 83.3% in the control. Application of sesame or groundnut cake did not reduce the infection much.

Habish and Hammad (1971) studied survival and chemical control of *X. sesami* causing bacterial leaf spot disease in sesame. The bacterium was found to persist in soil for upto six months, and on seeds for upto 16 months, and gave rise to infected seedlings. Fifteen chemicals and hot water treatments were tested for eradication of seed infection. Abavit B and Formalin were found to be the most effective, followed by Fertix 6704.

Sathiabalan et al (1971) carried out studies on the *Alternaria* blight disease of gingelly (*Sesamum indicum*) in Coimbator, India. Brown, round to irregular spots with concentric zones were observed on the leaves and resulted in severe defoliation. The pathogen was identified as *Alternaria sesami* and was not pathogenic on other hosts and vice versa. The disease was found to be seed and air borne, but not soil borne.

Malaguti et al (1972) recorded *Alternaria sesamicola* (=*Macrosporium sesami*) quite wide spread in Venezuela, characterized by leaf spot, stem necrosis and damping-off of seedlings. Inoculation of 10 varieties, with an isolate of the pathogen, showed marked differences in susceptibility among the varieties, but none of these could be called resistant.

Samuel (1972) studied the effect of vitamins and levels of pH on the growth and sporulation of *A. sesami*, the causal agent of leaf blight disease of sesame (*Sesamum indicum*).

Al-Beldawi (1973) made studies on the control of charcoal rot of sesame with Benomyl in Iraq.

Chakaravarti (1973) tested the efficacy of some fungicides and antibiotics in treatment of seeds to control damping-off and root rot of sesame (*Sesamum orientale*) caused by *Thiellavia terricola* var. minor by soil drenching.

Choopanya (1973) reported a phyllody disease of sesame (*Sesamum indicum*) from north east Thailand and determined the cause as Mycoplasma-like-bodies in the diseased tissues instead of virus particles.

Marimuthu et al (1973) studied phyllosphere microflora of healthy and virus infected *Sesamum indicum* that varied with disease intensity. Infected plants usually had more micro-organisms than the healthy ones. There seemed to be stimulation of the fungal flora with advancing infection and a gradual reduction of the bacterial population. Indole acetic acid synthesizing potential of the epiphytic flora increased with disease intensity.

Mazzani et al (1973) described origin and characteristic of Maporal, a new sesame variety, best adopted where soil pathogens of genera *Phytopthora, Fusarium, Macrophomina* and *Rhizoctonia* were most injurious.

Daftari and Verma (1973) tested seven chemical preparations to control seed-borne infection of *Macrophomina phaseoli* (*Selerotium bataticola*) on sesame seeds in relation to germination of infected seed, pre-emergence and post-emergence rot control and plumule and radicle length. Captan (N-trichloro methyl-mercapto-4-cyclohexene 1) 2- dicarboximide at 2 g/kg) was recommended for best overall performance.

Chaudhary and Singh (1974) described foot rot disease of sesame caused by *Corticium rolfsii.*

El-Ghany et al (1974) recorded susceptibility of eighty-seven cultivars and strains of sesame grown on soil infested with *Fusarium oxysporum, Rhizoctonia solani* and *Sclerotium bataticola.* It was, however, difficult to develop cultivars resistant to root rot wilt disease.

Habish and Hammad (1974) studied the effect of certain soil conditions and atmospheric humidity on seedling infection by *Xanthomonas sesami.* The laboratory experiments revealed that seedling infection of sesame (*Sesamum orientale*) by *Xanthomonas sesami* was most severe at soil temperatures of 20-29°C, occurred at 35°C, but was absent at 40°C. Leaf spot disease incidence was slightly affected by variation in soil moisture and relative humidity between 20-40 and 70-80% respectively. However, disease severity was markedly affected being most severe at 30-40% soil moisture and application of (R.H. 75-80%) N at a rate of 45 kg/ha increased the resistance of seedlings to infection but at higher levels (90-135 kg/ha) germination and seedlings growth were retarded.

El-Ghany et al (1975) carried out seed treatment trials with some fungicides to control root rot and wilt disease in Egypt. In the field experiments, the diseases caused by *Fusarium oxysporum, Rhizoctonia solani, Sclerotium bataticola* (*Macrophomina phaseolina*) and *Phytophthora* sp. were best controlled by seed treatment with albertane 4954.

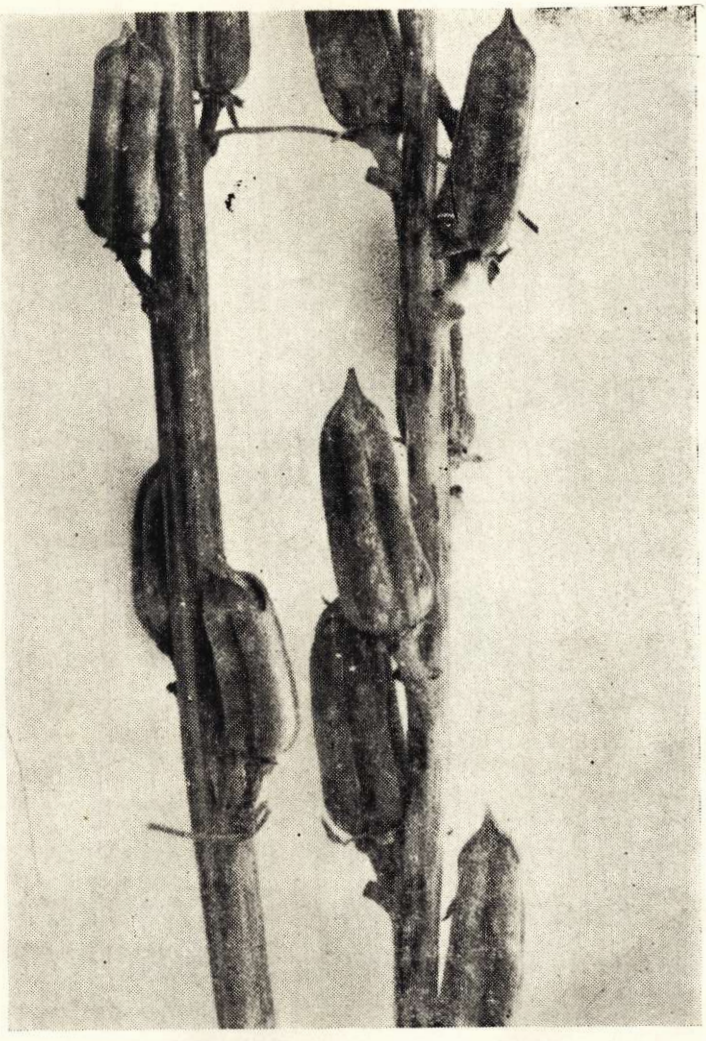

Fig. 1. Pods and stems showing infection by C. sesami.

Fig. 2. Proliferation induced by phyllody disease of sesame.

Mathur and Kabeere (1975) studied seed borne fungi of sesame in Uganda.

Seoud et al (1975) studied the effect of fungicide soil treatment on the incidence of root rot and wilt disease of sesame associated with *Fusarium oxysporum*, *Rhizoctonia solani*, *Sclerotium bataticola* (*Macrophomina phaseolina*) and *Phytophthora* sp. These were best controlled by soil treatment with Brassicol 75.

Deshpande (1976) reported the occurrence of cultural strains in *Alternaria sesami*. One of the two isolates, obtained from diseased sesame plants, was found highly virulent while the other mildly so.

Khan et al (1976) studied comparative pathogenicity of two strains of *Macrophomina phaseolina* from sesame. The seedling pot test revealed that the sesamum was the most susceptible of the test hosts to the two strains, followed by jute, bean (*Phaseolus vulgaris*) and cucumber, while sorghum was immune. The pycnidial strain was more pathogenic than the sclerotial one.

Malaguti (1976) reported leaf diseases of sesame in Venezula. Symptoms and pathogens of round white spot (*Cercospora sesami*), angular brown spot (*Cylindrosporium sesami*), zonate leaf spot (*Alternaria sesamicola*), and bacterial leaf spot *Xanthomonas* and *Pseudomonas sesami* were described and compared. Their economic importance and the conditions favouring them were also discussed.

Muheet and Chauhan (1976) stated that all insecticide treatments significantly reduced the incidence of phyllody. Thimet (Phorate) plus Metasystox was found to be the most effective in preventing the spread of the disease. The authors suggested that 20 kg/ha of Thimet 10 g combined with 0.03% metasystox spray may be used for the control of disease.

Verma & Daftari (1976) tried some antibiotics for treatment of sesame seeds. Of these, agrimycine completely controlled seed-borne *Pseudomonas sesami* and 94% germination occurred. Tetracycline hydrochloride gave good control of seed infection but had a deliterious effect reducing germination to 57%. The best field control was given by agrimycine seed treatment followed by a spray when the disease first appeared in the field.

Rathaiah and Pavgi (1976) studied the resistance of *Cercospora carthami* and *Ramularia carthami* from safflower and *C. sesamicola* from sesame to heat and desiccation. Tolerance of heat by sclerotia and/or stromata indicated the possibility of their oversummering in the field in India in crop debris and later in the soil.

Urdaneta et al (1977) tried five fungicide sprays in the field against bacteriosis disease of sesame (*Sesamum indicum*) in Venezuela. The spraying was done 44 days after germination. Cupravit 50 at 0.5% and difolatan 80 at 0.16% were the best reducing incidence by 19.0 and 16.8% and increasing yield by 11.7 and 67.4% respectively, compared with the control.

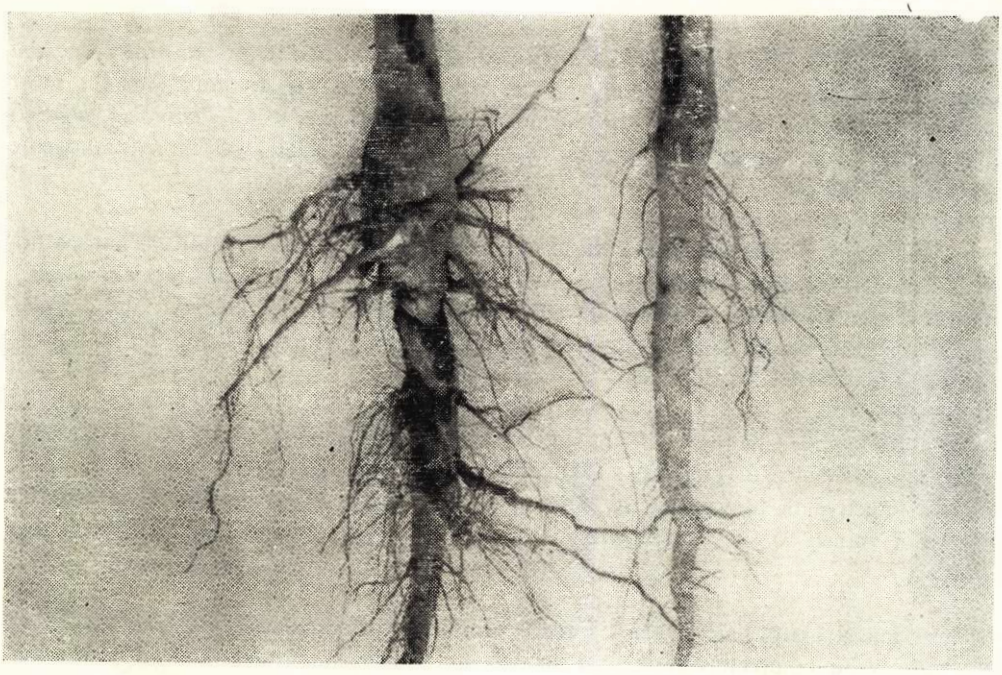

Fig. 3 Phyllody-infected root (left) and healthy root (right).

Parra et al (1978) studied the aetiology of the disease (wooly mold of sesame in Venezuela) incited by *Leveillula taurica*. The fungus was found to be pathogenic. Observations on morphology of the fungus and conidial germination were reported.

Observations. Three varieties of sesamum, namely Pb. 37, Calinda and Peshawar local (black seeded) were grown at the Medicinal Plants Farm and Silviculture Garden, Forest Institute, Peshawar. 7 pathogens i.e., *Fusarium oxysporum*, *Rhizoctonia bataticola*, *Macrophomina phaseoli*, *Cercospora sesami*, *Alternaria sesami*, *Leveillula taurica* and Virus-like organisms were recorded and found associated with wilt, root rot, charcoal rot, round white spot, concentric brown spot, powdery mildew and phyllody diseases, respectively. Out of these, *Cercospora sesami* and phyllody appeared quite damaging to the crop.

C. sesami was found to cause white circular spots 1-4 mm diameter with slightly raised dark brown areas (fasicles) in the centre on the leaves and pods, and elongated ones measuring 4-18 × 2-6 mm on the stem (Fig. 1). The attack of the disease was very heavy on all the three varieties grown.

The phyllody infected plants showed stunted growth, extreme proliferation of the growing tips and numerous small leaves, giving a witche's—broom like effect (Fig. 2). On examination, the infected roots showed swellings and also adventitious buds and roots (Fig. 3). The infected plants rarely produced seeds. The Peshawar local variety was found moderately susceptible to the disease.

Acknowledgements. The cooperation of the following is gratefully acknowledged:

(1) Mr. M.I. Sheikh, Director Forestry Research Division, Pakistan Forest Institute, Peshawar;

(2) Dr. M.N. Malik, Director Biological Sciences Research Division, Paskistan Forest Institute, Peshawar;

(3) Mr. Anwar Ahmad Khan, Medicinal Plants Botanist, P.F.I., Peshawar;

(4) Mr. Sajjad Hussain, Technical Assistant, Pathology Branch, P.F.I., Peshawar.

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