Research Article

DISEASE INCIDENCE OF VERTICILLIUM WILT, MACROPHOMINA WILT AND COLLAR ROT OF SUNFLOWER (*HELIANTHUS ANNUUS* L.) CAUSED BY *SCLEROTIUM ROLFSII* SACC. FROM TRIPURA

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ABSTRACT

Sunflower *(Helianthus annuus* L.) is an important oilseed crop in India. It is a recognized worldwide for its beauty, sunflower oil is a valued and healthy vegetable premium oil because of its light colour, high level of unsaturated fatty acids and lack of linolenic acid, bland flavor and high smoke points. Numbers of diseases caused by various fungi, bacteria and viruses, have been identified on wild or cultivated sunflower but only a few of them has economic significance as far as causing yield losses. Sunflower is attacked by many diseases, which reduce the yield and quality significantly under optimal conditions. During Present study, sunflower plants grown at trials allotted by Indian Institute of Oilseed Research, Hyderabad under College of Agriculture, Tripura, Lembucherra, West Tripura in the year 2016-17 and 2017-18 were evaluated for different diseases based on their characteristics symptom and plant pathological view. Results revealed that two types of wilting namely *Verticillium* wilt caused by *Verticillium* spp. and *Macrophomina* wilt caused by *Macrophomina phaseolina* are occurring along with incidence of collar rot of Sunflower (*Helianthus annuus* L.) caused by *Sclerotium rolfsii* Sacc under Agro-Climatic condition of Tripura.

INTRODUCTION

Helianthus annuus L. commonly known as sunflower is an important oilseed crop in India. It is a recognized worldwide for its beauty, sunflower oil is a valued and healthy vegetable premium oil because of its light colour, high level of unsaturated fatty acids and lack of linolenic acid, bland flavor and high smoke points. The primary fatty acids in the oil are oleic and linoleic (typically 90% unsaturated fatty acids) with the remainder consisting of palmitic and stearic saturated fatty acids. Sunflower seeds are enjoyed as a healthy, tasty snack and nutritious ingredient to many foods.

Numbers of diseases, caused by various fungi, bacteria and viruses, have been identified on wild or cultivated sunflower but only a few of them has economic significance as far as causing yield losses. Low yield of sunflower may be attributed to several reasons such as occasional adverse climatic conditions, poor agronomic methods of cultivation, non-availability of improved seed and prevalence of diseases and damage caused by pests. Sunflower is attacked by many diseases, which reduce the yield and quality significantly under optimal conditions (Mirza and Beg, 1983).

MATERIALS AND METHODS

Sunflower plants grown at trials allotted by Indian Institute of Oilseed Research, Hyderabad under College of Agriculture, Tripura, Lembucherra, West Tripura in the year 2016-17 and 2017-18. Affected plants of sunflower were brought into the laboratory. Studies of symptoms were carried out based on standard disease atlas, books and research papers. Pathogen concern is isolated aseptically in Potato Dextrose Agar (PDA) slants. Before isolation small bits from the diseased plant parts were cut and washed in running tap water followed by washing in distilled water. The washed samples were then dipped in 0.1% HgCl2 (Mercuric Chloride) solution for 30 to 45 seconds for surface sterilization and then washed in sterile distilled water. The PDA slants were then incubated at 28 □ 1□C in B.O.D. incubator for 14 days. Further sub culturing was carried out by taking 6 mm discs or single sclerotia of fungus. The isolated fungus was inoculated into healthy plants grown in pots for confirmation of Koch Postulates.

RESULTS AND DISCUSSION

Among various diseases of sunflower based three diseases has been reported based on symptomatological study.

Verticillium wilt caused by *Verticillium* spp. (*Verticllium dahliae* and *Verticillium albo-atrum*) *Macrophomina* wilts caused by *Macrophomina phaseolina* and Collar rot (*Sclerotium rolfsii* Sacc.) were recorded.

Fig. 1. Initial symptom of dead necrotic areas

i) Characteristic Symptoms of *Verticillium* wilt: Interveinal chlorosis and necrosis starting at lowest leaves and progressing upwards. Wilting generally occurs at bloom, usually in patches or in rows. Vascular tissues are damaged initially a brown ring may be present. Pith are shrunken and black at maturity.

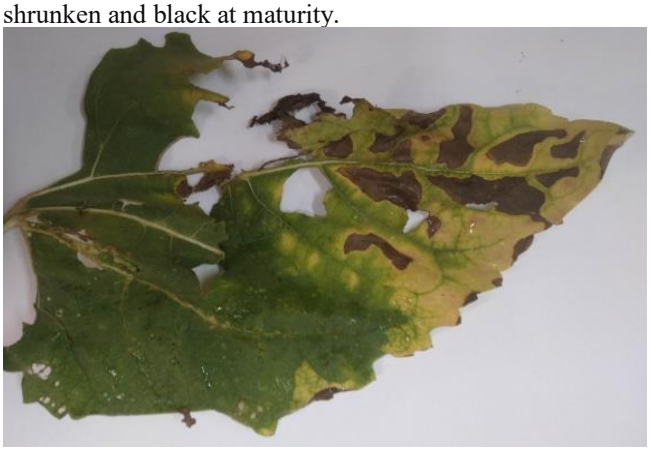

Fig. 2. Yellow hallo surrounding the infected area

Verticillium wilt symptoms are observed on individual plants or groups of plants in a field. Disease symptoms first appear on older plants, generally after the six-leaf stage. Prominent yellow, inter-veinal patches appear on leaves, which gradually enlarged and coalesce, while leaf centres turn brown and necrotic, having mottled appearance. Affected leaves rapidly become dry and die. Symptoms usually are not observed until flowering but under severe conditions they may occur as early as the six-leaf stage. Severely diseased plants may contain masses of tiny black fruiting bodies (micro-sclerotia) inside the stalk. These micro-sclerotia look like finely ground pepper. When highly magnified, the micro-sclerotia are irregular to club-shaped (0.1 mm or less in length). Affected stems have black streaky patches on them, and roots are also affected. Plants show stunting, small flower heads and destruction of root system (Mukhtar, 2009).

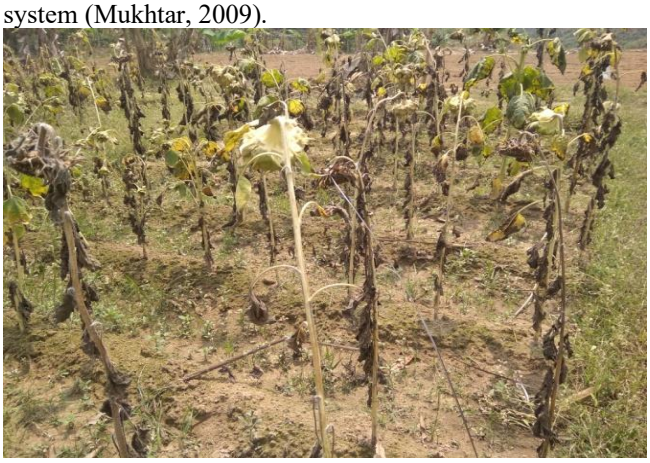

Fig. 3. Final stage of wilting showing dried, drooping leaves of sunflower plant

ii) Characteristic Symptoms of *Macrophomina* wilt (*Macrophomina phaseolina*)**:** Symptoms were first observed in plants approaching physiological maturity and consist of silver grey lesion girdling the stem at the soil line. Black spherical micro sclerotia were observed in the pith area of the lower stem, underneath the epidermis and on the exterior of the tap root. The internal stem had a shredded appearance later the vascular bundles become covered with small black flecks or microsclerotia (Piperkova *et al.,* 2016).

Fig. 4. Black Microsclerotia

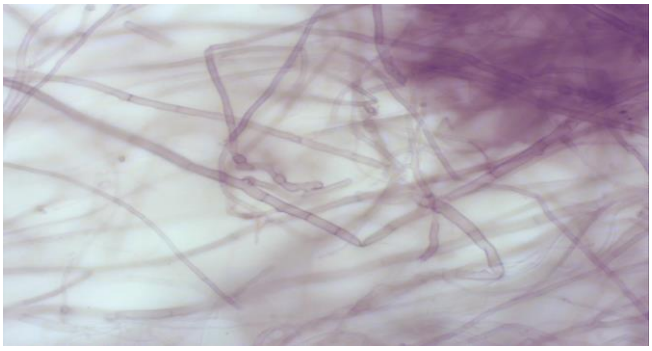

Fig. 5. Hyphal arrangement of the fungi

iii) Characteristic Symptoms of Collar Rot of Sunflower (*Sclerotium rolfsii Sacc.*): Leaves of the plants shows water soaked light brown or yellow appearance followed by drooping and drying of leaves. Under favourable climatic condition collar region of the infected plant shows white mycelia growth of the fungus and sometime initials of sclerotia were also observed under *in vivo* condition. Results of pathogenicity test further confirm development of above mentioned symptom after 3 to 4 days of inoculation of inoculums followed by successful re-isolation of the pathogen. In control pots no disease symptoms were developed.

Fig. 6. Experiment on Koch Postulates

The identity of the fungus Macrophomina phaseolina and Sclerotium rolfsii Sacc. has also been confirmed by authorized body of Department of Science and Technology, Govt. of India with their Accession Numbers 4328 and 4329 respectively.

From the above mentioned study based on symptomatology and initial pathological identification it is to report here disease incidence of Verticillium wilt, Macrophomina wilt and Collar Rot of Sunflower (Helianthus annuus L.) caused by Sclerotium rolfsii Sacc from Tripura. However, confirmation of the findings need to be done by multilocational trials in Tripura followed by molecular studies of the pathogens.

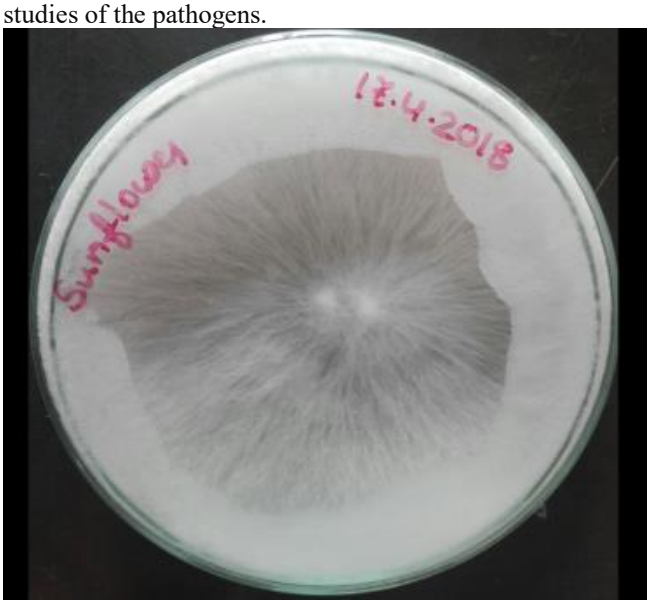

Fig. 7. Isolate of *S. rolfsii* Sacc.

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