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Screening of different germplasm of sunflower (*Helianthus annuus* L.) against sclerotinia stem rot of sunflower caused by *Sclerotinia scterotiorum*

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Abstract

Sunflower *(Helianthus annuus* L.*)* is one of the important oil seed crops of India occupying a prominent place in the country's vegetable oil scenario. *Sclerotinia scterotiorum* L. is the pathogen which produces sclerotinia stem rot of Sunflower on leaves, Stem and Crown. An experiment was conducted during 2010-2011 and 2011-2012 for screening of germplasm against the disease under natural epiphytotic condition. Total 110 Cultivars/varieties of Sunflower were tested out of these twelve proved resistant, seventeen moderately resistant, twenty six moderately susceptible, thirty two susceptible and twenty three were proved to be highly susceptible. None of the cultivar/ germplasm was free from the disease in both the testing.

Keywords : Sunflower, *Helianthus annuus* L., *Sclerotinia sclerotiorum* L., Stem rot, *germplasm.*

Introduction

Sunflower (*Helianthus annuus*.) is an important oil seed crop in India total Sunflower production is 1.62 m tonnes accounting for about 3.25 m ha. of area whereas in Uttar Pradesh contributed 0.12 m tonnes in an area of 0.26 m ha. during 2010-2011 (Anonymous, 2012). Among the oil seed crops, Sunflower has a pivotal place because of its high Oil Content, short duration, photo insensitiveness, high multiplication ratio, high degree of adoptability and good quality of oil. It contains high proportion of poly unsaturated fatty acid which exhibit hypocholestoerolenic effect and area good in preventing heart disease (Shingfield *et al.* 2006). It contains Vitamin A, D and K as well as good flavour substances. Sunflower cake or meal after oil extraction contains 40% high quality protein which is valuable as cattle and poultry feed. Its protein is superior to most of the vegetable proteins as it has about 90% digestibility apart from this its oil has a variety of industrial uses for instances in the manufacture of soap, cosmetic and baby foods (Schneiter & Miller 1981). A critical review of the causes for low yield indicates that diseases are the major limiting factors in the successful cultivation of this crop apart from other reasons, among several fungal, bacterial, viral and nematodal diseases, *sclerotinia* stem rot caused by *Sclerotinia sclerotiorum* was found to be prevalent an important cultivars of this crop in moderate to heavy loss in yield especially during Kharif season (Giudici *et al.* 2000, Masirevic & Gulya 1992, Yanar & Miller 2003). Therefore keeping in view the seriousness of the disease an study were carried out with the objective to obtaining higher yield of a good quality (Gentzbittel *et al.* 1998, Mestries *et al.* 1998).

Materials and Methods

The present investigation was carried out regular intervals during Rabi Crop season 2010-11 at Oil seed research farm, Chandra Shekher Azad University of Agriculture & Technology, Kanpur and other Locations of Uttar Pradesh. A total no of 110 varieties/cultivars were screened under natural conditions at oil seed research farm, Kanpur during 2010-2011 and 2011-2012. The genotypes found free, resistant under field conditions were subsequently tested under artificial conditions were subsequently tested under artificial conditions of inoculation in the glass house during 2012-2013. For the study 25 plants of each variety were raised and when the plants become 35 days old, they were inoculated

with the mycelial suspension and the humidity 80% was maintained for 48 hrs. Reaction of different varieties/culture was noted after 10 days of inoculation. The intensity of the disease development was assessed at regular intervals after 10 days by grading plants in six categories *viz*; 0, 1, 2, 3, 4 and 5 depending on infected plant parts (Table-1).

Table-1 Disease intensity with respect of category

Category	Reaction	Description
0.	Free	No infection
1.	Resistant	1-5 percent disease intensity
2.	Moderately resistant	5.1-15 percent disease intensity
3.	Moderately susceptible	15.1-25 percent disease intensity
4.	Susceptible	25.1 - 40 percent disease intensity
5.	Highly susceptible	above 40 percent disease intensity

Disease intensity was calculated by using following formula.

$$\text{Disease Index} = \frac{\text{Sum of numerical ability}}{\text{Total no of observation graded} \times \text{maximum disease category}} \times 100$$

Table 2 Reaction of Sunflower varieties /cultures to *S. sclertiorum* under natural conditions during 2010-2011 and 2011-2012.

Numerical value	Grades	Sunflower varieties/cultures
0	Free	Nil
1.	Resistant (less then 5% infection)	EC-27314, EC-82362, EC-8582, EC-103045, KSP-18, Comp-7, KBSH-1 (A), EC-10517, EC-10615, EC-109287, EC-101763, Sunstar-277
2.	Moderately Resistant (6-10% infection)	KSP-1, KSF-1, KSF-2, R-266, EC-89083, Blumix, Yubilini-60, Initiative, Pisa, Novinka, Majak, EC-109282, EC-101761, EC-101613, Isolbel
3.	Moderately Susceptible (11-20% infection)	INRA-6501, Sunraj, Camp-7, KSP-2, KSF-4, R-3376, EC1153103, EC-165443, EC-162269, G101, Brejanske, Reliable, Cucciolo, EC-69874, EC-85816, EC-93614, EC-93101, EC-93902, EC-116209, EC-119210, Carnika, Sputnic, Suria, SS-56, Co-1, KBSH-1
4.	Susceptible (21-30% infection)	EC-153007, G-100, DK-39, ISA, ISARDO, Volgar, 291B, ACC No.61, ACC No. 87B, EC-61038, EC-63096, EC-75209, EC-85818, EC-112846, EC-13183, Bulgarian, AC No.-401, ACC No.207B, RHA-298, KSP-3, KSP-1, Adalid Supper, NSH-Helios DC-1, KSF-4, SH-3352, Advance, NSH-102, OML-17, EC-101575, EC-101617, Modern.
5.	Highly Susceptible (above 40% infection)	EC-68413, EC-68414, KSF-3300B, DCC No-88, EC-89093, EC-89100, EC-112844, HS-301, Krermurh, Sunrise, ACC No.433, KSP-7, EC-81836, TC-100101, EC-101489, EC-103042, ACC No.107, Pogin, MSFH-1, EC-44281, EC-109297, EC-119210, Suntop-268

Result and Discussion

It is evident from the Table 2 that the out of 110 varieties/cultivars screened so far 12 were proved resistant, 17 moderately resistant 26 moderately susceptible, 32 susceptible and 23 highly susceptible none of the variety / culture was found consistently immune to the disease. Thirty one varieties/cultivars showing resistant and moderately resistant reactions under natural conditions in two successive years (2010-2011

and 2011-2012) were further tested under artificial inoculation condition in the crop season of 2013. Plants of each variety/cultivars were raised from surface sterilized seeds in 60 cm. earthen pots filled with autoclaved soil.

Table 3 Reaction of Sunflower varieties /cultures against *Sclerotinia sclerotiorum* under artificial inoculation conditions.

Numerical Value	Category	Name of Variety /culture
0	Immune	Nil
1	Resistant	KSP-18, Comp-7, KBSH-1(A), EC-101763, EC-27314, EC-82362, EC-8582, EC-103045
2	Moderately resistant	EC-10517, EC-10615, EC-109287 Sunstar-277, KSF-1, KSF-2, Blumix, KSP-1, R-266, EC-89083, Yubilini-60
3	Moderately susceptible	Initiative, Pisa, Navinka, Majak, EC-8520, EC-101613, EC-113043
5	Highly Susceptible	Nil

The result presented in table 3 shows that under artificial inoculation conditions, Sunflower varieties/cultivars differed significantly in respect of their reaction against the pathogen out of 31 varieties /cultivars were found moderately resistant and only 8 varieties/cultivars were proved moderately susceptible. The experiment shows that none of the cultivar/germplasm was free from the disease in both the testing.

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