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SCREENING OF SAFFLOWER GERMPLASM AGAINST *ALTERNARIA* LEAF SPOT

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Abstract

The present study was made to evaluate safflower germplasm accessions for resistance against *Alternaria* leaf spot. Natural disease screening was carried out during *rabi* 2014-15 at College of Agriculture, Vijayapur, U.A.S., Dharwad by growing a total of 80 safflower germplasm accessions in an augmented design. Based on intensity of disease scoring 61 germplasms were shown susceptible reaction with the disease intensity of 50 -70 per cent and remaining all germplasms along with checks were classified under highly susceptible group with more than 70 per cent disease intensity. This study further substantiates the lack of high and stable sources of resistance to alternaria leaf spots among the germplasms in safflower.

Key words : Safflower, germplasm, *Alternaria* leaf spot, resistance.

Introduction

Safflower is an important *rabi* oilseed crop primarily grown for its much valued edible oil having world-wide acceptability for its health benefits especially to heart patients. In India, it is cultivated in an area of 1.5 lakh ha with a production of 1.13 lakh tons giving a productivity of 726 kg/ha. Maharashtra and Karnataka are the first and second with reference to area and production, respectively whereas, productivity is highest in West Bengal (1000 kg/ha) followed by Bihar (805 kg/ha) and Karnataka (719 kg/ha) (Indiastat, 2014). There are numbers of safflower varieties under cultivation in different agroclimatic region in India. Still the area under cultivation decreases day by day. Number of factors is responsible for decreasing area. Crop damage due to pest and disease is one of the major constraints. Among these two, the leaf spot disease caused by *Alternaria carthami* is a serious problem especially when wet cloudy weather prevails continuously for more than a week during flowering period. In India, the disease is reported to cause 25-60% yield loss (Singh and Prasad, 2005) and some times as high as 80-90%, when the disease appears at early stage of crop growth (Krishna Prasad, 1988).

Breeding safflower for disease resistance is the most economical and convenient method for controlling major diseases. Mundel and Huang (2003) described in detail how to control major diseases of safflower by breeding and using cultural practices. Though, germplasm lines or cultivars showing partial or full resistance to some of the major diseases have been identified, the availability of genetic resistance is rare. To overcome this problem, present study was carried out to find out germplasm accession for resistant to *Alternaria* disease.

Materials and Methods

Eighty germplasm of safflower including checks like A-1, A-2, NARI-6, PBNS-12, HUS-305 were screened for their reaction to Alternaria leaf spots at College Of Agriculture, Vijaypur, Karnataka during *rabi* 2014-15 considered as hot spot for the alternaria leaf spots in Karnataka. Since, there was a severe incidence of alternaria leaf spots due to prolonged wet and cloudy weather with intermittent drizzling at flowering stage of the crop, it offered an excellent opportunity for natural epiphytotic screening for tolerance to leaf spots caused by *Alternaria carthami*. The crop was sown using Augumented randomized block design with single row system. Each genotype was planted with 45 cm row spacing and 20 cm between the plants. Recommended agronomic practices and insect pest control measures were followed as per the package of practices of University of Agricultural Sciences, Dharwad, Karnataka (Anonymous, 2003). The observations were recorded on five plant basis, selected randomly from each replication of the individual genotype for percent disease index

(PDI). The disease severity was recorded at post-flowering stage/seed filling stage following standard disease scoring scale (Mayee and Datar, 1986). Further, the elite materials were categorized as highly resistant, resistant, moderately resistant, susceptible and highly susceptible based on 0 to 9 disease scale for *Alternaria* (table 1).

Results and Discussion

The occurrence of natural epiphytotics of *Alternaria* significantly reduce seed yield in safflower. It is one trait which requires attention especially in the current scenario of climatic uncertainty. Literature reveals that resistance to *Alternaria* leaf spot is genetically controlled by monogenic recessive gene and sources of resistance are available only in wild species because of the histological nature of epidermal tissues in those species. However, in the present investigation 150 germplasm accessions were screened for the identification of resistance or even tolerance for the disease. The incidence of *Alternaria* leaf spot was observed in the field under natural conditions and the results are presented in table 2. Accessions were grouped based on 0 to 9 disease rating scale. Sixty one accessions showed susceptible reaction with grade 7 and nineteen accessions showed highly susceptible reaction with grade 9. No resistance to *Alternaria* disease was found in the germplasm screened, indicating lack of tolerance or resistance in the cultivated genotypes especially under high disease pressure conditions. Hence, success- ful breeding for tolerance/resistance to alternaria leaf spot should involve wild sources of resistance like *Carthamus palaestinu*s, *C. lanatus*, *C. creticus* and *C. turkestanicus*, which were reported to be immune to *Alternaria carthami* (Prasad and Anjani,

Table 1 : Disease rating scale (Mayee and Datar, 1986).

Grade	Description	Category
0	No symptoms on leaves	Immune
1	Small, round brown spots covering 1% or less of the leaf	Highly resistant
3	Brown sunken spots covering 1-10% of the leaf area	Resistant
5	Brown spots enlarging to form circular spots covering 1-25% of the leaf Area	Moderately resistant
7	Circular , brown, sunken spots covering 26-50% of the leaf area	Susceptible
9	Circular to irregular, brown sunken spots covering 51% or more of the leaf Area	Highly susceptible

Table 2 : Reaction of safflower accessions to *Alternaria* leaf spot evaluated at College of Agriculture, Vijayapur during *rabi* 2014-15.

S. no.	Disease reaction	Disease grade	P.D.I	Number of accessions	Accession
1.	Immune (0 %)	0	0	00	None
2.	Resistant (0-10 %)	1	0	00	None
3.	Moderately resistant (11-25%)	3	0	00	None
4.	Moderately susceptible (26-50%)	5	35-48	00	None
5.	Susceptible (51-75%)	7	50-70	61	PI-209297, PI253531, PI544033, PI253523, PI193473, PI181866, PI209289, PI237547, PI209287, PI209295, PI406015, PI283764, PI562638, PI543995, PI257582, PI613394, PI253541, PI304595, PI560172, PI273876, PI305529, PI253543,PI248808, PI254976, PI237549, PI306974, PI279091, PI407624, PI537682, PI286199 , PI537659, PI262430, Joladarasi,Chelguruki-1,Chelguruki-2, Chelguruki-3,Chelguruki-4,ASC-1,ASC-2,ASC-3,ASC-4, APSC-1, APSC-2, S-144,A-300, ASA-04,ASA-07,NARI-55, AKA-98-4, PI307055, PI312275, PI506427, PI311738, PI237548, PI560192 PI253908, NARI-6, A-2, PBNS-12.
6.	Highly susceptible (>75%)	9	78-89	19	PI300800, PI273876, PI386174, PI405984, PI291600, PI22699, PI560175, PI250202, PI250833, PI407624, Bhima, 98-25, ASGPM-07, ANN-02-04, EC-2, 98-25, A-1, HUS-305.

2008). The present study further substantiates the lack of high and stable sources of resistance to alternaria leaf spots among the cultivated genotypes of safflower.

It is already confirmed by earlier studies of Madhavi *et al*. (2005), Prasad and Anjani (2008), Gud *et al*. (2008), Murumkar *et al*. (2009), Gerald (2010) and Xu *et al*. (2011) that there is no resistance available in the cultivated genotypes of safflower. Safflower is seriously affected by the *Alternaria* leaf spot disease leading to severe yield loss. An attempt was made to screen and evaluate the germplasm accessions under natural field conditions. Screening for *Alternaria* disease revealed no resistance in the accessions studied.

The resistant wild species would serve as base material in disease resistance breeding programmes as well as to tag the resistant genes at molecular level for marker assisted selections in the field for *Alternaria* resistance.

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