

RESEARCH ARTICLE :

Screening of safflower germplasm/advanced material /parental lines against major disease Alternaria leaf spot

■ S.V. PAWAR, S.B. GHUGE, V.M. GHOLVE AND D.S. SUTAR

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SUMMARY : A field experiment with two replications was conducted at the All India Co-ordinated Research Project (AICRP) on oilseeds Safflower at Vasantrya Naik Marathwada Krishi Vidhyapeeth (VNMKV) Parbhani, Maharashtra (India) for the screening of different safflower germplasm/advanced material /parental lines against major disease Alternaria leaf blight. The experiment was conducted with four checks in the year *Rabi* 2016. Significant differences in resistance to the disease was found in the germplasm/advanced material /parental lines tested. Among the 16 lines, 12 lines registered tolerant, 2 lines registered susceptible and 2 lines showed highly susceptible reaction against Alternaria leaf spot. This study concludes that screening of safflower germplasm/advanced material /parental lines for resistance/tolerance to the disease Alternaria leaf spot is an important step in developing varieties/hybrids.

KEY WORDS :

Safflower germplasm, Alternaria, Leaf spot

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BACKGROUND AND OBJECTIVES

Safflower (*Carthamus tinctorius* L.) occupies prominent place in the agricultural wealth and economy of India. It belongs to family Compositae and believed to be native of Afghanistan. The word *Carthamus* is an Arabic word *quartum* (means the colour of dye obtained from florets). It is described as “*Kusumbha*” in ancient Sanskrit literature. Other Indian names, like *Kusum*, *Karrad* (Hindi), *Kusumpuli* (Bengali), *Kusumbo* (Gujrathi), *Kardi*, *Kurdi* (Marathi),

Sendurakam (Tamil), *Kusuma* (Telugu), *Kusube*, *Kusume* (Kannada), *Kusumba* (Punjabi) seem to have been derived from “*Kusumbha*”. Safflower (*Carthamus tinctorius* L.) is affected by a number of diseases. Alternaria leaf spot, caused by *Alternaria carthami* Chowdhury is one of the major fungal diseases of safflower (Deokar *et al.*, 1991). It is serious in India when wet cloudy weather prevails continuously for more than a week during flowering period. Reports indicate considerable yield loss from the disease in USA (Zimmer, 1963 and Crowell,

Author for correspondence :

S.V. PAWAR

All India Co-ordinated
Research Project on
Safflower, Vasantrya
Naik Marathwada Krishi
Vidyapeeth, PARBHANI
(M.S.) INDIA
Email : pawarsv99@
gmail.com

See end of the article for
authors' affiliations

1973) and Australia (Irwin, 1976). In India the disease is reported to cause 25-60 % seed yield loss every year (Singh and Prasad, 2005). Survey on intensity of *Alternaria* leaf blight of safflower in northern India revealed 27-90% seed yield loss when the disease appears at early stage of crop growth (Krishan Prasad, 1988). The disease *Alternaria* leaf blight of safflower is wide spread and have continued to be the major constraints in the production and productivity of safflower all over the country in general as well as particularly in the state of Maharashtra. It is seed borne or air borne and produces large irregular lesions on the foliage, stem and flower bracts, (Chowdhury, 1944 and Irwin, 1975 and 1976) and finally the leaf spot leads to blight symptoms (Ray and Basuchoudhary, 1984). The pathogen survives in seed and infected plant debris. Primary infection develops from infected seed; secondary infection takes place through airborne conidia. Considering the more economic losses to the crop the present investigation was undertaken.

Objectives:

- To find the level of resistance/tolerance against *Alternaria* leaf blight among the safflower germplasm/advanced material /parental lines
- To find the promising lines resistance/tolerance against *Alternaria* leaf blight from germplasm/advanced material /parental lines
- To decrease yield loss from *Alternaria* leaf blight in Safflower

RESOURCES AND METHODS

The seeds of the experiment were received from ICAR -IIOR Indian Institute of Oil Seed Research Hyderabad. The experiment was conducted at the field of AICRP (safflower), Department of Agricultural Botany, Vasantrya Naik Marathwada Krishi Vidhyapeeth, Parbhani during *Rabi* season of 2016-17. The screening of lines against major disease (*Alternaria* leaf blight) was done in two replications. Sixteen germplasm/advanced material /parental lines were screened in the field under natural epiphytotic condition during pre *rabi* season, 2016. The sowing was done in the second fortnight of August to gain the congenial atmosphere for the development of the air borne disease *Alternaria* leaf blight. The test lines were sown in a Randomized Block Design with the gross plot size having a single row of 5.0 m. The distance between rows was kept 30 cm and plant to plant distance

was kept 15 cm as closer distance favor the disease development. *Alternaria* susceptible genotypes Manjira, resistant genotype HUS-305, national check PBNS-12 and A-1 were sown after every fifth row of test lines. Recommended agronomic practices and insect pest control measures were followed as per the package of practices published by Vasantrya Naik Marathwada Krishi Vidhyapeeth, Parbhani, Maharashtra (Anonymous, 2004). The sprinkler irrigation was given at evening for two hours as per needs for the development and spread of the disease. Further, the lines were categorized as highly resistant, resistant, moderately resistant, susceptible and highly susceptible based on 0 to 9 disease scale for *Alternaria* (Table A). Per cent disease score was calculated as per the standard area diagram developed by Mayee and Datar (1986). For this purpose five leaves located at the bottom, five in the middle and five at the top of the plant were chosen and scored as per scale given subsequently.

| Disease incidence (0-9) scale | Disease incidence (%) | Reaction |
|-------------------------------|-----------------------|----------------------|
| 0 | No symptoms | Immune |
| 1 | < 1 | Resistant |
| 3 | 1-10 | Moderately resistant |
| 5 | 11-25 | Tolerant |
| 7 | 26-50 | Susceptible |
| 9 | >50 | Highly susceptible |

| Disease incidence (0-9) scale | Disease incidence (%) | Reaction |
|-------------------------------|-----------------------|----------------------|
| 0 | No wilting | Immune |
| 1 | < 1 | Resistant |
| 3 | 1-10 | Moderately resistant |
| 5 | 11-20 | Tolerant |
| 7 | 21-50 | Susceptible |
| 9 | 51 and above | Highly susceptible |

OBSERVATIONS AND ANALYSIS

Continuous efforts to locate resistant sources and their utilisation in resistance breeding programme are imperative to manage the diseases in the long run. Screening was therefore undertaken to evaluate a large number of line collections against major disease *Alternaria* leaf spot during the *Rabi* season 2016. The germplasm/advanced material /parental lines of safflower were

Table 1 : Screening of safflower germplasm/advanced material / parental lines against major disease (*Alternaria*)

| Disease incidence (0-9) scale | Accessions | Disease Reaction (%) |
|-------------------------------|---|-------------------------------|
| 0 | --- | Immune |
| 1 | ---- | < 1 (Resistant) |
| 3 | --- | 1 – 10 (M.Resistant) |
| 5 | Nari-P-26, W-521-3, Nari-P-22, Nari-P-25, GMU-7396, Nari-P-27, Nari-P-24, SAF-15-21, Nari-P-21, DSI-116, Nari-P-23, GMU-3705/6, GMU-3705/6 (12) | 11 -25 (Tolerant) |
| 7 | Nari-P-28, SAF-15-07 (02) | 26 – 50 (Susceptible) |
| 9 | GMU-3705, DSI-108 (02) | 51 and above (H. Susceptible) |
| Total | 16+4 (Checks) | |

evaluated based on 0 to 9 disease rating scale. The reaction of the different lines is presented in Table 1. Significant variations in disease severity, index (o to 9 scale) for major disease *Alternaria* leaf spot of safflower were observed in various lines. Out of the 16 germplasm/ advanced material /parental lines/collections evaluated, onlylines viz., Nari-P-26, W-521-3, Nari-P-22, Nari-P-25, GMU-7396, Nari-P-27, Nari-P-24,SAF-15-21, Nari-P-21, DSI-116,Nari-P-23 and GMU-3705/6 total twelve (12) registered tolerant reaction. Two lines viz., Nari-P-28, SAF-15-07 were found susceptible and two lines viz., GMU-3705, DSI-108 found highly susceptible to *Alternaria* leaf spot.

These findings will help to develop a new set of agronomically desirable decease-resistant varieties / hybrids to enhance and sustain safflower productivity.The present study revealed that out of the 16 lines tested only 12 lines registered tolerant reaction and 2 lines recorded susceptible and two lines found highly susceptible to *Alternaria* leaf spot while susceptible check Manjira exhibited maximum rating scale of 9.0.This suggests that disease the disease development was highly satisfactory and the categorization of materials into different classes is appropriate.Thus, it can be emphasized from the results that the identified tolerant lines hold excellent promise for tolerance against major disease *Alternaria* leaf spot and can be used for developing variety /hybrids and composites in future programme of breeding for *Alternaria* leaf spot disease tolerance with due care.

This study confirms that differences in resistance –

Table 2 : Screening of safflower germplasm/advanced material / parental lines against *Alternaria*

| Sr. No. | Name of lines | Mean | Reaction |
|---------|---------------|-------|----------------|
| | HUS-305 | 10.4 | M.Resistant |
| | MANJIRA | 66.5 | H. Susceptible |
| | A-1 | 20 | Tolerant |
| | PBNS-12 | 19 | Tolerant |
| 1. | Nari-P-28 | 28 | Tolerant |
| 2. | Nari-P-26 | 21.5 | Tolerant |
| 3. | W-521-3 | 18 | Tolerant |
| 4. | Nari-P-22 | 24.5 | Tolerant |
| 5. | Nari-P-25 | 21.5 | Tolerant |
| | HUS-305 | 9 | M.Resistant |
| | MANJIRA | 70.5 | H. Susceptible |
| | A-1 | 19.5 | Tolerant |
| | PBNS-12 | 21 | Tolerant |
| 6. | GMU-7396 | 22 | Tolerant |
| 7. | DSI-108 | 52.5 | H. Susceptible |
| 8. | SAF-15-07 | 26.5 | Tolerant |
| 9. | Nari-P-27 | 23.5 | Tolerant |
| 10. | Nari-P-24 | 20 | Tolerant |
| | HUS-305 | 08 | M.Resistant |
| | MANJIRA | 70.5 | H. Susceptible |
| | A-1 | 21.5 | Tolerant |
| | PBNS-12 | 22.5 | Tolerant |
| 11. | SAF-15-21 | 21 | Tolerant |
| 12. | Nari-P-21 | 24 | Tolerant |
| 13. | DSI-116 | 19 | Tolerant |
| 14. | Nari-P-23 | 21 | Tolerant |
| 15. | GMU-3705/6 | 19.5 | Tolerant |
| 16. | GMU-3705 | 76.5 | H. Susceptible |
| | HUS-305 | 7 | M.Resistant |
| | MANJIRA | 80 | H. Susceptible |
| | A-1 | 25 | Tolerant |
| | PBNS-12 | 23 | Tolerant |
| | S.E.±3.53 | | |
| | C.D. (P=0.05) | 10.24 | |
| | CV18.73 | | |

tolerance to *Alternaria* leaf spot diseases exit in germplasm/parental lines of safflower. The resistant – tolerance nature of parental /germplasm lines observed in present field trials confirmed the reports by Singh *et al.* (1987); Borkar and Shinde (1988); Zad (1992); Khanam (1993); Ismail *et al.* (2004) and Pawar *et al.* (2013) These finding suggest that it is possible to improve an existing lines through further selection and screening of the progenies of the paental/germplam line.



Alternaria leaf spot of Safflower



Microphotography of Safflower *Alternaria* leaf spot



Particular symptom of *Alternaria* leaf spot of safflower



Overview of screening of safflower germplasm/advanced material /parental lines against *Alternaria*



Overview of Screening of Safflower germplasm/advanced material /parental lines against *Alternaria*

Authors' affiliations :

S.B. GHUGE, V.M. GHOLVE AND D.S. SUTAR, All India Co-ordinated Research Project on Safflower, Vasantrao Naik Marathwada Krishi Vidyapeeth, PARBHANI (M.S.) INDIA

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