

**RESEARCH ARTICLE :**

Screening of safflower varieties / cultivars, genotypes and germplasm lines against *Alternaria carthami*

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SUMMARY : Safflower is one of the most important oilseed crop grown in India and there are several cultivars and varieties available but fragmented information available their reaction against pathogen particularly *Alternaria* blight (*Alternaria carthami*). There is the absolute need to screening under epiphytotic condition during the year 2013-14 and 2014-15. In the year 2013-14 total 36 test entries of safflower exhibited different reactions against *A. carthami*. However, three entries viz., HUS-305, DSH-242 and A-1 showed tolerant reaction with mean blight intensity in the range of 18.64 to 24.64 per cent; 14 entries showed susceptible reaction with moderate mean blight intensity in the range of 26.47 to 50.25 per cent and 19 entries exhibited highly susceptible reaction with higher mean blight intensity in the range of 51.50 to 87.92 per cent. None of the safflower entry was found immune or resistant or moderately resistant to the disease. During 2014-15, 39 test entries of safflower exhibited different reactions. However, three entries viz., DSF-2014, PBNS-84 and PBNS-122 showed tolerant reaction with mean blight intensity in the range of 20.17 to 25.00 per cent; 25 entries showed susceptible reaction with moderate mean blight intensity in the range of 26.15 to 50.13 per cent and 11 entries exhibited highly susceptible reaction with higher mean blight intensity in the range of 56.50 to 85.15 per cent. None of the safflower entry was found immune or resistant or moderately resistant to the disease.

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BACKGROUND AND OBJECTIVES

Safflower (*Carthamus tinctorious*) is an important oilseed crop, belonging to the family Composite and believes to be native of Afghanistan. In India it is most commonly known as Kardai in Marathi and Kusum in Hindi. Its cultivation is spread over various

parts of the world both in tropical and temperate countries. Safflower, a multipurpose crop has been grown for the orange red dye (*carthamin*) extracted from it is brilliant coloured flowers and for its quality oil (30 % rich in polyunsaturated fatty acids (Linoleic acid, 78%). Safflower is known to have many medicinal properties for curing several chronic

diseases and is widely used in Chinese herbal preparations. The tender leaves, shoots and thinning of safflower are used as pot herb and salad. It is rich in Vitamin-A, Iron, Phosphorus and Calcium. Bundles of young plants are commonly sold as green vegetables in market in India and some neighboring countries by Nimbkar (2002).

Like other agronomical crops, safflower is also affected by many biotic and abiotic stresses/agents. Of the biotic agents, fungi cause major diseases, followed by bacteria, viruses and nematodes. Major safflower diseases caused by fungi are: Leaf spot/blight (*Alternaria carthami*), Wilt (*Fusarium oxysporum* F. Sp. *carthami*), Root rot (*Rhizoctinia bataticola*), Powdery mildew (*Erysiphe cicutaria* DC) and Anthracnose (*Colletotrichum capsici*); by the bacteria is Leaf blight/spot (*Pseudomonas syringae* Van Hall); by the viruses are: Mosaic (Cucumber mosaic virus), Necrosis (Tobacco streak virus) and Root knot (*Melioidogyne hapla*) nematode disease by Bhale *et al.* (1998). Among these diseases, under present situation leaf spot/blight caused by *Alternaria carthami* (Choudhary) has become one of the major constraints in the production and productivity of safflower in the country in general as well as in the state of Maharashtra particularly. The disease (*A. carthami*) has been reported to cause 25 to 60 per cent yield losses in safflower (Singh and Prasad, 2005). The disease has been also reported to reduce drastically the seed size, seed volume test as well as per cent oil content.

Typical symptoms of the disease (*A. carthami*) appeared as irregular necrotic lesions on leaves and stem. Dark necrotic lesions 2-5 mm in diameter are firstly found on hypocotyls and cotyledons. In mature plant, small brown to dark brown concentric spot of 1-2 mm appear on leaves and brown discoloration appear on the stem, dark brown spot with concentric ring upto 1 cm in diameter appear on leaves which later developed in to large lesion.

Now-a-day the occurrence of safflower blight is the major threat for oilseed crop production so recent study conducted to evaluate different cultivars / varieties against test pathogen so as to minimize the problem and required cost for management of *Alternaria* blight disease

RESOURCES AND METHODS

Screening of safflower varieties / cultivars,

germplasm lines and elite lines against *A. carthami*:

The field experiments were conducted under AICRP (Safflower) at Vasant Rao Naik Marathwada Krishi Vidyapeeth, Parbhani during *Rabi* seasons of 2013-14 and 2014-15 to assess the reactions of safflower varieties / cultivars, germplasm lines and elite lines, against *A. carthami*, under natural epiphytotic. A total of 36 entries supplied by DOR, Hyderabad were sown at 30 x 15 cm spacing, maintaining two rows of 4.0 m/length per test entry and after five test entries, two rows of safflower cv. MANJIRA (Susceptible) were sown. All the test entries were replicated twice.

Superimposed observations on *Alternaria* blight disease intensity were recorded on five randomly selected plants / entry, applying 0-9 grade disease rating scale (Mayee and Datar, 1986) at 15 days interval starting first observation at initiation of the disease and last at 15 days after before harvest of the crop.

Disease rating	Area affected (%)	Disease reaction
0	No disease	Immune (I)
1	< 1	Resistant (R)
3	01 to 10	Moderately resistance (MR)
5	11 to 25	Tolerant (T)
7	26 to 50	Susceptible (S)
9	51 and above	Highly susceptible (HS)

Per cent *Alternaria* blight disease intensity (PDI) was worked out by applying following formula given by McKinney (1923).

$$PDI = \frac{\text{Summation of numerical ratings observed}}{\text{No. of leaves / plants observed} \times \text{maximum grade}} \times 100$$

OBSERVATIONS AND ANALYSIS

The results obtained from the present study as well as discussions have been summarized under following heads:

Reactions of safflower entries :

Results (Table 1) revealed that during 2013-14, natural epiphytotic of *A. carthami*, all 36 test entries of safflower exhibited different reactions against *A. carthami*. However, three entries *viz.*, HUS-305, DSH-242 and A-1 showed tolerant reaction with mean blight intensity in the range of 18.64 to 24.64 per cent; 14 entries *viz.*, PBNS-125, SSF – 1109, PBNS – 124, DSI – 116,

Table 1 : Reactions of safflower cultivars, germplasm lines against *Alternaria* blight disease during Rabi, 2013-14

Sr. No.	Entries	Av. PDI (%)	Reactions	Sr. No.	Entries	Av. PDI (%)	Reactions
1.	JSI - 120	60.45	HS	19.	AKS - 327	66.72	HS
2.	PBNS-125	33.35	S	20.	DSI - 115	79.45	HS
3.	SSF - 1109	46.50	S	21.	PBNS - 122	64.72	HS
4.	NARI - 198	60.52	HS	22.	DSI - 113	51.50	HS
5.	PBNS - 12 (Check)	69.43	HS	23.	HUS-305	24.64	T
6.	DSI - 118	87.92	HS	24.	JSI - 117	64.42	HS
7.	AKS / GMU-4576	79.54	HS	25.	DSI - 114	50.25	S
8.	JSI - 118	69.90	HS	26.	SSF - 1201	31.44	S
9.	PBNS - 124	48.85	S	27.	ASF - 1302	33.28	S
10.	SSF - 1102	67.70	HS	28.	AKS - 326 (AVT - I)	27.84	S
11.	DSI - 117	80.42	HS	29.	DSH - 242 (IHT)	18.64	T
12.	NARI - 97	69.45	HS	30.	NARI - 95 (AVT - I)	33.45	S
13.	ASF - 1301	70.52	HS	31.	DSH - 250 (AHT - I)	26.47	S
14.	JSI - 119	82.50	HS	32.	NARI-H-15 (Hybride check)	44.64	S
15.	DSI - 116	49.75	S	33.	DSH - 249 (AHT - I)	33.15	S
16.	PBNS - 123	58.60	HS	34.	PBNS - 12 (Check)	30.15	S
17.	SSF - 1215	72.55	HS	35.	PBNS - 120 (AVT - I)	32.10	S
18.	NARI - 96	70.72	HS	36.	A-1	21.64	T
S.E. _±		--	--	--	--	--	2.90
C.D. (P = 0.05)		--	--	--	--	--	8.10
CV		--	--	--	--	--	11.8

Table 2 : Reactions of safflower cultivars, germplasm lines against *Alternaria* blight disease during Rabi, 2014-15

Sr. No.	Entries	Av. PDI (%)	Reactions	Sr. No.	Entries	Av. PDI (%)	Reactions
1.	PBNS-116	43.10	S	22.	PBNS-122	20.17	T
2.	NARI-P ₆	45.00	S	23.	DSF-104	66.00	HS
3.	NARI-P ₃	30.15	S	24.	SSF-1308	45.25	S
4.	PBNS-72	65.00	HS	25.	NARI-P ₂	50.13	S
5.	DSI-100	45.25	S	26.	PBNS-33	47.50	S
6.	DSF-2014	25.00	T	27.	NARI-P ₅	66.00	HS
7.	PBNS-84	20.50	T	28.	NARI-P ₈	75.65	HS
8.	SSF/GMU 4912	30.35	S	29.	SSF-1310	41.00	S
9.	DSI-114	26.15	S	30.	DSI-106	35.70	S
10.	DSI-103	56.50	HS	31.	SSF-1374	85.12	HS
11.	NARI-P ₇	32.52	S	32.	DSF-4	26.13	S
12.	DSI-118	36.45	S	33.	NARI-P ₁	41.15	S
13.	PBNS-58	50.00	S	34.	DSF-5	35.00	S
14.	DSI-116	59.50	HS	35.	DSI-101	85.00	HS
15.	SSF -12 13-1	38.12	S	36.	NARI-P ₄	26.25	S
16.	SSF-1302	70.00	HS	37.	SAF 1205-2	41.00	S
17.	PBNS-123	59.51	HS	38.	WSAF- 1205-1	35.00	S
18.	PBNS-114	38.50	S	39.	SSF -1344	85.15	HS
19.	SSF/GMU -6878	44.50	S	S.E. _±			2.9
20.	SSF-1341	50.24	S	C.D. (P = 0.05)			8.1
21.	DSI-105	36.50	S	C.V.			11.8

DSI – 114, SSF – 1201, ASF – 1302, AKS – 326, NARI – 95, DSH – 250, NARI-H-15, DSH – 249, PBNS – 12 and PBNS – 120 showed susceptible reaction with moderate mean blight intensity in the range of 26.47 to 50.25 per cent and 19 entries viz., JSI – 120, NARI – 198, PBNS – 12, DSI – 118, AKS / GMU-4576, JSI – 118, SSF – 1102, DSI – 117, NARI – 97, ASF – 1301, JSI – 119, PBNS – 123, SSF – 1215, NARI – 96, AKS – 327, DSI – 115, PBNS – 122, DSI – 113 and JSI – 117 exhibited highly susceptible reaction with higher mean blight intensity in the range of 51.50 to 87.92 per cent. None of the safflower entry was found immune or resistant or moderately resistant to the disease.

Results (Table 2) revealed that during 2014-15, under natural epiphytotics of *A. carthami*, all 39 test entries of safflower exhibited different reactions against *A. carthami*. However, three entries viz., DSF-2014, PBNS-84 and PBNS-122 showed tolerant reaction with mean blight intensity in the range of 20.50 to 25.00 per cent; 25 entries viz., PBNS-116, NARI-P₆, NARI-P₃, DSI-100, SSF/GMU 4912, DSI-114, NARI-P₇, DSI-118, PBNS-58, PBNS-114, SSF/GMU -6878, SSF-1341 and DSI-105 showed susceptible reaction with moderate mean blight intensity in the range of 26.15 to 50.13 per cent and 11 entries viz., PBNS-72, DSI-103, DSI-116, SSF-1302, PBNS-123, DSF-104, NARI-P₅, NARI-P₈, SSF-1374, DSI-101 and SSF -1344 exhibited highly susceptible reaction with higher mean blight intensity in the range of 56.50 to 85.15 per cent. None of the safflower entry was found immune or resistant or moderately resistant to the disease.

These results are in conformity most of the entries / varieties with the findings of those reported earlier by several workers against, *Alternaria carthami* of safflower Indi *et al.*, 2004; Harishbabu *et al.*, 2005; Murumkar *et al.*, 2009; Balode *et al.*, 2012; Anonymous, 2013; Ghuge *et al.*, 2013; Pawar *et al.*, 2013 and Gholve *et al.*, 2015.

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REFERENCES

Anonymous (2013). Safflower Annual Progress Report, 2013-

14. Directorate of Oilseeds Research, Rajendranagar, Hyderabad. pp. 105-121.

Balode, K.L., Mane, P.N., Rathod, P.K. and Deshmukh, S.N. (2012). Evaluation of safflower germplasm for resistant to *Alternaria* leaf spot. *J. Oilseeds Res.*, **29** (Spl. Issue) : 97-99.

Bhale, M.S., Bhale, U. and Khare, M.N. (1998). Disease of important oilseed crops and their management. In : Pathological problems of economic crop plants and their management. (Eds. S.M. Paul Khurana), *Scientific Publishers*, Jodhpur, pp. 251-279.

Gholve, V.M., Taware, M.R. and Ghuge, S.B. (2015). Screening of safflower germplasm lines against *Alternaria carthami* under artificial epiphytotics. *Trends Biosci.*, **8** (1) : 61-63.

Ghughe, S.B., Zote, A.K., Patange, M.J. and Mehtre, S.P. (2013). Screening of selected elite materials against *Alternaria* (major disease) of safflower. In : National Symposium on Plant Diseases : Diagnostics and Integrated Disease Management for Food Security, December 27-28, 2013, VNMKV, Parbhani : 131.

Harishbabu, B.N., Rudra Naik, V., Hanumantharaya, L., Raju, S.G. and Yaragoppa, S.D. (2005). Evaluation of promising lines of safflower for *Alternaria* tolerance, seed yield and its components. *Karnataka J. Agric. Sci.* : 803-806.

Indi, D.V., Murumkar, D.R., Patil, A.J. and Akashe, V.B. (2004). Screening of safflower germplasm against *Alternaria* leaf spot under field conditions. *J. Maha. Agric. Univ.*, **29** (3) : 344-346.

Mayee, C.D. and Datar, V.V. (1986). *Phytopathomethory*: Technical Bulletin Published by Marathwada Agricultural University, Parbhani (M.S.) India. pp. 100-104.

McKinney (1923). A new system of grading plant diseases. *J. Agric. Res.*, **26** : 195-218.

Murumkar, D.R., Gud, M.A., Akashe, V.B., Shinde S.K. and Kadam, J.R. (2009). Identification of source of resistance to major diseases and pest of safflower. *J. Pl. Dis. Sci.*, **4** (1) : 107-109.

Nimbkar, N. (2002). Safflower rediscovered Times. *Agric. J.*, **2** : 32-36.

Pawar, S.V., Dey, U., Munde, V.G., Hulagappa and Nath, A. (2013). Screening of elite material against major diseases of safflower under field conditions. *African J. Agric. Res.*, **8** (2) : 230-233.

Singh, V. and Prasad, R.D. (2005). Integrated management of pests and diseases in safflower. Directorate of Oilseeds Research, Hyderabad, India pp. 49.

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