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Reaction of Safflower Advanced Breeding Lines To Leaf Spots Caused by *Alternaria carthami*

B.N. HARISH BABU AICRP (Safflower), ARS, Annigeri and College of Horticulture, Hiriyur-577 598, Karnataka, India

B.N. GEETHA KUMARI Krishi Vigyana Kendra, Hiriyur, UAHS, Shimoga, Karnataka, India

ABSTRACT

Safflower is an important rabi oilseed crop which has immense medicinal value for various ailments. Leaf spots caused by Alternaria cartahmi is one of the major biotic stresses causing considerable yield loss. Fifteen advanced breeding lines along with checks were screened for tolerance to leaf spots caused by Alternaria carthami under natural conditions of high disease pressure during rabi 2009 at Agricultural Research Station, Annigeri, Dharwad (Karnataka), an important hotspot for this disease. Significant differences were observed among the genotypes for per cent disease index (PDI) and seed yield. High yielding advanced breeding lines ASA-07, AS-96-1-2 and AS-19 showed highly susceptible reaction to leaf spots with PDI > 90 per cent. A non-spiny breeding line A-98-04 and two spiny genotypes (AS-99-1-2-5 and AS-B-02-03) showed susceptible to moderately susceptible reaction as that of NARI-6 but were poor yielders. This study further substantiates the lack of high and stable sources of resistance to alternaria leaf spots among the cultivated genotypes of safflower.

KEYWORDS : – Safflower, Advanced breeding lines, Alternaria, Leaf spots

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 has been cultivated on an area 2.95 lakh ha with a production and productivity of 1.89 lakh tonnes and 650 Kg/ha, respectively. Maharashtra, Karnataka, Andhra Pradesh and Gujarat are the major safflower growing stats in the country. Although the safflower oil has proven health benefits particularly for heart patients, the area under this crop has been declining over the years due to biotic and abiotic stresses coupled with spiny nature of the crop (Hedge *et al*., 2003). In Karnataka, chief production constraints of safflower include biotic stresses like aphids and alternaria leaf spots. 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).

MATERIAL AND METHODS

Fifteen advanced breeding lines of safflower including national and local checks were screened for their reaction to Alternaria leaf spots at Agricultural Research Station, Annigeri, Dharwad, Karnataka during *rabi* 2009-10, 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 randomized block design with three replications. The plot size of 2.7 x 5 m was used for each genotype for each replication. Each genotype was planted with 45 cm row spacing and 20 cm between the plants. The observations were recorded on 10 plant basis, selected randomly from each replication of the individual genotype for seed yield and on 5 plant basis 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). The data on yield per plant and oil content (%) was also recorded from each of the accessions after harvesting of the crop.

RESULTS AND DISCUSSION

The genotypes exhibited significant differences for seed yield and PDI but not for oil content. The advanced breeding lines ASA-07, AS-96-1-2 and AS-19 found to be the best yielding genotypes compared to check varieties but showed highly susceptible reaction with > 90 per cent disease severity. None of the test entries showed tolerant reaction to alternaria leaf spot disease (Table 1).

The non-spiny check, NARI-6 has been reported to be highly stable in terms of seed yield (Patil *et al*., 1992 and Parameshwarappa *et al*., 1993) has shown lowest disease severity among the test entries but with recorded low seed yield compared to spiny checks and other high yielding spiny genotypes. The non-spiny advanced breeding line A-98-04 was comparable to NARI-6 in terms of disease severity and recorded marginally higher seed yield than NARI-6 indicating moderately susceptible reaction to alternaria leaf spots under high disease pressure. This finding supports the earlier reports that, the non-spiny genotypes were relative less susceptible to leaf spots than the spiny types (Cervantes *et al*., 2001; Harish Babu *et al*., 2005). However, spiny genotypes AS-99-1-2-5 and AS-B-02-03 also exhibited moderately susceptible reaction similar to that of non-spiny genotypes indicating lack of tolerance or resistance in the cultivated genotypes especially under high disease pressure conditions. Hence, successful breeding for tolerance/resistance to alternaria leaf spot should involve wild sources of resistance like *Carthamus palaestinus*, *C. lanatus*, *C. creticus* and *C. turkestanicus* which were reported to be immune to *Alternaria carthami* (Prasad and Anjani, 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.

Table 1. Mean seed yield, oil content and percent disease index (PDI) of safflower advanced breeding lines

Sl. No.	Genotype	Seed Yield (Kg/ha)	Oil content (%)	PDI (%)
1	AS-98-64	679.01	27.36	100.0
2	AS-96-1-2	971.60	28.12	91.1
3	AS-99-1-2-5	800.00	28.31	82.2
4	AKA-98-4-1	841.97	27.44	95.6
5	ASA-07	1030.86	28.61	91.1
6	ASGPM-07	634.57	27.42	91.1
7	ASA-04	875.31	28.06	91.1
8	AKA-98-4-2	885.18	28.32	95.6
9	AS-99-2-3	858.02	27.64	95.6
10	AS-19	890.12	27.66	100.0
11	AS-B-02-03	691.36	27.82	82.2
12	A-98-04	786.54	28.02	73.3
13	A-1 (NC)	865.93	27.11	86.7
14	A-2 (LC)	807.41	29.34	95.6

15	Nari-6	749.38	28.66	73.3
	CD at 5%	154.77	1.34	10.6
	CV (%)	21.53	4.87	13.47

NC- National Check; **LC**- Local Check **PDI**- Per cent Disease Index

REFERENCES

1. Cervantes-Martinez, J.E., Rey-Ponce, M and Velazquez-Cagal, M. 2001. Evaluation of accessions from world collection of safflower for Alternaria incidence and seed oil content. In *Proceedings of the 5th International Safflower Conference*, Williston, ND, and Sidney, MT, July 23–27, 2001. Bergman, J.W. and H.H. Mundel, Eds., p. 163.
2. Harish Babu, B.N., Rudra Naik, V., Hanumantharaya, L., Raju, S.G., and Yaragoppa, S.D., 2005, Evaluation of Safflower breeding lines of safflower for *Alternaria* tolerance, seed yield and its components. Karnataka Journal of Agricultural Sciences, 18(3): 803-806
3. Hegde, DM and Ramanjuneyulu, GV., 2003, Diversified uses of Safflower. Directorate of Oilseed Research, Rajendra nagar, Hyderabad. Pp. 1-18
4. Krishna Prasad, N. V . 1988 Studies on the Alternaria leaf blight of safflower (*Carthamus tinctorius* L.) Ph.D., Thesis, Varanasi : Benaras Hindu University. P.168.
5. Mayee, C. D. and Datar, V. V. 1986 Diseases of safflower, Phytopathometry, a technical bulletin published by Marathwada Agricultural University, Parbhani (MS), India, pp.100-104.
6. Patil, PS, Patil AM, and Deokar, AB, 1992, Stability of yield in rainfed and irrigated Safflower. Journal of Maharashtra Agricultural Universities, 17: 66-69.
7. Parameshwarappa, KG, Giriraj, K, Gulaganji, GG and Ravi Kumar, RL, 1993, Parameters for seed yield, oil and hull content in safflower. International Safflower Conference, Beijing, China. Pp. 589-593
8. Prasad, R.D. and Anjani, K. 2008 Sources of resistance to Alternaria leaf spot among *Carthamus* wild species. 2008 Safflower: Unexploited potential and world adaptability. *Proceedings of the 7th International Safflower Conference,*Wagga Wagga, New South Wales, Australia.
9. Singh, V and Prasad, R. D. 2005 Integrated management of pests and diseases in safflower. Directorate of Oilseeds Research, Hyderabad, India, pp 49.