SCREENING OF INDIAN MUSTARD GERMPLASM AGAINST WHITE RUST RESISTANCE (ALBUGO CANDIDA (LEV) KUNTZ)

P.P.Gupta, P.Kumar, P.R.Kumar, Dhiraj Singh
Indian Council of Agricultural Research,
Haryana Agricultural University,
Hisar-125 004, INDIA

INTRODUCTION

Crop Brassicas commonly referred to as rapeseed-mustard comes next to groundnut and constitute a group of oilseed crops comprising two distinct types i.e., i) autogamous Yellow Sarson and Tora type Brown Sarson (Brassica campestris) and Indian mustard (Brassica juncea); ii) allogamous - Brown Sarson (Lotni type) and Toria (Brassica campestris) and Taramira (Eruca sativa). These crops are grown under wide range of agro-climatic conditions. Indian mustard (Brassica juncea,L), which is most important member of group, accounting for more than 70 per cent of the area under rapeseed-mustard followed by Toria, Yellow Sarson and Brown Sarson. Taramira(Eruca sativa) is a crop which is grown on very poor, sandy soils with low rainfall. Indian mustard (Brassica juncea) and Sarson group of plants, however, are grown both on sandy and heavy soils, under irrigated as well as rainfed conditions. Apart from Brassica juncea, Brassica campestris and Eruca sativa, these are two other species of the genus Brassica i.e., Brassica napus and Brassica carinata which are also being getting popularity.

One of the major constraints, limiting the production of rapeseed-mustard in the country is absence of cultivars resistant to several disease like Alternaria blight, white rust, downy mildew and powdery mildew. White rust caused by Albugo candida(Lev) Kunze, is the most serious disease of common occurence. When the infection is localized only on the leaves, it may not result in yield loss but systematic or otherwise infection causing malformation of the whole plant and more so on floral organs results in substantial yield losses (Saharan et al, 1984; Saharan and Lakra, 1988). Petrie and Vanter pool (1974). From Canada reported that systemic stem infection causes an average reduction of 60 per cent in seed yield on individual plants when the disease is accompanied by downy mildew (Peronospora parasitica) the crop gets completely damaged. The use of resistant varieties serves as an effective, safe and economical method to save the crop from ravages of the diseases. The present studies were undertaken to identify the potential lines for use in developing white rust resistant cultivars.

MATERIALS AND METHODS

In all 1607 germplasm lines of Brassica species obtained from different parts of the country were sown in paired rows of 4m length RBD design. The susceptible check was sown

after every 10 lines. All the recommended agronomical package of practices were followed to raise the good crop. The data were recorded on disease intensity due to white rust on leaves using 0-5 scales. The malformation(staghead formation) was recorded on per cent twigs infected. The observations on foliage infection due to white rust were recorded during the last week of January,1990 at flowering stage. The per cent staghead formation was recorded 20 days before harvesting. The exotic germplasm being late, the foliar infection on them were recorded after 20 days of normal observations. Besides, data on different morphological traits such as days to first flowering, days to 50% flowering, days to maturity, plant height, primary branches, secondary branches, length of main raceme, siliquae on main raceme, siliqua length, seeds per siliqua, seed yield and oil content were also recorded.

RESULTS AND DISCUSSION

In all, 1569 germplasm lines of Indian mustard were grown and the data with respect to seed yield and its component traits indicated the presence of sufficient amount of variability. The maximum and minimum values recorded with respect to all the quantitative traits have been presented in Table-1.

The data on foliage infection and stag-head formation due to white rust have been presented in Tab.2 The high temperature (i.e.Max.23.7 Min. 2.7 and Max. 25.2 Min.3.5 C) during the months of Dec.,1989 and Jan.,1990, resulted into less occurance of white rust disease on crop under natural conditions. Most of the lines from Berhampore centre(i.e. B series) were susceptible to foliar infection of white rust and were graded as 2. Thirty lines were categorized in the grade 3 and only 6 lines were put in the grade one. 70 lines were free from staghead formation and the remaining lines had 0.50 to 8.07 per cent of staghead formation. Further, 389 lines(RC series) from Hisar centre were susceptible and categorized in the grade 2. 146 lines were given the score 1, while 7 lines as 3 and only 10 lines were free from this disease. Nearly 200 lines were free from staghead formation whereas in remaining lines it ranged from 0.5 to 9.5 per cent. The performance of lines from Kanpur(CSR Series) was no way observed to be different from that of Berhampore(B series) and Hisar (RC series) centre except that the level of staghead formation was comparatively low. Of the 523 lines, 486 lines were scored in the grade 2 for foliar infection. Twenty five lines were graded as 1 and twelve lines were graded as three. 212 lines were free from staghead formation. The level of staghead formation in rest of the lines ranged from 0.5 to 9.0 per cent.

Out of 100 lines (PR & PRG series) from Pantnagar centre (Uttar Pradesh) none of the lines were free from foliar infection. 86 lines were given the score 2. Ten lines were graded as one. Only five lines were free from staghead formation. The level of staghead formation in rest of the lines ranged from 0.5 to 12.0 per cent.

Out of 90 lines taken from other than above locations, 5 lines were free from foliar infection. Six lines were graded as one. Seventy five lines were graded as two. Only four

lines were graded as three. Eleven lines were free from staghead formation. The level of staghead formation in rest of the lines ranged from 0.5 to 7.5 per cent.

Further, 10 lines of Brassica napus, 9 lines of Brassica campestris and 16 lines of Brassica carinata were evaluated for different quantitative traits besides foliage infection and staghead formation due to white rust. A good amount of variability was observed with respect to the data on quantitative traits(Table-3). Regarding the foliage infection and staghead formation due to white rust all the lines of Brassica carinata except for BCRIDA-174 and Karan Sarson and in Brassica napus except for ISN-706 were free from foliar infection and staghead formation due to white rust. Out of 9 exotic lines of B. campestris four were free from foliar infection, four were graded as two and one was graded as one. Staghead ranged from 1.0 to 4.0 per cent.

In general B. juncea and B. campestris were susceptible to white rust infection whereas B. napus and B. carinata were free from this disease with few exception. Similar results have been reported by other workers from India.(Kolte, 1987, Lakra and Saharan, 1989)

REFERENCES

Kolte, S.J. 1987. Important diseases of rapeseed and mustard in India: Present research progress and future research needs. In Proceedings of the Third Oil Crops Network Workshop held in Addis Ababa, Ethiopia, 6-10 October 1986 Published in 1987. P 91-106

Lakra, B.S. and G.S.Saharan, 1989. Sources of resistance and effective screening techniques in Brassica Albugo system. Indian Phytopath 42: 293(Abst.083)

Petrie, G.A. and Vanterpool, T.C.1974. Fungi associated with hypertrophies caused by infection of cruciferae by Albugo cruciferarum. Can Plant Dis.Surv.54:37p

Saharan,G.S., Kaushik, C.D., Gupta, P.P. and Tripathi, N.N.1984 Assessment of losses and control of white rust of mustard. Indian Phytopath.(Abst.) 37:397

Saharan, G.S. and Lakra, B.S. 1988. Correlation of leaf and staghead infection intensities of white rust with yield components of mustard. Indian J.Mycol, Pl.Pathol, (Abst.) 18:81

Table 1 Maximum and minimum values with respect to seed yield and component traits in Indian Mustard sown at P.C. Unit, Hisar during 1989-90

S. No.	Character	Maximum	Minimum	Values of standard	
				Kranti	Varuna
1.	Days to first flowering	91(PR-51)	55(B-303)	65	52
2.	Days to 50% flowering	97(PR-51)	60(B-303)	69	67
3.	Days to maturity	155(PR-8965)	118(RC-5)	140	140
4.	Plant height(cm)	257.0 (RC-969)	100.0 (CSR-925 CSR-1149)	178.6	178.8
5.	Primary branches (No.)	3.0(RC-1445)	14.4 (CSR-305)	5.37	5.51
6.	Secondary branches (No.)	32.0(RCC-1)	5.20(RC-291)	14.18	14.4
7.	Length of main raceme(cm)	100.0 (CSR-771)	33.0 (RC-352)	54.36	57.50
8.	Siliquae on main raceme(No.)	75.0 (CSR-569)	18.8 (RC-106)	40.69	40.30
9.	Siliqua length(cm)	6.73 (CSR-1170)	2.76 (RC-167)	3.79	3.79
10.	Seeds per siliqua(No.)	25.7 (RAURS-30)	5.9 (B-209)	10.75	11.90
11.	Seed yield/ plant (g)	25.0 (CSR-305)	0.56 (RC-312)	13.16	13.21
12.	Oil content(%)	46.6 (CSR-523)	19.2 (B-443)	-	-

Table 2 Reaction of different lines of Brassica collected from different location to white rust at P.C.Unit, Hisar during 1989-90

S. No.	Crop	Location	Total lines (No.)	No.of lines under different rating (0-5 scale) 0	1	2	3	4	5	Staghead infection (%range)	Without Staghead (No.)
1.	*B. juncea*	Berhampore	306	0	6	270	30	0	0	0.5 - 8.07	70
		Hisar	552	10	146	389	7	0	0	0.5 - 9.50	200
		Kanpur	523	0	25	486	12	0	0	0.5 - 9.0	212
		Pantnagar	100	0	10	86	4	0	0	0.5 - 12.0	5
		Other	90	5	6	75	4	0	0	0.5 - 7.5	11
2.	*B. napus*	P.C.Unit	10	9	0	1	0	0	0	3.4	9
3.	*B. campestris*	P.C.Unit	9	4	1	4	0	0	0	1.0 - 4.0	3
4.	*B. carinata*	P.C.Unit	16	14	0	2	0	0	0	2.0	14

Table 3 Maximum and minimum values with respect to seed and component traits in *B. napus* *B. campestris* and *B. carinata* sown at P.C.Unit,Hisar during 1989-90

S. No.	Character	*B. napus*		*B. campestris*		*B. carinata*	
		Maximum	Minimum	Maximum	Minimum	Maximum	Minimum
1.	Days to first flowering	89(HNS-4,11)	71(GS-7005)	78(YST-851)	60(Chamba-2)	90(HC-2)	59(BCRIDA 205
2.	Days to 50% flowering	94(HNS-11)	79(HNS-1)	83(YST-851)	66(Chamba-2)	95(HC-2)	65(HC-1, BCRIDA-205,171
3.	Days to maturity	153(HNS-1,8)	128(HNS-3,4)	151(NDYS-2)	134(Menjla-1)	155 (Karan Sarson	132(BCRIDA 171)
4.	Plant height(cm)	216(HNS-8)	127(ISN-706)	201(FR-Sarson)	152(Candle)	210(HC-7)	147(HC-1)
5.	Primary branches(No.)	8.2(HNS-9)	4.4(HNS-8)	7.0(Chamba-2)	4.6(FR Sarson)	14.4(HC-2)	4.2(K. Sarson)
6.	Secondary branches(No.)	17.6(HNS-3)	7.6(GS-7006)	22.2(Chamba-2)	3.0(Candle)	25.0(B-174)	9.6 (HPC-1)
7.	Length of main raceme(cm)	93.0(GSL-7027)	38.7(ISN-706	71.0(Bele)	43.0(YSP-842)	78.0 (HC-4)	24.0 (HC-2)
8.	Siliquae on main raceme (No.)	67.6(GSL-7027)	36.7(ISN-706	58.6(Candle)	39.6(Bele)	65.8 (HC-4)	13.0 (HC-2)
9.	Siliquae length (cm)	4.72(GSL-7027)	3.3(HNS-4)	4.0(NDYS-2)	3.1(Candle)	4.9(HC-1)	3.1(HPC-1)
10.	Seeds per siliquae(No.)	18.10(ISN-706)	8.5(GS-7005)	13.4 (NDYS-1)	10.6 (Candle)	16.1(HC-1)	9.1(HPC1)
11.	Seed yield/plant(g)	16.63(GSL-7027)	1.88(HNS-4)	8.16 (Chamba-2)	0.72 (Bele)	13.06 (B-206)	0.77 (B-172)
12.	Oil content(%)	38.6(GSL-7027)	28.0(G-1501)	40.6(Bele)	29.6(NDYS-2)	39.6(B-171)	27.0(B-174)