

INFLUENCE OF SOWING TIME AND SPACINGS ON THE SEVERITY OF IMPORTANT DISEASES OF RAPESEED-MUSTARD

MANMOHAN*

Department of Plant Pathology
CCS Haryana Agricultural University,
Hisar-125 004 (Haryana), India

*(e-mail: mmbaghel@gmail.com)

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SUMMARY

White rust, *Alternaria* blight and powdery mildew are major diseases which are seriously affecting foliage and pods in the Indian mustard. The present investigation was carried out in field to investigate the effects of dates of sowing and spacings on the diseases development in two cultivars Varuna and RH-9801 of Indian mustard. The disease intensity of white rust on leaves in relation to both varieties (Varuna and RH-9801), both spacing and four dates of sowing increased with delay in dates of sowing. *Alternaria* blight intensity on leaves and pods decreased with delay in dates of sowing. However, the powdery mildew intensity on leaves and pods increased with delay in dates of sowing.

Key words : White rust, *Alternaria* blight, powdery mildew, sowing time, spacing, rapeseed-mustard

Rapeseed-mustard is an important oilseed crop grown both in tropical and sub-tropical regions of the world. Among the major production constraints, the fungal diseases like white rust, *Alternaria* blight and powdery mildew are severe menace in sustaining higher production. Severe outbreak of these diseases adversely affects foliage leaves as well as imparts harmful effects on flowering and pod formation. The feeding of animals on diseased foliage leaves and seed meal may cause health problems in animals. These not only deteriorate the quality but also quantity of seed, oil and seed meal considerably. White rust caused by *Albugo candida* (Pers ex. Hook) O. Kuntze is most severe and wide spread. Tripathi and Kaushik (1978) reported that the incidence of white rust on Indian mustard increased with the enhancement of date of sowing. Kolte *et al.* (1986) noticed that the crop sown in first week of October escaped the infection from white rust. However, the November sown crop recorded high incidence and severity of white rust at Pantnagar in rapeseed mustard. Crop sown from 21st October to 5th November can be saved from heavy infection of *Alternaria* blight (Gupta *et al.*, 2003). Minimum disease severity on pods was observed in 1st October sown crop, whereas it was maximum in November sown crop (Kumar and Kumar, 2006). Similarly, early planted crop resulted in low severity of powdery mildew, whereas late planted crop resulted in

higher powdery mildew intensity (Dange *et al.*, 2003). The row to row and plant to plant spacing also plays an important role in disease development (Mehta *et al.*, 2005). However, data on interaction between plant spacing and dates of sowing are lacking in case of rapeseed-mustard. So, the present study was undertaken to determine the influence of dates of sowing and row to row spacing on the incidence of different diseases of rapeseed-mustard.

MATERIALS AND METHODS

The field experiment was conducted at Research Area, Department of Plant Pathology, CCS Haryana Agricultural University, Hisar, Haryana during season of 2010-11. This experiment was laid out in a randomized block design (RBD) with three replications, two cultivars (Varuna and RH-9801) and plot size 1.8 x 2 m². The crop was raised in field keeping row to row and plant to plant spacing at 30 x 15 cm and 45 x 20 cm as required sowing was done in four dates. The irrigation and fertilizers were applied as per requirement and recommendations. The thinning was done after 21 days of sowing to maintain the proper plant population. Observations on appearance and severity of all the three diseases were recorded from 10 plants randomly selected from each plot using 0-5 scale at regular intervals till

maturity of the crop. Disease intensity was calculated by using the formula of McKinney (1923).

RESULTS AND DISCUSSION

The disease intensity of white rust on both the cultivars Varuna and RH-9801 sown on four dates of sowing from 5th October to 20th November 2010 with two spacings 30 x 15 cm and 45 x 20 cm was observed. Observations of disease were taken at different intervals just after appearance of the symptoms. There were significant differences in disease intensity among cultivars, dates of sowing and spacing at different intervals. Results presented in Table 1 reveal that in variety Varuna, the white rust intensity increased with the delay in dates of sowing. The maximum disease severity on leaves was observed on fourth date of sowing (42.7%) followed by third date of sowing (38.0%), whereas it was minimum in first date of sowing in both the spacings. In variety RH-9801, the maximum disease intensity in leaves was observed on fourth date of sowing (45.3%), whereas the minimum disease severity was observed in first date of sowing in both the spacings. While comparing both the spacings, the minimum disease was observed in spacing 45 x 20 cm. In variety Varuna, no specific trend of stagheads appearance was observed in different dates of sowing with two spacings. The maximum stagheads (35.3%) were recorded in fourth date of

sowing followed by first date of sowing (16.0%) and it was not observed in third date of sowing. Similar trend of disease was observed with large spacing (45 x 20 cm). The observations on stagheads intensity on variety RH-9801 were recorded and revealed similar trend, however, the intensity with closer spacing was more with first date of sowing as compared to variety Varuna in Table 1. Stagheads did not appear in third date of sowing in both cultivars and spacings. Delay in dates of sowing resulted in more intensity of stagheads as has already been reported by various workers. So, the present information is in accordance with reports of earlier workers (Yadav *et al.*, 2002; Mehta *et al.*, 2005).

The observations of *Alternaria* blight on leaves and pods were taken at different intervals just after appearance of the disease. There were significant differences in disease intensity among cultivars, dates of sowing and spacing at different intervals. Results in Table 2 reveal that the maximum severity of *Alternaria* blight on leaves (18.6%) was observed in first date of sowing at the end of the crop followed by second date of sowing with 16.1 per cent and the minimum disease intensity (12.2%) was observed in fourth date of sowing in variety Varuna with spacing 30 x 15 cm. Similar trend was recorded with wider spacing. The data on disease intensity of *Alternaria* blight in variety RH-9801 presented in Table 2 revealed that the disease intensity decreased with the delay in sowing and the maximum

TABLE 1

Effect of different dates of sowing and spacing on the white rust intensity (%) on leaves and stagheads of cvs. Varuna and RH-9801 of Indian mustard

Observation intervals	White rust intensity (%) on leaves															
	Varuna								RH-9801							
	Spacing (30 x 15 cm)				Spacing (45 x 20 cm)				Spacing (30 x 15 cm)				Spacing (45 x 20 cm)			
	D ₁	D ₂	D ₃	D ₄	D ₁	D ₂	D ₃	D ₄	D ₁	D ₂	D ₃	D ₄	D ₁	D ₂	D ₃	D ₄
14-01-2011	9.3	12.0	14.7	17.3	8.7	12.7	14.0	16.0	10.0	12.0	14.7	22.0	8.0	10.0	14.0	26.7
11-02-2011	22.0	24.0	25.3	28.7	25.3	26.0	26.7	29.3	24.7	26.0	26.7	28.7	25.3	26.0	27.3	30.7
10-03-2011	30.0	34.0	37.3	42.7	31.0	36.7	38.0	37.3	32.0	34.0	38.7	39.3	35.3	36.3	39.0	45.3
Mean	20.4	23.3	25.8	29.6	21.6	25.1	26.2	27.5	22.2	24.0	26.7	30.0	22.9	24.1	26.8	34.2
C. D. (P=0.05)	S=NS, DOS=3.02, OI=2.62								S=NS, DOS=3.00, OI=2.60							
Stagheads (%) of white rust																
Observation	16.0	4.7	0.0	35.3	21.7	9.3	0.0	22.3	28.3	4.7	0.0	31.3	29.3	13.3	0.0	19.3
C. D. (P=0.05)	S=NS, DOS=2.93, OI=4.14								S=NS, DOS=5.50, OI=7.70							

D₁–1st date of sowing (5th October), D₂–2nd date of sowing (20th October), D₃–3rd date of sowing (5th November), D₄–4th date of sowing (20th November), S–Spacing, DOS–Dates of sowing, OI–Observation intervals.

TABLE 2

Effect of different dates of sowing and spacing on the *Alternaria* blight intensity (%) on leaves and pods of cvs. Varuna and RH-9801 of Indian mustard

Observation intervals	<i>Alternaria</i> blight intensity (%) on leaves															
	Varuna								RH-9801							
	Spacing (30 x 15 cm)				Spacing (45 x 20 cm)				Spacing (30 x 15 cm)				Spacing (45 x 20 cm)			
	D ₁	D ₂	D ₃	D ₄	D ₁	D ₂	D ₃	D ₄	D ₁	D ₂	D ₃	D ₄	D ₁	D ₂	D ₃	D ₄
4-03-2011	9.2	8.3	5.0	5.0	10.0	6.7	4.2	3.3	10.0	10.0	4.2	3.3	9.2	8.3	4.2	4.2
14-03-2011	18.3	15.8	12.5	13.3	14.2	14.2	12.5	9.2	17.7	18.3	11.7	11.7	15.8	16.3	12.5	11.7
24-03-2011	28.3	24.2	18.3	15.3	24.2	20.8	18.3	15.8	25.8	23.3	20.8	19.2	24.2	23.3	20.8	18.2
Mean	18.6	16.1	11.9	12.2	16.1	13.9	11.7	9.4	17.8	17.2	12.2	11.4	16.4	16.0	12.5	11.4
C. D. (P=0.05)	S=1.24, DOS=1.76, OI=1.52								S=NS, DOS = 2.44, OI=2.11							
<i>Alternaria</i> blight intensity (%) on pods																
18-03-2011	12.5	9.2	6.7	4.2	9.2	7.5	6.7	5.8	13.3	10.0	7.5	5.8	11.7	12.5	8.3	4.2
28-03-2011	30.2	24.2	23.3	13.3	26.7	23.3	22.5	15.8	28.3	29.2	24.2	24.2	32.3	25.0	22.5	18.5
Mean	21.4	16.7	15.0	8.8	18.0	15.4	14.6	10.8	20.8	19.6	15.9	15.0	22.0	18.8	15.4	11.4
C. D. (P=0.05)	S=NS, DOS=3.42, OI=2.42								S=NS, DOS=4.31, OI=3.05							

D₁–1st date of sowing (5th October), D₂–2nd date of sowing (20th October), D₃–3rd date of sowing (5th November), D₄–4th date of sowing (20th November), S–Spacing, DOS–Dates of sowing, OI–Observation intervals.

(17.8%) was recorded in first date of sowing followed by second date of sowing (17.2%) and the minimum disease intensity was observed in fourth date of sowing (11.4%) in closer spacing (30 x 15 cm). Similar trend was recorded with wider spacing that disease intensity decreased with delay in sowing. The maximum disease intensity (16.4%) was recorded in first date of sowing and minimum (11.4%) in fourth date of sowing in wider spacing. On pods also, the disease intensity decreased with delay in sowing with both the spacings in both the varieties. The maximum disease severity was recorded in first date of sowing (21.4%) and minimum disease intensity in fourth date of sowing (8.8%) in variety Varuna with spacing of 30 x 15 cm. In variety RH-9801, the maximum disease intensity on pods was recorded in first date of sowing (20.8%) and minimum in fourth date of sowing (15.0%) in spacing of 30 x 15 cm. On same variety, similar trend was recorded with wider spacing that disease intensity decreased with delay in sowing. The development of disease intensity on leaves and pods was found non-significant among spacings, dates of sowing and observation intervals. The perusal of data revealed that the disease intensity decreased on leaves and pods with delay in date of sowing. Among both the spacings the disease intensity was more during first date of sowing which subsequently decreased with

advancing the date of sowing (20th November). Gupta *et al.* (2003) reported that disease intensity was low on the crop sown in the month of October and delay in dates of sowing enhanced the disease intensity. Present findings are not in accordance with the findings of above workers with the findings of Kumar and Kumar (2006). The probable reason might be that present investigation, disease appears late in this season and due to unfavourable weather conditions during the development of disease. It has been reported that disease appears more on the older plant as compared to the younger plants. This could be referred as another reason that conditions favourable for disease development appeared late by the time. The crop was mature and subsequently unfavourable weather conditions did not help the disease development.

The observations of powdery mildew on leaves and pods were taken at different intervals just after appearance of the disease. There were significant differences in disease intensity among cultivars, dates of sowing and spacing at different intervals. Results in Table 3 reveal that maximum severity of powdery mildew on leaves (18.9%) was observed in fourth date of sowing at the end of crop followed by third date of sowing with 18.2 per cent and the minimum disease intensity (17.1%) was observed in first date of sowing in variety Varuna with spacing of 30 x 15 cm. Similar

TABLE 3

Effect of different dates of sowing and spacing on the powdery mildew intensity (%) on leaves and pods of cvs. Varuna and RH-9801 of Indian mustard

Observation intervals	Powdery mildew intensity (%) on leaves															
	Varuna								RH-9801							
	Spacing (30 x 15 cm)				Spacing (45 x 20 cm)				Spacing (30 x 15 cm)				Spacing (45 x 20 cm)			
	D ₁	D ₂	D ₃	D ₄	D ₁	D ₂	D ₃	D ₄	D ₁	D ₂	D ₃	D ₄	D ₁	D ₂	D ₃	D ₄
9-03-2011	10.0	10.0	10.0	10.7	8.0	8.7	9.3	11.3	8.7	8.7	10.0	10.7	8.7	9.3	9.3	10.7
16-03-2011	14.7	15.3	15.3	16.0	12.0	13.3	14.0	15.0	14.0	12.7	14.0	14.7	14.7	13.0	13.3	16.0
23-03-2011	26.7	28.0	29.3	30.0	26.7	28.7	32.7	30.0	26.7	29.3	30.7	32.0	26.0	28.0	32.0	32.0
Mean	17.1	17.8	18.2	18.9	15.6	16.9	18.7	18.8	16.5	16.9	18.2	19.1	16.5	16.8	18.2	19.6
C. D. (P=0.05)	S=NS, DOS=1.52, OI=1.31								S=NS, DOS=1.55, OI=1.34							
Powdery mildew intensity (%) on pods																
20-03-2011	10.0	10.0	12.7	15.3	8.0	8.0	10.7	12.0	6.7	7.3	12.0	14.0	9.3	10.7	12.7	14.0
29-03-2011	14.0	14.0	18.0	22.0	12.0	14.0	18.7	22.7	12.0	12.7	18.7	18.0	14.0	14.7	22.0	24.7
Mean	12.0	12.0	15.4	18.7	10.0	11.0	14.7	17.4	9.4	10.0	15.4	16.0	11.7	12.7	17.4	19.4
C. D. (P=0.05)	S=1.44, DOS=2.03, OI=1.44								S=1.30, DOS=1.85, OI=1.30							

D₁–1st date of sowing (5th October), D₂–2nd date of sowing (20th October), D₃–3rd date of sowing (5th November), D₄–4th date of sowing (20th November), S–Spacing, DOS–Dates of sowing, OI–Observation intervals.

trend was recorded with larger spacing that disease intensity increased with delay in sowing. The perusal of data of disease intensity in variety RH-9801 revealed that the disease intensity also increased with delay in sowing and maximum (19.1%) was recorded in fourth date of sowing followed by third date of sowing (18.2%) and the minimum disease intensity was observed in first date of sowing (16.5%) in closer spacing (30 x 15 cm). Similar trend was recorded with wider spacing. Disease intensity increased with delay in sowing. On pods also the disease intensity increased with delay in sowing with the spacing in both the varieties.

The maximum disease severity was recorded in fourth date of sowing (18.7%) and minimum disease intensity in first date of sowing (12.0%) on variety, Varuna with spacing of 30 x 15 cm. In variety RH-9801, the maximum disease intensity on pods was recorded in fourth date of sowing (16.0%) and minimum disease intensity was recorded on first date of sowing (11.7%) in spacing of 30 x 15 cm (Table 3). Similar trend was recorded with wider spacing that disease intensity increased with delay in sowing. The present findings are in accordance with the findings of Dange *et al.* (2003) that disease intensity increased with delay in planting time. They also reported that crop sown during end of November recorded maximum disease intensity as compared to

crop sown during first week of October in Gujarat.

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