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Growth and yield of *Brassica* species as influenced by sulphur application and sowing dates

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ABSTRACT

A field experiment was conducted during winter (*rabi*) seasons of 1998–99 and 1999–2000 at Ludhiana, to study the response of *Brassica* species to sulphur application under different dates of sowing. The crop sown on 15 November gave 14.61 and 17.53 q/ha seed yield in 1998–99 and 1999–2000, respectively, which was significantly higher than that of 10 December-sown crop. Application of 25 kg S/ha resulted in significant increase in yield attributes, seed and oil yield of *Brassica* species during 1998–99. However, seed and oil yields of *B.* species increased significantly with S application up to 50 kg/ha during 1999–2000. Interaction effects between sowing dates and *Brassica* species revealed that under delayed sowing on 10 December, *B. carinata* A. Braun gave significantly higher seed as well as oil yield as compared to *B. napus* L. during 1999–2000. The seed and oil yield of 15 November-sown crop increased significantly up to 50 kg S/ha, whereas the response of 10 Decembe sown crop was obtained only up to 25 kg S/ha.

Key words : *Brassica* species, Sowing dates, Sulphur, Yield

Brassica species are highly responsive to sulphur application, as it is a constituent of glucathione which plays an important role in the synthesis of oil. Sulphur requirement of *Brassica* species is quite high with the optimum level ranging from 20 to 60 kg/ha, depending on the soil status and yield potential (Aulakh and Pasricha, 1997). The sulphur removal per tonne of produce is the highest (12 kg/ha) in oilseeds (Tandon, 1986). However, sulphur requirement of *Brassica* species may vary under different dates of sowing because of differential trends obtained in growth and yield of the crop. The information on response of *Brassica* species to sulphur under different dates of sowing is rather limited. The present investigation was undertaken to assess the sulphur requirement of *Brassica* species in relation to sowing dates.

MATERIALS AND METHODS

The field investigation was carried out during the winter (*rabi*) seasons of 1998–99 and 1999–2000 under irrigated conditions at Ludhiana. The soil site was sandy loam

with pH 7.8, organic carbon 0.12% and 98, 7.5, 97 and 20.4 kg/ha of available N, P, K and S respectively. The experiment was laid out in split-plot design, comprising combinations of 2 sowing dates (15 November and 10 December) and 2 *Brassica* species (*Brassica carinata* A. Braun and *Brassica napus* L.) in main plots and 3 levels of sulphur (0, 25 and 50 kg/ha) in subplots with 4 replications. Direct seeding of *Brassica carinata* cv. 'PC 5' was done on 15 November and 10 December with a row spacing of 45 cm, and plant-to-plant spacing of 10 cm was maintained by thinning the crop 15 days after sowing. However, *B. napus* was raised through transplanting of 50 days old seedlings of cv. 'GSL 1' on 15 November and 10 December at 45 cm × 10 cm spacing as per recommended package of practices for its cultivation in the state. Full dose of sulphur as per treatments was applied through gypsum at the time of sowing/transplanting.

RESULTS AND DISCUSSION

Yield-attributing characters

Sowing dates had profound effect on various yield attributes, except siliquae/plant (Table 1). The crop sown on 15 November produced 15 and 8% more seeds/ siliqua over 10 December-sown crop during crop season of 1998–99 and 1999–2000 respectively. Similarly, 15 November-sown crop recorded 11 and 15% higher 1,000-seed weight than 10 December-sown crop during 1998–99 and 1999–2000 respectively. These results confirm the findings of Brar *et al.* (1998), who reported that yield attributes of *Brassica* species were reduced significantly when sowing was done beyond 15 November

The yield of *Brassica* species increased significantly with the application of sulphur at 25 kg/ha compared with the control during both the years (Table 1). The effect of higher dose of sulphur, i.e. 50 kg/ha, was found statistically at par with that of 25 kg/

Table 1. Effect of sowing dates and sulphur on yield-attributing characters of *Brassica* species

Treatment	Siliquae/plant		Seeds/siliqua		1,000-seed weight (g)	
	1998–99	1999–2000	1998–99	1999–2000	1998–99	1999–2000
Sowing date						
15 November	237.3	218.4	17.38	18.95	3.39	3.47
10 December	229.0	210.7	15.07	17.63	3.05	3.01
CD (P=0.05)	NS	NS	0.76	0.77	0.08	0.11
Brassica *species*						
B. carinata	240.2	219.9	14.37	16.02	3.45	3.39
B. napus	226.1	209.2	18.08	20.56	2.99	3.11
CD (P=0.05)	12.9	NS	0.76	0.77	0.08	0.11
Sulphur (kg/ha)						
0	215.7	200.0	14.88	16.01	3.01	3.08
25	245.3	219.9	16.99	19.75	3.31	3.32
CD (P=0.05)	17.9	12.5	0.92	1.45	0.06	0.11

ha. The magnitude of increase in siliquae/plant, seeds/siliqua and 1,000-seed weight with the application of 25 kg S/ha over the control was 13 to 10, 14 to 23 and 10 to 8% in 1998–99 and 1999–2000 respectively. The favourable effect of sulphur application on the growth of *Brassica* species might have enhanced the production of various yield attributes. Mohan and Sharma (1992) also reported significance of sulphur application in improving the yield attributes of *Brassica* species.

Seed yield

Sowing of *Brassica* on 15 November recorded significantly more seed yield, being 17.6 and 32.5% higher over delayed sowing on 10 December during 1998–99 and 1999–2000 respectively (Table 2). Pooled seed yield also showed similar effects of sowing dates. Shorter growth period and abnormal temperature at seeding

Table 2. Effect of sowing dates and sulphur on seed and oil yield of *Brassica* species

Treatment	Sowing date								
	1998–99			1999–2000			Pooled mean		
	15 Nov	10 Dec	Mean	15 Nov	10 Dec	Mean	15 Nov	10 Dec	Mean
Brassica *species*									
B. cariniata	17.61	16.10	16.85	17.51	15.59	16.55	17.56	15.85	16.70
B. napus	11.61	8.73	10.17	17.53	8.91	13.22	14.57	8.82	11.70
Sulphur (kg/ha)									
0	12.30	10.89	11.60	15.38	11.33	13.36	13.84	10.96	12.40
25	15.52	13.11	14.31	17.72	12.56	15.14	16.62	12.84	14.73
50	16.01	13.25	14.64	19.47	12.86	16.16	17.74	13.05	15.38
Mean	14.61	12.42		17.53	12.25		16.07	12.31	
	Oil yield (q/ha)								
Brassica *species*									
B. carinata	5.75	5.15	5.45	6.19	5.07	5.63	5.97	5.11	5.54
B. napus	4.42	3.26	3.84	7.07	3.35	5.21	5.75	3.31	4.53
Sulphur (kg/ha)									
0	4.20	3.57	3.89	5.89	3.68	4.48	5.05	3.62	4.34
25	5.42	4.46	4.94	6.69	4.35	5.52	6.06	4.40	5.23
50	5.64	4.58	5.11	7.31	4.40	5.85	6.48	4.49	5.49
Mean	5.08	4.22		6.63	4.17		5.86	4.19	

CD (P=0.05)	*Seed yield*		*Oil yield*		*Seed yield**	*Oil yield**
	1998–99	*1999–2000*	*1998–99*	*1999–2000*		
Sowing date (D)	1.24	1.56	0.43	0.54	1.05	0.39
Brassica species (B)	1.24	1.56	0.43	NS	1.05	0.39
Sulphur (S)	0.60	0.78	0.22	0.28	0.70	0.30
D × B	NS	2.21	NS	0.77	1.48	0.55
D × S	NS	1.10	NS	0.39	0.79	0.32

*Pooled data

and different growth stages of *Brassica* species under delayed sowing (10 December) exhibited adverse effect on growth parameters and also on yield components which was reflected in reduced yield. Narang and Singh (1987) also reported significant reduction in yield of Indian mustard under delayed sowing. *Brassica carinata* yielded significantly more than *B. napus* during both the years. *B. napus* being shallow-rooted lodged due to high windstorm which resulted in its poor performance. Application of 25 kg S/ha significantly increased the yield attributes and yield of *B.* species. The increase in seed yield at 25 and 50 kg S/ha over the control was 23.4 and 26.2% in 1998–99 and 13.3 and 20.9% during 1999–2000 respectively. Aulakh and Pasricha (1997) also reported similar results. Significant interaction between sowing dates and *Brassica* species in 1999–2000 indicated that early sowing of *Brassica* species on 15 November recorded the maximum yield of 19.47 q/ha with 50 kg S/ha. Similar trend of interactive effects of sowing dates and sulphur was observed on pooled seed yield of *Brassica* species.

Oil yield

Oil yield of *Brassica* species during individual seasons as well as pooled over the seasons was significantly higher under early sowing (15 November) as compared to late sowing (10 December). The sowing of crop on 15 December recorded 20.4 and 59.0% higher oil yield over 10 December sowing during 1998–99 and 1999–2000, respectively, owing to higher seed yield (Table 2). *Brassica carinata* gave more oil yield than *B. napus* owing to its higher seed yield during 1998–99. Higher oil content of *Brassica napus* could not compensate the reduction in oil yield on account of its very low seed yield. Significant increase in oil yield of *Brassica* species was obtained with application of S at 25 kg/ha. Interactive effects between sowing dates and species indicated that under early sowing *Brassica napus* and under delayed sowing *B. carinata* gave significantly higher oil yield during 1999–2000. Improvement in oil yield was recorded with S applied at the rate of 50 and 25 kg/ha under 15 November and 10 December sowing, respectively, during 1999–2000. Interaction effects of sowing dates and *Brassica* species and sowing dates and sulphur on pooled oil yield also followed similar trends as in 1999–2000.

REFERENES

Aulakh, M.S. and Pasricha, N.S. 1997. Role of balanced fertilization in oilseed based cropping systems. *Fertiliser News* **42** : 101–111.

Brar, Z.S., Bal, D.S. and Johl, A.S. 1998. Influence of sowing dates, nitrogen and planting geometry on the performance of gobhi sarson (*Brassica napus* subsp. *oleifera* var. *annua*). *Indian Journal of Agronomy* **43** : 133–137.

Mohan, K. and Sharma, H.C. 1992. Effect of nitrogen and sulphur on growth, yield attributes, seed and oil yield of Indian mustard (*Brassica juncea*). *Indian Journal of Agronomy* **37** : 748–154.

Narang, R.S. and Singh, S. 1987. Studies on sowing dates of Indian mustard for double cropping under irrigated condition. *Indian Journal of Agronomy* **32** : 208–209.

Tandon, H.L.S. 1996. *Sulphur Research and Agricultural Production in India.* Fertilizer Development and Consultation Organization, New Delhi.