STUDIES ON CROP GEOMETRY IN RELATION TO IRRIGATION IN INDIAN MUSTARD (BRASSICA JUNCEA, (L) CZERN & COSS)

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In India, rapeseed and mustard are primarily grown under rainfed conditions and that too under conserved moisture. However, it has been observed that irrigation plays a vital role in increasing its production. The potential of a variety can be retained with one or two irrigations after sowing on conserved moisture. The main problem in some states like Haryana, is the limited availability of water and it has been observed that by adjusting the crop geometry, water requirement can be minimized to a greater extent. The present study was, therefore, initiated to minimize the water use by way of row spacing adjustments on the yields of Indian mustard.

MATERIALS AND METHOD :

The present study was carried out at the farm of Haryana Agricultural University, Hissar ($29^{0}10'N$, $75^{0}46'E$, 215.2 meters above Mean Sea Level). The soil was sandy loam having ph. 8.0, low in nitrogen, medium in phosphorous and high in Potash. The experiment comprises of 9 treatments i.e. three row spacings and three irrigation levels viz; 30 cm flat sowing with no, one and two irrigations ; 45 cm row spacing with alternate channel made 40-45 days after sowing and no, one and two irrigations in the channel only and 45 cm + 15 cm row spacings with alternate channel made after 40-45 days of sowing at nil, one and two irrigations for three years i.e. 1975-76 to 1977-78 with variety Prakash of Indian mustard. The experiment was laid out in a randomized block design comprising of four replications during all the years of study. Each treatment was represented by a plot measuring 2.4m in width and 10m in length. A basal dose of 80 kg N/ha was applied through Urea. A presowing irrigation was also applied in order to wet the root zone to field capacity. The subsequent irrigations were applied as per treatments. The total rainfall observed during the crop period (i.e. Oct. to March) was 51.1, 27.6 and 97.9 mm during 1975-76, 76-77 and 77-78 respectively.

The crop was sown after the harvest of preceeding bajra fodder crop during mid Oct. Thiodan spray was done to control the attack of Mustard sawfly in the month of Nov. The crop was also protected from Mustard aphid by giving the sprays of Metasystox during the month of Jan/Feb. The seed yield per plot was recorded in Kgs-and thereafter, converted per hectare. The data with respect to 1000-seed weight and oil content was also recorded. The oil content was estimated by Soxhlet apparatus per specifications outlined in AOAC (1962).

RESULTS AND DISCUSSION :

The data presented in table-1a indicated that during the year, 1975-76, the flat sowing at 30 cm with no irrigation recorded significantly lower yields (1937 kg/ha). The seed yields of 2502 and 2748 kg/ha were obtained with the application of one and two irrigations utilizing 796th. lit. and 1708th. lit/ha of water respectively. The differences between one and two irrigations were observed to be non-significant. The row spacing of 45 cm recorded low seed yield as compared to 30 cm spacing at all the levels of irrigations except for no irrigation treatment where the yield was just at par. The row spacings of 45+15 cm with one and two irrigations gave appreciably higher seed yield of 2706 and 2632 kg/ha utilizing 287th. lit. and 574th. lit./ha of water respectively.

During the year, 1976-77, the data revealed that one irrigation yielded 58 percent more over control where no irrigation was applied. (Table-1b). Further, the differences between one and two irrigations were only about 13 percent. In flat sowing at 30 cm sowing with and without irrigation the average yield came out to be 1600 kg/ha, in 45 cm spacing with alternate channel it was 1541 kg/ha while with 45+15 cm the yields were observed to be 1694 kg/ha. The highest seed yield of 2106 kg/ha was obtained in 45+15 cm spacing with two irrigations (250th. lit/ha) closely followed by 2005 kg/ha of flat sowing with one irrigation (602th. lit/ha).

The perusal of data for the year 1977-78 presented in table-1c indicated that the maximum seed yield of 1667 kg/ha was attained by 45+15 cm spacing with two irrigations (336th. lit/ha) closely followed by the same spacing with one irrigation recording 1513 kg/ha (175th. lit/ha). The differences were statistically significant. On an average the treatments like no irrigation recorded a yield of 1157 kg/ha, one irrigation 1355 kg/ha and two irrigations 1373 kg/ha. The flat sowing at 30 cm with and without irrigation on an average recorded 1200 kg/ha, at 45 cm the yields were 1175 kg/ha while at 45+15 cm, the seed yield was 1509 kg/ha. Further the data revealed that the yield differences between no irrigation and one irrigation were very narrow, and between one and two irrigations the differences were negligible. It is mainly because of heavy rains received during winter season of this year.

The average of three years data (Table-2) revealed that with the increase of number of irrigations yield levels were also increased in all the row spacings. The percentage increase from control to one irrigation was about 38 and from one irrigation

to two, the increase was only about 6 percent. Further it was observed that the row spacings of 45+15 cm with two irrigations exhibited maximum seed yield of 2152 kg/ha, 1000-seed weight of 3.21 g, and actual oil yield of 803.3 kg/ha. The total quantity of water utilized per ha was 383 thousand litres. The oil content in the seed was 37.33 percent. This was closely followed by the same spacing with one irrigation recording 1978 kg/ha seed yield, 3.06 g 1000-seed weight, 744.7 kg oil yield/ha and 37.65 percent oil in the seed. The quantity of water used in this treatment was only 192 thousand litres/ha.

The normal practice i.e. 30 cm flat sowing with two irrigations recorded seed yield of 1965 kg/ha, actual oil yield of 722.3 kg/ha with 3.01 g seed weight/1000 seeds and 36.76 percent oil, but the quantity of water used was 1369 lit/ha i.e. three times more than 45+15 gm row spacing with two irrigations.

Thus, it is very clear that adjusting crop geometry by manipulating row spacings (45+15 cm) we can save about 75 percent of water and in addition can get a little more seed yield over 30 cm flat sowing.

REFERENCES :

A.O.A.C. 1962. Official Methods of the Association of official Agricultural chemists. 7th ed. Washington, D.C.

Table 1a : Showing the results of Irrigational trial on Indian mustard at Hissar during, 1975-76.

Sr. No.	Treatments	Yield kg/ha.			
	Irrigation Row spacing	Control	One irrigation	Two irrigations	Mean
1	2	3	4	5	6
1.	30 cm	1938	2502 (796)	2748 (1708)	2396
2.	45 cm (with alternate channel)	1903	2149 (318)	2242 (652)	2098
3.	45 + 15 cm (with alternate channel)	–	2706 (287)	2632 (574)	2669
	Mean C.D. at 5% 397 kg/ha.	1920	2452	2541	

Table 1 b : Showing the results of irrigational trial on Indian mustard at Hissar during, 1976-77.

1	2	3	4	5	6
1.	30 cm	899	2005 (602)	1896 (1198)	1600
2.	45 cm (with alternate channel)	1160	1540 (160)	1925 (326)	1541
3.	45 + 15 cm (with alternate channel)	1260	1716 (113)	2106 (200)	1694
	Mean C.D. at 5% 551 kg/ha.	1106	1754	1976	

Table 1 c : Showing the results of irrigational trial on Indian mustard at Hissar during, 1977-78.

1	2	3	4	5	6
1.	30 cm	1059	1292 (613)	1250 (1201)	1200
2.	45 cm (with alternate channel)	1063	1260 (179)	1203 (351)	1175
3.	45 + 15 cm (with alternate channel)	1348	1513 (175)	1667 (336)	1509
	Mean C.D. at 5% 170 kg/ha.	1157	1355	1373	

Figures in parenthesis indicates the water used in th. lit/ha.

Table 2 : Sowing the results of irrigational trial pooled over three years (1975-76 to 1977-78) on Indian mustard.

Sr. No.	Treatments	Quantity of water utilized (1000 lts.)	1000-seed wt (g)	Oil content (%age)	Yield kg/ha	Oil yield (kg/ha)
1.	30 cm flat sowing (no irri.)	–	3.13	36.83	1298	478.0
2.	30 cm flat sowing (one irri.)	670	2.98	37.31	1933	721.1
3.	30 cm flat sowing (two irri.)	1369	3.01	36.76	1965	722.3
4.	45 cm channel (no. irri.)	–	2.96	37.39	1375	514.1
5.	45 cm channel (one irri.)	219	3.03	37.98	1650	626.6
6.	45 cm channel (two irri.)	443	3.01	36.83	1786	657.8
7.	45 + 15 cm channel (no irri.)	–	2.94	36.09	1348	486.5
8.	45 + 15 cm channel (one irri.)	192	3.06	37.65	1978	744.7
9..	45 + 15 cm channel (two irri.)	383	3.21	37.33	2152	803.3