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Effect of Various Dates of Sowing and Irrigation Scheduling Based on IW: CPE Ratios on Growth, Biological Yield and Economics Return on Cress (*Lepidium sativum* L.)

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A field experiment was conducted at College Agronomy farm, Anand Agricultural University, Anand, Gujarat during *rabi* season of the year 2012 on loamy sand texture soil to study the effect of different dates of sowing and irrigation scheduling based on IW:CPE ratios on yield attributes and seed yield of cress (*Lepidium sativum* L.) results revealed that crop sown on 15th November (D_3) recorded significantly higher plant height (17.56 cm) at 30 DAS and harvest index (18.97 %) and significantly the highest plant height at 60 (96.56 cm), 90 (111.63 cm) DAS as well as seed (2133 kg/ha) and straw (11223 kg/ha) yields. Irrigation treatment I_3 (0.8 IW:CPE ratio) noted significantly the highest plant height (17.56, 91.00 and 103.88 cm) at 30, 60 and 90 DAS, respectively as well as seed (1926 kg/ha), straw (10528 kg/ha) yield and significantly higher harvest index (18.00%). These treatments also exhibited highest gross realization and B CBR during investigation.

Key words: Cress, date of sowing, Irrigation scheduling (IW:CPE ratio), seed yield and economics.

Cultivation of medicinal crops has assumed greater importance due to the tremendous potential they offer in formulating newer drugs against many diseases and illness that affect human kind. The diversified agro-climate of India is boon for the cultivation of medicinal crops. (Kumar *et al.* 2007).

Cress (*Lepidium sativum* L.) also known as Garden Cress or Water Cress in English, Chandrasur or Haliya or Chansur in Hindi and Ashelio or Asheliya in Gujarati and Ahliv or Chandrashul in Marathi belonging to family "cruciferae". The plant is indigenous to India and is grown in Central India as winter crop of high protein diet. The external application of seed poultice is effective in joint pains, blood clots and skin diseases. Seeds are used to cure urinary infection, redness of eyes and in leprosy. Seeds are also used as good tonic for children, old persons and for women after delivery. (A Hand book of Herbal Remedies).

Among the cultural measures, proper adjustment of sowing period appears to be an economical tool which may help to reduce the stress on the crop. The delayed in sowing is badly influencing by climatic conditions which ultimately reflects on yield attributes and finally the seed yield.

Water is well known essential constituent of living organism for their growth and development. Either excess or deficit use of water reduces the crop yield drastically. Water stress during the active crop growth phase results into suppression of crop growth as it influences the photosynthesis and other physiochemical processes and or death by desiccation. The excess

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water leads in to the problems of raising water table, soil salinity. Hence, water management studies have become an important aspect of research for irrigated crops. The ideal scheduling of irrigation depends upon the soil, climate and plant characteristics.

MATERIALS AND METHODS

A field investigation was conducted during *rabi* season of the year 2011-12 at college Agronomy farm, B. A. College of Agriculture, Anand Agricultural University, Anand (Gujarat) to study the effect of different dates of sowing and irrigation scheduling based on IW:CPE ratios on yield attributes and seed yield of cress under middle Gujarat conditions. The soil of the experimental plot was loamy sand in texture having field capacity 13.65%, bulk density 1.34g/cc, organic carbon 0.43%, total nitrogen 0.033%, available phosphorus 50.0 kg/ha, available potash 285.91 kg/ha with pH 7.8. There were sixteen treatment combinations consisting of 4 sowing dates (15th October, 30th October, 15th November and 30th November) and 4 irrigation levels (I_0-Control, irrigation at 30, 60 and 80 DAS, I_1-0.4 IW:CPE ratio, I_2-0.6 IW:CPE ratio, I_3-0.8 IW:CPE ratio) were tested in a 4 time replicated strip plot design. The cumulative pan evaporation values were calculated from daily pan evaporation measured with the help of USWB class 'A' open pan evaporimeter installed at meteorological observatory, which was in the proximity of the experimental plot. The quantity of irrigation water applied in surface flooding was measured by 7.5 cm parshall flume. A fixed depth of 50 mm irrigation water was applied to each treatment at irrigation based on control and IW: CPE ratios of 0.4, 0.6 and 0.8, respectively. The variety of cress "Guj.Assalio-1" was sown on respective dates at 30 cm apart. A uniform dose of 60 kg of N, 40 kg of P_2O_5, 0 kg of K_2O/ha was applied at the time of sowing. First common light irrigation of 25 mm was applied immediately after dry sowing and second common light irrigation was applied 10 DAS to each plot for uniform stand of crop.

RESULT AND DISCUSION

Effect of dates of sowing

Data presented in Table-1 indicated that date of sowing was significantly effect on plant height at various days, harvest index and yield of cress. Treatment D_3 (15th November) recorded significantly higher plant height at 30 DAS (17.56 cm) and significantly the highest plant height at 60 (96.56 cm) and 90 (111.63 cm) DAS. Increasing height might be due to prevailing low and high temperature which resulted into slower rate of cell division, cell elongation and ultimately produced the shortest plant. These findings are in close agreement with Singh *et al.* (1998) for mustard.

Significantly the highest seed (2133 kg/ha) and straw (11223 kg/ha) yields were recorded in treatment D_3 (15th November). Whereas, significantly the lowest seed (1208 kg/ha) and lower straw (7751kg/ha) yields were observed in treatment D_1 (15th October). Treatment D_3 (sowing at 15th November) recorded higher seed yield to the tune of 20.20%, 34.50% and 43.36% over the treatments D_2 (sowing at 30th October), D_4 (sowing at 30th November) and D_1 (sowing at 15th October), respectively. Lower yield in early sowing might be attributed to unfavourable temperature during the crop season *i.e.* high temperature at the time of germination in 15th October sowing (D_1). The reduction in yield due to delay in sowing might be attributed to less flowering and seed setting on account of unfavourable temperature accompanied by winds coinciding with flowering and seed setting stage of the late sown crop responsible for reduction in seed yield with delayed sowing. Kumar *et al.* (2002) have also reported marked reduction in seed yield of mustard due to delay sowing. Date of sowing had significant effect on harvest index. Significantly higher harvest index (18.97%) was recorded under treatment D_3 (sowing at 15th November).

Effect of irrigation scheduling (IW:CPE ratios)

Irrigation scheduling at 0.8 IW:CPE ratio (I_3) recorded significantly the highest plant height 17.56, 91.00 and 103.88 cm at 30, 60 and 90 DAS respectively followed by the treatments I_2 (0.6 IW:CPE ratio), I_0 (Control, irrigation at 30, 60 and 80 DAS) and I_1 (0.4 IW:CPE ratio). The significant increase in the plant height in treatment I_3 (0.8 IW:CPE ratio) might be due to optimum supply of soil moisture surrounding root zone by favourably improving the nutrient uptake and translocation which ultimately linked with the plant growth and development in terms of plant height due to

frequent irrigation. These results are in accordance with those reported by Malavia *et al.* (1988) for mustard. Irrigation scheduling (IW:CPE ratios) had marked effect on seed and straw yields. Data presented in Table-1 and Fig-1, 2 revealed that significantly the highest seed (1926 kg/ha) and straw (10528 kg/ha) yields were obtained from treatment I_3 (0.8 IW:CPE ratio), whereas, significantly the lowest seed (1277 kg/ha) and straw (7739 kg/ha) yields were observed under treatment I_1 (0.4 IW:CPE ratio). Treatment I_3 (0.8 IW:CPE ratio) recorded higher seed yield at the extent of 9.91%, 21.91% and 33.69% over the treatments I_2 (0.6 IW:CPE ratio), I_0 (control, irrigation at 30, 60 and 80

Table 1. Effect of dates of sowing and irrigation scheduling based on IW:CPE ratios on yield attributes and seed yield of cress

Treatments	Plant height (cm)			Seed yield	Straw yield	Harvest index
	At 30 DAS	At 60 DAS	At 90 DAS	(kg/ha)	(kg/ha)	(%)
Dates of sowing (D)						
D_1 : 15thOctober	14.88	66.69	74.00	1208	7751	15.46
D_2 : 30th October	16.88	91.88	106.38	1702	9438	18.01
D_3 : 15th November	17.56	96.56	111.63	2133	11223	18.97
D_4 : 30th November	16.19	84.31	93.31	1397	8651	16.05
S.Em.±	0.24	1.35	1.46	53.09	362.81	0.34
C D (P = 0.05)	0.79	4.34	4.70	169.87	1160.70	1.09
C V %	6.06	6.40	6.09	13.18	15.66	7.97
Irrigation (I)						
I_0 : Control, irrigation at 30, 60 and 80 DAS	16.06	82.38	94.31	1504	9024	16.62
I_1 : 0.4 IW:CPE ratio	15.25	79.75	91.25	1277	7739	16.22
I_2 : 0.6 IW:CPE ratio	16.63	86.31	96.06	1735	9772	17.65
I_3 : 0.8 IW:CPE ratio	17.56	91.00	103.88	1926	10528	18.00
S.Em.±	0.27	0.92	0.89	30.43	196.09	0.26
C D (P = 0.05)	0.88	2.97	2.87	97.36	627.34	0.83
C V %	6.78	4.38	3.73	7.55	8.46	6.09

Table 2. Economics of cress as influenced by dates of sowing and irrigation scheduling based on IW:CPE ratios

Treatments	Common cost (Rs./ha)	Treatment cost (Rs./ha)	Cost of cultivation (Rs./ha)	Gross realization (Rs./ha)	CBR
Dates of sowing (D)					
D_1 : 15th October	14,768	-	14,768	64,276	1:4.35
D_2 : 30th October	14,768	-	14,768	89,819	1:6.08
D_3 : 15th November	14,768	-	14,768	1,12,262	1:7.60
D_4 : 30th November	14,768	-	14,768	74,176	1:5.02
Irrigation (I)					
I_0 : Control, irrigation at 30, 60 and 80 DAS	14,768	1,750	16,518	79,712	1:4.83
I_1 : 0.4 IW:CPE ratio	14,768	1,400	16,168	67,720	1:4.19
I_2 : 0.6 IW:CPE ratio	14,768	1,750	16,518	91,636	1:5.55
I_3 : 0.8 IW:CPE ratio	14,768	2,100	16,868	1,01,564	1:6.02

Price of Cress: Seed-Rs.50/kg, Straw-Rs.0.50/kg

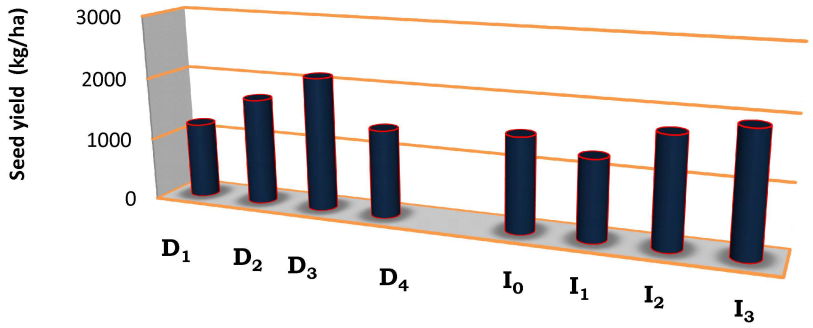

Fig. 1. Effect of date of sowing and irrigation scheduling (IW:CPE ratio) on seed yield

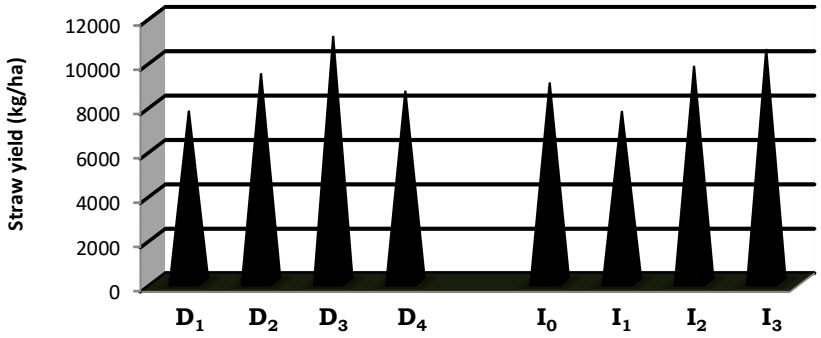

Fig. 2. Effect date of sowing and irrigation scheduling (IW:CPE ratio) on straw yield

DAS) and I_1 (0.4 IW:CPE ratio), respectively. It might be the adequate supply of moisture favourably improved nutrient uptake and translocation which ultimately is linked with the growth and development. Beneficial effects of these parameters resulted in to higher seed yield. Other reason for increasing seed yield might be due to the fact that the crop receiving irrigation at early growth stage established its root system deep into the soil for better extraction of moisture from larger volume of soil. The results are in agreement with Malavia *et al.* (1988), Singh and Dixit (1989) and Bhalerao (2001) for mustard. Data pertaining to effect of irrigation scheduling (IW:CPE ratios) had significant effect on harvest index (%). The higher harvest index (18.00%) was recorded under treatment I_3 (0.8 IW:CPE ratio), which was remained at par with treatment I_2 (0.6 IW:CPE ratio), 17.65%, Significantly lower harvest index (16.22%) was observed under treatment I_1 (0.4 IW:CPE ratio), which was remained at par with treatment I_0 (Control, irrigation at 30, 60 and 80 DAS).

Economics

The data indicated that the maximum gross realization Rs. 1,12,262 per hectare and CBR (1:7.60) were secured under treatment D_3 (sowing at 15th November) and minimum gross realization Rs. 64,276 per hectare and CBR (1:4.35) were found under treatment D_1 (sowing at 15th October). In case irrigation scheduling, maximum gross realization Rs. 1,01,564 per hectare and CBR (1:6.02) were secured under treatment I_3 (0.8 IW:CPE ratio). Minimum gross realization Rs. 67,720 per hectare and CBR (1:4.19) were observed under treatment I_1 (0.4 IW:CPE ratio).

CONCLUSION

For securing higher seed yield from cress crop raised on loamy sand soil of middle Gujarat, it is concluded that crop should be sown at 15th November with six irrigations, each of 50 mm depth scheduled at an IW:CPE ratio of 0.8 (2+4 irrigations). The first common light irrigation of 25

mm should be applied immediately after dry sowing, second common irrigation would be at 10 days after first common irrigation for good germination and uniform crop establishment. Moreover four differential irrigation, 1st and 2nd should be applied an interval of 19 to 22 days and 3rd and 4th should be applied an interval of 15 to 19 days.

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