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Impact of sowing dates and land treatments on Indian Mustard *(Brassica juncea)* in nontraditional areas of Andhra pradesh

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Abstract: The effect of three land treatments (Flatbed, Ridge and furrow and Broad bed and furrow) and four dates of sowing (September 15, October 1, October 15 and November 1) were studied during rabi season of 1999-2000 at S.V. Agricultural College, Tirupati (a non traditional area for mustard) Andhra Pradesh. Among the land treatments, broad bed and furrow method gave significantly highest growth parameters, yield attributes, seed yield, oil yield and net returns compared to flat bed method. Highest seed yield of 2.02 q ha^{-1} was obtained with October 1st sowing and decreased gradually thereafter.

Key words : Mustard, Land treatments, Dates of sowing

Introduction

Mustard play an important role in oilseed economy of India and ranks second in terms of area sown and production next to groundnut. There is an urgent need to raise the oilseeds production in view of the large gap between demand and supply. In order to meet the edible oil requirement of 10.49 mt equivalent to 34.64 mt of oilseeds by 2020 AD cultivation of oilseeds crops like mustard should be extended to non-traditional area. In Andhra Pradesh mustard is cultivated in an area of 2,800 ha with a productivity of 250 kg ha^{-1} which is very low (Statistical abstract, 1998). Suitable agro techniques like optimum time of sowing and land treatments should be developed to increase the productivity of mustard. Time of sowing of any crop plays a major role in influencing the productivity of mustard. If the mustard is sown late, duration is reduced due to high temperature during the reproductive phase with concomitant reduction in yield. Mustard is very sensitive to water logging. Due to bimodel type of monsoon at Tirupati, many a time it is subjected to oil drained conditions during early stages resulting in poor growth. To avoid ill drained conditions different land treatments are needed for proper establishment and growth. Keeping this in view, the present investigation was takenup to findout suitable land treatments and optimum time of sowing for mustard in the southern agroclimatic conditions of Andhra Pradesh, since such information of these aspects is meagre.

Materials and Methods

A field experiment was conducted during rabi season of 1999-2000 at the S.V. Agricultural College Farm, Tirupathi. The soil of the experimental field was sandy clay loam with pH 7.7 low in available nitrogen (185 kg ha^{-1}), medium in available phosphorus (16 kg ha^{-1}) and low in available potassium (128 kg ha^{-1}). The treatments consisting of 3 land treatments (Flat bed, Ridge and furrow and Broad bed and furrow method) and 4 dates of sowing (September 15, October 1, October 15, and November 1) were tested in a randomised block design with factorial concept and replicated thrice. Mustard variety seetha was sown at a seed rate of 5-6 kg ha^{-1} and at a spacing of 30 x 10 cm in a flat bed and ridge and furrow method and 30 x 7.5 cm in broad bed and furrow method to maintain the same plan population. Urea, SSP and MOP were used as the sources of N, P and K, respectively. An uniform basal dose of 50 kg N, 60 kg P_2O_5 and 40 kg K_2O ha^{-1} was applied by opening the furrows adjacent to seed rows. The crop

able 1. Effect of land treatments and dates of sowing on growth components of mustard.

reatments	Plant height (cm)	DMP (g m^{-2})	No.of primary branches $plant^{-1}$	CGR g m^{-2} day^{-1} 30-60 DAS	LAI (at 60 DAS)	Days to 50% flowering	Days to maturity
and treatments							
lat bed	94.34	187.70	2.49	3.79	1.10	35.75	87.0
idge and urrow	105.18	220.31	2.73	4.55	1.23	35.50	86.25
road bed and urrow	107.97	231.38	2.78	5.04	1.27	33.75	85.0
Em+	1.22	4.3	0.034	-	0.024	0.65	2.12
D at 5%	3.65	12.6	0.102	-	0.072	NS	NS
Dates of sowing							
eptember 15	90.06	160.80	1.78	3.07	0.96	31.33	94.33
ctober 1	114.84	252.5	3.36	5.25	1.43	33.33	87.33
ctober 15	110.09	242.4	2.97	5.24	1.30	35.33	85.0
lovember 1	95.01	195.8	2.56	4.28	1.10	40.0	79.0
Em+	1.63	4.88	0.039	-	0.028	0.76	2.27
D at 5%	4.86	14.6	0.118	-	0.084	2.26	6.80

DAS : Days after sowing

Table 2. Economics of mustard as effected by land treatments and dates of sowing.

Treatments	Gross return (Rs. ha^{-1})*	Net return (Rs ha^{-1})*	Benefit cost ratio*
Land treatments			
Flat bed	8385	3273	1.41
Ridge and furrow	1003	4010	1.66
Broad bed and furrow	10460	4440	1.73
Dates of sowing			
September 15	6620	940	1.09
October 1	12046	6060	2.01
October 15	11193	5206	1.86
November 1	8640	2653	1.43

DAS : Days after sowing
* Data not statistically analysed

was top dressed with 50 kg N at the time of flowering. A total precipitation of 370.5 mm was recieved during crop growth period. Weekly mean maximum and minimum temperatures during the crop growth period ranged from 26.7 to 36.9 and 16.4 to 26.2°C, respectively. Total numbers of rainy days are 23 during the crop growth period. Presowing irrigation was given to ensure good germination and uniform plant stand. Subsequent irrigations were given as and when required to maintain optimum moisture in soil. A total of four irrigations were given during the entire growth period. The other cultural operations were taken up as per the recommendation.

Table 3. Effect of land treatments and dates of sowing on yield attributes, seed and oil yield of mustard

Treatments	No. of siliqua plant^{-1}	No. of seeds siliqua^{-1}	Test weight (g)	Seed weight plant^{-1}(g)	Seed yield (q ha^{-1})	Stalk yield (q ha^{-1})	Oil content (q ha^{-1})	Oil yield (q ha^{-1})	HI (%)
Land treatments									
Flad bed	88.78	8.40	2.13	1.56	4.19	13.96	35.97	1.58	22.44
Ridge and furroww	100.02	8.64	2.23	2.01	5.09	16.34	36.86	1.88	22.28
Broad bed and furrow	107.11	8.79	2.30	2.11	5.15	16.89	37.45	1.91	23.51
SEm+	2.8	0.18	0.04	0.05	0.1	0.58	0.17	0.01	0.17
CD at 5%	8.5	NS	NS	0.16	0.32	1.74	NS	0.052	NS
Dates of sowing									
September 15	81.80	7.58	2.03	1.22	3.31	11.72	37.11	1.23	21.38
October 1	113.16	9.60	2.42	2.63	6.02	18.38	37.60	2.25	24.06
October 15	102.67	9.07	2.31	2.10	5.59	17.60	36.40	2.10	23.4
November 1	96.84	8.19	2.12	1.62	4.32	15.22	35.90	1.59	22.0
SEm+	3.3	0.21	0.05	0.06	0.12	0.67	0.22	0.02	0.21
CD at 5%	9.8	0.65	0.16	0.18	0.37	2.01	0.68	0.061	0.64

DAS : Days after sowing

Results and Discussion

Maximum number of siliquae per plant, seed and straw yield was observed in broad bed and furrow method of sowing, which was comparable to ridge and furrow method of sowing. Growth parameters, number of siliquae per plant, seed and straw yield recorded in flat bed method of sowing was minimum. Different land treatments did not influence the number days taken for 50% flowering and maturity, number of seeds per siliqua, test weight, oil content and harvest index substaintially. Number of days for 50 % flowering and maturity is genetically controlled and mainly influenced by climate. In the present experiment the number of days taken for 50 % flowering and maturity was not influenced by land treatments since these are largely varietal dependent. Improved performance of mustard sown on broad bed and furrow and ridge and furrow compared to flat bed method with regard to growth and yield is probably due to better soil moisture regime, deeper root system and better nutrient utilization (Khan and Agarwal 1985).

Time of sowing profoundly influenced the growth of mustard. Plant height and dry matter recorded with October 1 and October 15 sowing were similar and further delay in sowing reduced these parameters significantly. With delay in sowing from October onwards there was significant reduction in number of primary branches per plant and leaf area index. Sowing on September 15 resulted in significantly lower plant height, number of primary braches per plant, leaf area index and dry matter production. Delay in sowing from September 15 onwards

ncreased the days taken for 50% flowering nd reduced the number of days taken to maturity. Number of siliquae per plant, seed weight per plant, seed yield, oil yield and harvest index decreased significantly with delay in sowing from October 1 onwards. Number of seeds per siliqua, test weight and stalk yield recorded in October 1 and October 15 sowing were on par, but decreased significantly with further delay to November. Growth parameters, yield attributes and yield observed in September 15 sowing was significantly lowest, which might be due to decreased crop growth and physiological activities of the plant as a result of higher temperature during the vegetative period. Though the reproductive period was longer, the seed yield was lowest due to the reduced source. Number of days taken for 50% flowering increased with delay in sowing from September 15 onwards. Lower temperatures experienced by late sown crop prolonged the vegetative period and increased the number of days taken for 50 % flowering. Delayed flowering in late sown crops due to the gradual fall in temperature was also reported by Ghosh and Chatterjee (1988). Higher temperature during the reproductive phase shortened the reproductive period thus reducing the duration of late sown crop. Growth parameters, yield attributes, yield and harvest index recorded in October 1 sowing were significantly the highest mainly due to better partitioning and translocation of photoshynthates to economic sink, which increased the number of siliquae per plant and seed weight per plant, while it was not the case with other dates of sowing. Poor yields of mustard under late sowing due to shorter reproductive period and poor partitioning of photosyntates was reported by Sahoo *et al.* (2000) and Jain *et al.* (1989). Reduced reproductive phase and improper development of seed in late sown crops might have caused reduction in oil content (Kumar and Shastry, 1981). Crop sown on October 1 resulted in highest oil yield and decreased significantly with delay in sowing, which might be due to reduced reproductive phase in late sown crops, causing reduction in seed yield and oil content resulting in low oil yield (Sharma *et al.* 1992). The gross returns, net returns and returns per rupee invested were highest with October 1 sowing in broad bed and furrow method and lowest with September 15 sowing in flat bed method.

Based on these results, it may be concluded that in non-traditional areas with bimodal type of rainfall as in Tirupathi (A.P) mustard may be sown under either broad bed and furrow or ridges and furrow method preferably by first fortnight of October to achieve higher yield.

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