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Research Article

PERFORMANCE OF MUSTARD GREENS CULTIVARS (*Brassica juncea* (L.) Czern) UNDER NAMSAI CONDITIONS, ARUNACHAL PRADESH

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Abstract: Mustard greens is a popular leaf vegetable of North East India. An experiment was conducted in the Research Farm of the Arunachal University of Studies to evaluate the performance of different mustard greens cultivars on different sowing time under Namsai conditions of Arunachal Pradesh. Three local varieties of mustard greens (Namsai Local, Yazali Local and Ziro Local) were evaluated during *rabi* season 2019-20 in replicated factorial randomized block design, with monthly sowings during the month of September, October and November 2019. Statistical analysis revealed that the varieties differed significantly with respect to various growth and yield parameters in three different sowing dates. Among the three cultivars, Namsai Local recorded the highest plant height (17.13 cm) at 45 days after sowing (DAS) and at time of seed harvest (135.27 cm). Namsai Local also recorded the largest leaf length (16.50 cm) and leaf width (10.87 cm). The varieties differed significantly for days to 50% flowering, leaf area index (LAI) and leaf morphology. Ziro Local reported no flowering, no production of secondary branches, pods and seed formation. Variety Namsai Local reported the highest leaf yield (680 g/ plot), the highest number of siliqua per plant (258.18) and maximum number of seeds per siliqua (16.06). Variety Yazali Local recorded the highest seed yield (544.77 kg/ha). Sowing in October 15th recorded the tallest plants (18.42 cm) at 45 DAS, largest leaf width of 11.13 cm, maximum number of siliquae (168.84 nos.), number of seeds per siliqua (11.42 nos.), and seed yield (386.39 kg/ha). Sowing in September 15th reported the highest LAI (120.37 cm^2) and the highest number of leaves (8.90) per plant. In terms of interaction effect of variety and sowing time, the highest leaf yield at first harvest was recorded in Namsai Local sown on 15th September (83 g), whereas the highest leaf yield at second harvest was recorded in Yazali Local sown on 15th October (1253.67 g). Total yield did not differed significantly.

Keywords: *Mustard greens, Namsai Local, Leaf yield*

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Introduction

Improvement in A field experiment was conducted at the Agricultural Research Farm of the Arunachal University of Studies, Namsai during the month of September, October and November of 2019-2020. The location of Namsai falls under tropical climate zone with an average rainfall of 3500-4000 mm at an elevation of 156 meters from mean sea level. Pure, healthy and good quality seeds of three cultivars of mustard greens *i.e*., Namsai Lai, Yazali Lai, Ziro Lai collected from farmers field of the respective places of origin were used for the experiment. The experiment was conducted in a factorial randomised block design involving two factors *i.e*., varieties (Namsai Local- V1, Yazali Local- V2, and Ziro Local- V3) and three dates of sowing (15th of September- S1, 15th of October- S2 and 15th of November- S3). Seeds were sown in lines at a spacing of 45 cm x 30 cm and at a depth of 3-4 cm. Gap filling were done at four leaves stage after 12-15 days of sowing to maintain uniform plant population. The crop was harvested for both leaf and seed. Leaves were harvested twice, first when crop had 8-12 leaves per plant at 45 DAS and second after 10 days. Seed harvesting was done when the crop turned yellow from green. The crop was sun dried, threshed and the seeds were collected. Data and seed yield recorded from each plot were subjected to statistical analysis by using analysis of variance (ANOVA) method.

Results and Discussion

Results of statistical analysis of mean growth and yield parameters of mustard greens are furnished in [Tables-1] and [Tables-2].

Growth parameters

B. juncea is a leafy vegetable and the vegetative phase of the crop has profound influence in total yield. The data on growth parameters like plant height, leaf length, leaf width, number of leaves, days to 50% flowering, number of branches, leaf characteristics and leaf area index (LAI) were recorded at different growth stages [Table-1]. Results showed that, Namsai Local recorded the maximum plant height of 17.13 cm and 135.27 cm at 45 DAS and at seed harvest stage. Plant height at 45 DAS was significantly highest in Namsai Local (V1); and other two varieties (Yazali Local and Siro Local) were at par with each other. Namsai Local (V1) also recorded significantly highest leaf length (16.50 cm), leaf width (10.87 cm) and number of branches (21.47) per plant, while the other two varieties were at par with each other. Number of leaves per plant did not vary statistically, and all varieties uniformly recorded eight leaves at 45 DAS. Similar result was reported earlier by Kazi (2014). The earliest 50% flowering was observed in Yazali Local (64 DAS) with the highest leaf area index (LAI) of 120.067 cm^2. Ziro Local showed no flowering during its crop duration at all. It can be noted that the difference in flowering can be due to the effect of genetic character and climatic conditions affecting each variety differently. Leaf of Namsai Local had a smooth texture on both at upper and lower surface of leaves, whereas Yazali Local and Ziro local had tiny hairs (pubescence) on the lower surface of the leaves. Leaf area did not vary significantly between varieties, and between sowing times.

With respect to the dates of sowing, the tallest plant height was recorded in S2 (18.42 cm). The plant height was negatively influenced by delayed sowing.

Table-1 *Mean growth parameters of mustard greens influenced by variety and time of sowing*

Treatments	Plant height (cm)		Leaf length (cm)	Leaf width (cm)	No. of leaves per plant	Days to 50% flowering	Number of branches (75DAS)	Leaf area index (cm^2)
	45 DAS	At seed harvest						
V1	17.13	135.27	16.5	10.87	8.42	67.11	21.47	118.65
V2	14.78	115.11	15.00	10.11	8.49	64.67	20.73	120.08
V3	16.00	18.19	14.74	9.40	8.01	0.00	0.00	100.25
CD for variety means (P= 0.05)	1.45	12.89	1.49	1.31	0.81	NS	1.24	NS
SE (±)	0.48	4.29	0.49	0.44	0.27	0.26	0.41	9.91
S1	16.31	91.94	15.64	10.04	8.90	44.00	14.60	120.37
S2	18.42	90.71	17.33	11.13	7.78	44.111	14.56	120.06
S3	13.18	85.92	13.27	9.20	8.24	43.67	13.04	98.55
CD for sowing time (P= 0.05)	1.45	NS	1.49	1.31	NS	NS	1.24	NS
SE (±)	0.48	4.29	0.49	0.44	0.27	0.26	0.41	9.91
T1 : V1S1	17.33	142.07	18.20	11.20	9.33	67.00	22.73	143.78
T2 : V1S2	19.73	135.07	18.13	11.80	7.60	67.33	21.80	130.18
T3 : V1S3	14.33	128.67	13.17	9.60	8.33	67.00	19.87	81.99
T4: V2S1	14.93	116.07	14.87	9.93	8.93	65.00	21.07	130.18
T5 : V2S2	17.53	118.0	16.87	11.07	8.07	65.00	21.87	112.62
T6 : V2S3	11.87	111.3	13.27	9.33	8.47	64.00	19.27	117.43
T7 : V3S1	16.67	17.70	13.87	9.00	8.43	0.00	0.00	87.15
T8 : V3S2	18.00	19.07	17.00	10.53	7.67	0.00	0.00	117.37
T9 : V3S3	13.33	17.80	13.37	8.67	7.99	0.00	0.00	96.23
CD for interaction (P=0.05)	2.52	22.33	2.58	2.27	1.39	1.33	2.15	51.48
SE (±)	0.85	7.45	0.86	0.76	0.46	0.44	0.71	17.17
CV (%)	9.11	14.41	9.66	12.94	9.69	1.75	8.84	26.32

Table-2 *Mean yield parameters of mustard greens influenced by variety and sowing time*

Treatments	Leaf yield (g/ plot of 6 sq m)			No. of siliquae /plant	No. of seeds/siliquae	Seed yield (kg / ha)
	First harvest	Second harvest	Total leaf yield			
V1	680	631.11	1311.11	258.18	16.06	338.22
V2	465.56	457.78	923.33	205.03	15.56	544.77
V3	430	696.78	1129	0	0	0
CD for variety means (P= 0.05)	214.56	NS	NS	12.44	1.49	72.19
SE (±)	74.86	140.10	145.95	4.15	0.49	33.46
S1	636.67	434.44	1073.33	144.18	10.36	246.88
S2	477.78	907.89	1385.67	168.84	11.42	386.39
S3	461.11	443.33	904.44	150.19	9.83	249.72
CD for sowing (P= 0.05)	NS	420.06	437.59	12.44	1.49	72.19
SE (±)	74.86	140.10	145.95	4.15	0.49	33.46
T1 : V1S1	830	466.67	1296.67	229.67	15.73	259.20
T2 : V1S2	613.33	913.33	1526.67	294.20	17.20	444.40
T3 : V1S3	596.67	513.33	1110.00	250.67	15.23	311.07
T4: V2S1	723.33	390.00	1113.33	202.87	15.33	481.43
T5 : V2S2	353.33	556.67	910.00	212.33	17.07	714.77
T6 : V2S3	320.00	426.67	946.67	199.9	14.27	438.10
T7 : V3S1	356.67	446.67	810.00	0	0	0
T8 : V3S2	466.67	1253.67	1720.33	0	0	0
T9 : V3S3	466.67	390.00	856.67	0	0	0
CD for interaction (P=0.05)	371.63	727.57	757.92	21.55	2.59	125.03
SE (±)	129.67	242.67	252.79	7.19	0.86	57.95
CV (%)	40.88	70.62	39.05	8.06	14.18	24.54

The longest leaf length (17.33 cm) and leaf width (11.13 cm) at 45 DAS was observed in S2. Delay in sowing from October 15to November 15 decreased the LAI significantly and it was due to decrease in mean temperature at later dates of sowing which reduced the leaf expansion and growth of the crop. A similar finding was reported earlier by Panda (2004). In terms of interaction effect of variety and sowing time, the tallest plant height at 75 DAS was recorded in V1S2 (19.73 cm) and at seed harvest the tallest plant height was observed in V1S1 (142.07 cm) and shortest in V3S1 (17.700 cm). Combinations V1S1, V1S2 and V2S2 expressed superiority among others for plant height at 45 DAS. Maximum leaf length at 45 DAS was recorded in V1S1 (18.20 cm) and shortest in V1S3 (13.17 cm). The largest leaf width was recorded in V1S2 (11.80 cm) and smallest in V3S3 (8.67 cm). The maximum number of leaves was recorded in V1S1 (9.33) and minimum in V1S2 (7.60). Namsai Local in first (September) and second (October) sowing were found superior for growth parameters like leaf length and leaf width. The maximum leaf area index (LAI) was observed in V1S1 (143.78 cm^2) which can be noted as the varietal effect with positive effect of favourable climatic condition. The highest number of branches at 75 DAS was recorded in V1S1 (22.73 nos.) and lowest in V2S3 (19.27 nos.) while V3S1, V3S2 and V3S3 recorded no branching. The maximum duration for 50% flowering (67days) was recorded in Namsai Local (V1) in all sowing times; while the earliest duration for 50% flowering was recorded in Yazali Local in November sowing (V2S3, 64 days). Ziro Local (V) recorded no flowering in any of the sowing times. The possible reason for decrease in flowering duration in the late sown crop could be that the environmental conditions for growth were favourable for a faster growth and attained flowering stage early. In early season sown crop obtained more time for various activities and could complete various phenological stages. Similar trends in days to 50% flowering was reported by Mendham *et al*, that delayed sowing accelerated growth and decreased day number from sowing to 50 % flowering stage.

Yield parameters

Results showed that, the highest leaf yield at first harvest was recorded [Table-2] in Namsai Local (680 g/ plot) and the highest leaf yield at second harvest in Ziro Local (696.78 g). Significant differences in leaf yield were noticed only in first harvest. V1 and V3 gave comparatively high leaf yield. Yield of second harvest and total leaf yield per plot were not statistically different. Effect of sowing time was also not statistically different; however, September and October (S1 and S2) sowing recorded a high yield (636.67g and 907.89 g respectively). In terms of interaction effect of variety and sowing time, the highest total leaf yield was recorded by variety Namsai in all three sowing times. Ziro Local (V3) reported no flowering leading to no branching and subsequently leading to no siliquae and seed formation. Thus, no seed yield was attained by this variety. This could be due to unfavourable weather and soil conditions of the Namsai area as this cultivar is well acclimatised to cool climatic conditions of Siro in comparison to Namsai area. The reasons for non-flowering habit of Ziro Local under Namsai conditions needs further investigation for confirmation.

The highest number of siliquae per plant (258.18), seeds per siliquae (16.06 nos.) and seed yield (544.77 g) were recorded in Namsai Local (V1). The highest number of siliquae per plant (168.84), number of seeds per siliquae (11.422) the highest seed yield (386.39 g) was recorded in S2. The results are in agreement with the results reported by Pal et al. (1996) and Thakur and Singh (1998). From the findings of the experiment, it can be concluded that among the three cultivars or eco types evaluated, Namsai Local recorded the highest growth and yield attributes. In terms of sowing time, September 15th sowing gave the highest leaf yield.

Conclusion

The study indicates superiority of Namsai Local variety of mustard greens and its early season sowing (September and October) for better growth and high leaf yield under Namsai conditions.

Application of research: This research indicates the optimum sowing time and the suitable vaiety of mustard green for Namsai condition. Sowing of suitable variety in optimum time can give higher yields.

Research Category: Agriculture Sciences

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Study area / Sample Collection: Namsai, Arunachal Pradesh

Cultivar / Variety / Breed name: Ziro lai , Namsai lai and Yazali lai

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