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Evaluation of Planting Density and Nitrogen on the Performance of Kaon [*Setaria italica* (L.) Beauv.]

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Abstract: An investigation was carried out to ascertain the effect of planting density and nitrogen on the performance of kaon. The planting density was regulated by the seed rate per hectare. Four different seed rates (4, 6, 8 and 10 kg ha^{-1}) and five nitrogen levels (0, 15, 30 and 60 ka ha^{-1}) were used for this study. The result of the study revealed that the planting density significantly influenced the yield and yield contributing characters such as plant population per square meter, plant height, number of tiller per plant, effective tiller per plant, grains per panicles, grain and straw yields. Nitrogen too significantly influenced the yield and yield contributing characters except plant population per square meter. The maximum grain yield (1.98 t ha^{-1}). The dose of 60 kg N ha^{-1} produced the highest grain yield (1.87 t ha^{-1}) and it was statistically similar to 45 kg N ha^{-1} (1.82 ha^{-1}). The interaction effect due to seed rates and nitrogen levels showed significant influence on effective tiller per plant, grain and straw yield and harvest index. The combination of 10 kg seed and 60 kg nitrogen per hectare produced the highest grain yield (2.15 t ha^{-1}).

Key words: Planting density, nitrogen, performance, kaon

Introduction

Kaon is a minor cereal crop in Bangladesh. In our country, it is grown either as sole or as mixed crop specially in the river bank areas with minimum care and input. Planting density, governed by seed rate per hectare, has a large effect on the growth and productivity of crop plants., Population density modifies plants micro-climate and influences availability and uptake of nutritional components as well as eventually affects yield. Kaon is generally regarded as poor tillering type species (Horiuchi and Yasue, 1980) among the millet group. Therefore, high yield potential is mostly dependent on the number of crop per unit area. Appropriate plant density should be determined which governs the ultimate ear density and grain yield, Cereal crops generally uptake a large quantity of nitrogen for yield. Adequate information is not available in Bangladesh regarding planting density and nitrogen level for maximization of yield of kaon with optimum level of nitrogen governing minimum cost. Farmers of different areas of Bangladesh grow it at different times without any recommended seed rate and nitrogen dose which resulted in low grain yield. Hence, the present experiment was undertaken in order to evaluate the planting density and nitrogen levels on the performance of kaon and to determine the optimum level of planting density and nitrogen for maximization of grain yield of kaon.

Materials and Methods

The experiment was carried out during the period from November, 1998 to April, 1999 at Agronomy Farm, Hajee Mohammad Danesh University of Science and Technology, Dinajpur, Bangladesh. The soil of the experimental site was sandy loam with PH value of 6.5 to 7.5. Organic matter content was moderate and general fertility was low (BARC., 1989). Shibnagar cultivar of kaon was used as materials for the study. The experiment was laid out in split plot design replicated thrice, keeping for seed rates i.e., 4, 6, 8 and 10 k ha^{-1} in main plots and five nitrogen levels namely 0, 15, 30, 45 and 60 kg/ha^{-1} in subplot. The crop was fertilized with nitrogen as (per schedule of the experiment along with 35 kg P_2O_5 and 30 kg K_2O per hectare through urea, triple super phosphate and muriate of potash, respectively. One half of total nitrogen and whole of P_2O_5 and K_2O were applied at the final land preparation. The rest of nitrogen was applied in two equal splits at Crown Root Initiation (CRI) and mid tillering (MDT) stage, respectively. Before harvesting, ten sample plants were randomly selected from each plot was measured after proper drying in a storable condition (12% moisture condition).

Results and Discussion

Effect of planting density: Table 1 shows that planting density significantly influenced on the plant population per square meter. The lowest number of plant was produced by the planting density of 4 kg seed per hectare but it was found identical to that of 8 kg seed per hectare. Almost similar response was found by Sardar *et al.* (1987) where the maximum grain yield of foxtailmillet was found from 8 kg seed/ha. This best yield was supported by the yield contributing characters such as number of effective tillers per plant, number grains per panicle, weight of 1000 grains but panicle length did not show any significant differences. The response of straw yield showed similar trend as in grain yield due to the better response of plant height and total number of tiller per plant.

Effect of nitrogen level: Table 2 also shows that yield and yield contributing characters of foxtailmillet are progressively increased with the increasing levels of nitrogen. Among the different nitrogen levels, the best yield was produced by the treatment of nitrogen 60 kg ha^{-1} which was statistically found similar to that of nitrogen 45 kg ha^{-1}. The present study was almost similar to Haque and

Table 1: Effect of different planting densities on yield and yield contributing characters of Kaon

Planting densities (kg seed ha^{-1})	Crop characters									
	Plant population /m^2	Plant height (cm)	No. of tiller/ plant	No. of effective tiller/plant	Panicle grain/ panicle	No. of grain/ panicle	Weight of 1000 grain (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Harvest index (%)
4 (S_1)	41.53c	105.3a	3.32a	2.32a	17.31a	2714a	1.862a	1.31c	1.132c	41.85
6 (S_2)	42.47b	104.3ab	3.30a	217a	17.20a	2708a	1.824a	1.62b	2.32b	41.11a
8 (S_3)	44.47a	103.3b	2.94b	1.87b	17.14a	2606b	1.810a	1.93a	2.61a	42.51a
10 (S_4)	44.678	103.0b	2.90b	1.88b	18.49a	2601b	1.800a	1.98a	2.71a	42.21a

Figure in the column having same letter (S) do not differ significantly at 5% level

Table 2: Effect of nitrogen levels on yield and yield contributing characters o Koan

Doses of nitrogen (kg ha^{-1})	Crop characters									
	Plant population /m^2	Plant height (cm)	No. of tiller/ plant	No. of effective tiller/plant	Panicle grain/ panicle	No. of grain/ panicle	Weight of 1000 grain (g)	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Harvest index (%)
o (N_o)	43.08a	97.69d	2.07c	1.70c	16.75a	25.96c	1.747b	1.20c	1.95c	38.09c
15 (N_1)	43.41a	100.54c	3.10b	2.01b	16.96a	26.48b	1.798b	1.49b	2.10b	41.50b
30 (N_2)	43.16a	103.94b	3.25b	2.06b	17.05a	26.77b	1.870a	1.60b	2.15b	42.66b
45 (N_3)	43.25a	109.40a	3.90a	2.75a	17.12a	27.90a	1.876a	1.82a	2.30a	44.17a
60 (N_4)	43.50a	108.34a	4.15a	3.15a	17.31a	28.25a	1.885a	1.87a	2.35a	44.31a

Figure in the column having same letter (S/ do not differ significantly at 5% level

Table 3: Interaction between planting densities and nitrogen levels on crop characters, grain and straw yields and harvest index

Treatments	No. of effective tiller/plant	Grain yield (t ha^{-1})	Straw yield (t ha^{-1})	Harvest index (%)
S_1N_0	1.80e	0.95h	1.45f	39.58ef
S_1N_1	2.10bc	1.33g	1.84e	41.95abcde
S_1N_2	2.30bc	1.50fg	2.03de	42.49abc
S_1N_3	25.50ab	1 .42fg	1.92de	42.51abc
S_1N_4	2.90a	1.36fg	1.89de	42.20abcd
S_2N_0	1.80	1.40fg	2.13de	39.66cdef
S_2N_1	1.83de	1.40fg	1.90de	42.42abcd
S_2N_2	1.96bcd	1.70de	2.68ab	38.81f
S_2N_3	2.36ab	1.87bcd	2.43bc	43.48a
S_2N_4	2.40ab	1.74de	2.45bc	41.52bcd
S_3N_0	1.83de	1.73de	2.43ab	51.58bcde
S_3N_1	1.93de	2.05abc	2.73ab	42.88ab
S_3N_2	1,96bcde	2.04abc	2.66ab	43.40ab
S_3N_3	2.10bc	2.03abc	2.76ab	43.39ab
S_3N_4	2.10bc	2.07ab	2.70ab	43.39ab
S_4N_0	1.63e	1.55ef	2.71cd	41.22bcdef
S_4N_1	1.83de	1.85cd	2.76ab	40.13cdef
S_4N_2	1.86cde	2.02abc	2.80a	41.90abcde
S_4N_3	2.00bcd	2.07ab	2.79a	42.59abc
S_4N_4	2.03bcd	2.15a	2.81a	43.34ab

Khan (1989) where it was reported that nitrogen 49 kg ha^{-1} produced the highest grain yield. Again it was paretically in agreement with that of Ghaffer (1995) who reported that nitrogen 75 kg ha^{-1} produced the highest grain yield. The highest response of the trail was supported by the yield contributing characters such as plant height, number of effective tillers per plant, number of grain per panicle, weight of 1000 grains. Plant population/m^2 and panicle length did not show any significant difference. The control plots showed significantly the least response in yield and yield contributing characters. Similar trend of nitrogen response was observed in case of straw yield.

The interaction between planting densities and nitrogen levels have no significant influence on most of the crop characters studied except the number of effective tiller/plant, grain and straw yield and harvest index (Table 3). The result is in conformity with that of Ghaffer (1994) where the maximum grain yield of foxtailmillet was found from the combination of 10 kg seed and 60 kg nitrogen/ha.

References

BARC., 1989. Fertilizer Recommendation Guide. BARC, New Airport Road, Dhaka, pp: 11-41.

Ghaffer, M.A., 1994. Development of management practices of millets for higher production. BAU Res. Prog., 8: 14-18.

Ghaffer, M.A., 1995. Development of management practices of millets for higher production. BAU Res. Prog., 9: 16-20.

Haque, M.M. and M.R. Khan, 1989. Study of the seed rates and fertilizer rates of Kaon. Proceedings of the 13th Annual Bangladesh Science Conference, January 27-30, 1989, Dhaka, pp: 139-140.

Horiuchi, T. and T. Yasue, 1980. Studies on corresponded relations between plant characters and cultivation methods. II. Growth response of the native millets to the technical differences between direct sowing and transplanting. Jpn. J. Crop Sci., 49: 593-601.

Sardar, F., A. Hossain and S.H. Hawlader, 1987. Study of the seed rates and fertilizer rates of Kaon. Proceedings of the 12th Annual Bangladesh Science Conference, July 1987, Dhaka, pp: 8.