

Response of promising pearl millet (*Pennisetum glaucum*) cultivars to levels and time of nitrogen application under rainfed conditions

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ABSTRACT

A field experiment was conducted during the rainy (*kharif*) seasons of 1998 and 1999 at New Delhi, to study the response of 4 cultivars of pearl millet [*Pennisetum glaucum* (L.) R.Br.-emend-stuntz] to different levels and times of N application. Among the 4 cultivars, a hybrid from the IARI, New Delhi, 'Pusa 605' and a composite from the ICRISAT, 'Raj 171' outyielded the other cultivars 'Pusa Bajri 266' and 'ICMH 356'. A dose of 60 kg N/ha was found to be as good as 90 kg N/ha and split application showed advantage over the basal application.

Key words : Pearl millet cultivars, N-fertilization, Rainfed conditions

Pearl millet is an indispensable crop of arid and semi-arid regions of the country. It is highly preferred as a staple food and also valued greatly for its dry fodder in livestock farming systems which is predominant in these areas. The performance is commendable, as this crop continues to be grown on marginal lands with low levels of input. However, inadequate nitrogen fertilization, which is already deficient in these areas (Khateek, 1999) and use of low-yielding traditional cultivars keep the yields very low. The present investigation was, therefore, conducted to study the response of pearl millet cultivars to levels and times of N application under rainfed conditions.

MATERIALS AND METHODS

The experiment was conducted at New Delhi, during the rainy seasons of 1998 and 1999. The soil was sandy loam and almost neutral in reaction (pH 7.6) with low nitrogen (105.81 kg/ha) and phosphorus (9.75 kg/ha) and medium in potassium (235.05 kg/ha). Four cultivars, 2 each from the IARI, New Delhi (a hybrid 'Pusa 605' and a composite, 'Pusa Bajri 266') and the ICRISAT, Hyderabad (a hybrid 'ICMH 356' and a composite, 'Raj 171') were tried. These cultivars were tested against different levels and time of N application (0, 30, 60 and 90 kg/ha, each dose applied both as basal and in 2 equal splits). Thus,

the experiment consisted of 28 treatment combinations was laid out in randomized block design (factorial) with 3 replications. The crop was sown in the first week of July. The total rainfall received during rainy season in 1998 and 1999 was 419.30 and 289.20 mm respectively. Thus, in rainy season of 1999, the rainfall was less by 130.10 mm with erratic distribution and the crop experienced a prolonged dry spell of about 20 days.

RESULTS AND DISCUSSION

Performance of pearl millet cultivars

Among the 4 cultivars, hybrid 'Pusa 605' registered the maximum plant height, higher number of tillers/plant, more dry matter/plant, more grain weight and 1,000-grain weight and thereby gave higher grain and stover yields (Table 1). However, it was comparable with a composite 'Raj 171'. Lower values for all the above parameters were registered with 'ICMH 356' and 'Pusa Bajri 266'. However, cultivars did not show any variation for number of tillers/plant at harvest. The faster growth rate and early canopy production might have resulted in better crop growth of 'Pusa 605' and 'Raj 171' which ultimately resulted in better utilization of photosynthates thereby giving higher grain and stover yields.

Effect of level and time of N application

The level and time of N application remarkably influenced all the growth parameters, yield components and also grain and stover yields (Table 1). A dose of 90 kg N/ha applied in 2 equal splits resulted in taller plants and more tillers/plant, dry

matter/plant (18.76 g) and 1,000-grain weight which in turn resulted in higher grain and stover yields. Nitrogen @ 90 kg applied in 2 splits gave higher grain yield of 27.0 and 22.64 q/ha in 1998 and 1999 respectively and the magnitude of increase in 1998 over the control, 30 kg N/ha as basal and 30 kg N/ha in split was 98.08, 42.10 and 28.57% respectively, and the corresponding values in 1999 were 74.1, 43.3 and 21.3%. However, 60 kg N/ha in splits was also found to be as good as 90 kg N/ha applied in split but both these were significantly superior to 30 kg N/ha applied either as basal or in split. Split application had a little edge over basal application. This might be due to continuous supply of nitrogen with split application which will replenish the available nitrogen in the soil and thus made available to the crop. The enhanced N application might have helped in rapid cell multiplication and resulted in expansion of leaf area, thereby accelerating the photosynthetic rate and ultimately increased all the growth parameters.

Grain and stover yields in rainy season of 1998 were slightly higher than those of 1999. This was mainly due to low and erratic distribution of rainfall during rainy season 1999. However, the increase in grain and stover yields with enhanced N application could be ascribed to better plant growth and dry-matter production due to higher photosynthetic area. This is further supported by the fact that soil of the experimental field was low in nitrogen (105.81 kg/ha). Thus, an increase in nitrogen supply might have increased all growth parameters, yield-attributing characters which ultimately contributed to

Table 1. Effect of levels and time of nitrogen application on different cultivars of pearl millet

Treatment	Plant height (cm)		Tillers/ plant		Dry matter/ plant (g)		Grain weight/ ear (g)		1,000-grain weight (g)		Grain yield (q/ha)		Stover yield (q/ha)	
	1998	1999	1998	1999	1998	1999	1998	1999	1998	1999	1998	1999	1998	1999
Cultivar														
'Pusa 605'	239.5	195.5	2.4	2.1	98.55	79.64	17.84	15.95	7.70	7.24	24.30	20.60	82.10	75.71
'Pusa Bajri 266'	221.5	183.9	2.3	1.9	85.71	75.74	15.81	14.64	7.10	6.93	19.75	17.85	69.31	60.37
'ICMH 356'	212.2	174.7	1.9	1.8	84.59	77.86	15.62	14.25	7.04	6.90	19.37	16.56	70.03	57.22
'Raj 171'	232.9	187.5	2.3	1.9	97.42	78.02	17.18	15.32	7.43	7.18	27.72	19.30	81.52	66.56
CD (P=0.05)	11.9	11.7	NS	NS	4.51	NS	1.38	4.51	0.38	NS	3.53	2.03	10.76	5.76
Level and time of N application														
0 kg/ha	203.1	168.8	1.6	1.5	78.40	58.54	14.87	13.18	6.51	6.46	13.70	13.00	49.37	48.70
30 kg/ha at sowing	215.8	179.4	2.3	1.9	84.75	71.55	16.98	15.02	7.04	6.97	19.00	15.80	67.37	57.12
15 kg/ha at sowing+ 15 kg/ha at 15 DAS	221.7	189.4	2.3	2.0	88.91	74.83	16.94	15.06	7.18	7.27	21.00	18.67	73.62	61.71
60 kg/ha at sowing	233.4	197.5	2.4	2.0	92.87	86.23	18.37	17.15	7.40	7.31	23.40	18.57	78.51	64.37
30 kg/ha at sowing+ 30 kg at 30 DAS	249.1	206.8	2.7	2.3	107.45	86.47	19.73	17.35	7.63	7.49	25.62	20.86	86.12	68.00
90 kg/ha at sowing	246.7	204.6	2.5	2.0	85.04	86.32	19.39	17.00	7.42	7.34	23.75	18.75	81.75	66.80
45 kg/ha at sowing+ 45 kg/ha at 45 DAS	250.6	209.7	2.1	2.1	109.36	89.46	19.81	17.72	7.65	7.57	27.00	22.64	88.62	71.07
CD (P=0.05)	12.6	12.2	0.5	0.5	5.11	5.34	1.85	1.62	0.34	0.31	4.10	2.69	10.09	7.61

increase in grain and stover yields. The results confirm the findings of Gautam (1979) and Banwari Lal (1986).

Thus hybrid 'Pusa 605' can be grown successfully under the rainfed conditions of Delhi region. Split application of 60 kg N/ha was found to be optimum for higher yields of pearl millet.

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