

Response of Pearl Millet to Major Nutrients

BY

O. S. KANDASWAMY¹, M. S. THANGAM², M. S. RAMAKRISHNAN³, K. K. CHANDRAGIRI⁴
T. R. SRINIVASAN⁵ AND S. VARISAI MUHAMMAD⁶

ABSTRACT

The response of four hybrid varieties of bajra to the application of N, P and K was studied at Bhavanisagar, Tamil Nadu for three years. The results indicate the response of bajra to nitrogen fertilisation alone. The optimum dose was found to be around 140 kg/ha.

INTRODUCTION

Pearl millet (*Pennisetum typhoides* S & H) is being cultivated largely as a staple food of Tamil Nadu both under irrigated and rainfed conditions. The fullest potential yield of pearl millet can be achieved only by proper fertilisation. Singh and Mehta (1959) reported that the response of local varieties was only upto 40 kg N/ha while the hybrid varieties responded up to 160 kg/ha. Similar results have been reported by Singh and Maurya (1969) and Pal and Kaushik (1973). Mahendra Pal *et al.* (1973) also reported that the response of the hybrid varieties varied according to the agro-climatic conditions. The same HB 1 variety responded upto 98.11 kg N/ha at Ludhiana and Hissar region while at Tamil Nadu the optimum dose was 129.92kg/ha. Hence it is necessary to fix up the optimum dose of nitrogen for each region. Experiments on the

fertiliser needs of bajra so far conducted in this country have been largely restricted to levels of nitrogen alone keeping P and K constant. Information on the response of this major cereal crop for the combination of N, P and K is meagre. Hence to fix the optimum dose of N, P and K for the four hybrids, an experiment was conducted at the Agricultural Research Farm, Bavanisagar for three years and the results are briefly presented in this paper.

MATERIALS AND METHODS

A trial was laid out in 3³ confounded design with four hybrids of bajra viz. HB 1, HB 3, HB 4 and X 3. The manurial treatments were 0, 150 and 300 kg nitrogen/ha, 0, 37.5 and 75 kg of P₂O₅/ha and 0, 25 and 50 kg K₂O/ha. Nitrogen was applied in two equal dose first at planting and sub-

1 and 4 Research Assistants, 3. Superintendent. Agricultural Research Station, Bhavanisagar, 2. and 5. Assistant Professors, 6. Director of Research, Tamil Nadu Agricultural University, Coimbatore.

sequent application 26 days after planting. Phosphorus and potash were applied as single super and muriate of potash at the time of planting. The treatments were replicated twice. Three crops were raised during the summer season of 1970, 71 and 72. During the summer, 1970, the seed setting was affected due to the receipt of rainfall during the flowering period. The gross and net plot sizes were 6.0×3.6 m and 5.7×3.3 m respectively. The seedlings were transplanted giving a spacing of 30×25 cm on all the three years. No basal dressing of farm yard manuring was applied. The soil was loam with medium in available phosphorus rich in potash and low in available nitrogen.

RESULTS AND DISCUSSION

1. Yield potential of hybrids:

The yield data in respect of four hybrids are presented in Table 1.

In all the three years HB3 variety recorded the highest yield of grain followed by HB4 in the first and third years and HB1 during the second year. However, considering the overall mean values of all the three years performance, HB3 recorded the highest yield of 2514 kg of grain/ha and the other two viz. HB1 and HB4 were on par with each other. The overall mean values indicate the suitability of the variety HB 3 for this locality.

TABLE 1. Yield of grain and straw [Kg/ha]

Varieties	I year		II year		III year		Mean	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
HB 1	737	1937	2553	4996	2700	4778	1966	3888
HB 3	1430	2544	3050	5282	3055	4559	2514	4118
HB 4	931	1759	2224	5527	3050	4424	2088	3897
X 3	649	3077	1580	7354	1391	7354	1208	5929
S. E.	52.80	70.39	60.51	102.99	98.16	61.66		
C.D. (5%)	147.00	196.00	188.00	284.00	169.00	208.00		

TABLE 2. Effect of fertiliser application on yield (Kg/ha)

Treatments	I year		II year		III year		Mean	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
N 0	605	1242	999	2875	1965	2767	890	2294
N 150	1114	2797	3236	6255	2910	6262	2420	5104
N 300	1090	3070	3415	7752	3079	7089	2528	5970
S. E.	37.61	135.60	120.50	163.02	77.06	69.40		
C. D. (5%)	110.00	408.00	355.00	387.00	227.00	205.00		
P 0	821	2339	2359	5690	2265	5500	1818	4506
P 150	921	2342	2623	5545	2454	5465	1999	4450
P 300	1068	2428	2661	5647	2332	5153	2018	4406
S. E.	37.61	135.60	120.50	163.02	77.06	69.40		
C. D. (5%)	110.00	NS	NS	NS	NS	NS		
K 0	948	2320	2558	5730	2252	5378	1919	4476
K 25	923	2369	2519	5600	2409	5370	1954	4446
K 50	938	2330	2582	5552	2392	5370	1971	4517
S. E.	37.61	135.60	120.50	163.02	77.06	69.40		
C. D. (5%)	NS	NS	NS	NS	NS	NS		

Effect of fertilisers on the grain yield

The effects of fertiliser application on the yield of grain and straw for all the three years are presented in Table 2

The statistical scrutiny of the data indicated that the response of hybrid varieties was largely only to nitrogen fertilisation except for the first year wherein there was response for the application of phosphorus. The response for nitrogen application was significant on all the three years under study. Although there was no significant response for application of phosphorus during the second and third years there is a trend in favour for the application of phosphorus. The lack of response to the application of phosphorus can be due to the fact that the soil was medium in available in P_2O_5 . Even this medium available P_2O_5 would have been just sufficient for the proper growth of this crop. Regarding the third nutrient potassium, the response was not seen on all the three years both in respect of grain and straw yields. This is quite natural as the soil was rich in this element and the uptake of this nutrient is generally only to the required extent as against the luxury consumption in case of some other crop.

None of the two interactions as well as NPK interactions were found to be significant showing the dominant effect of nitrogen alone in increasing the growth, and yielding potentialities of the crop.

Behaviour of varieties to fertilisation :

Statistical scrutiny of the data for all the three years indicated that none of the varieties responded to the application of phosphate and potash either in terms of grain or straw yield. On the other hand there was considerable response for the application of nitrogen. Similarly none of the interactions both two factor as well as high order interactions were found to be significant. Hence further computation of response curve and economics of fertilisation were restricted to the nitrogen fertilisation alone. The data pertaining to the yield of grain and straw of the four hybrids at different levels of nitrogen fertilisation is given in Table 3.

A perusal of the table indicates that the response for nitrogen was only up to 150 kg/ha in case of varieties HB 1, HB 3 and HB 4 while there is a trend for higher dose for X 3. In order to find out the limit of response, response curves were fitted for all the varieties considering the mean values of all the three years put together and best equations of quadratic type was to be suitable or predicting the yield response. The equations are as follows :

$$HB1 \ Y = 1792 + 10.23X - 0.04X^2$$

$$HB3 \ Y = 2041 + 11.68X - 0.04X^2$$

$$HB4 \ Y = 1823 + 8.84X - 0.03X^2$$

$$X3 \ Y = 923 + 5.46X - 0.01X^2$$

where Y is the estimated yield and X is the nitrogen applied in kg/ha.

RESPONSE OF PEARL MILLET TO MAJOR NUTRIENTS

TABLE 3. Response of varieties for nitrogen

Varieties	N 0		N 150		N 300		Mean	
	Grain	Straw	Grain	Straw	Grain	Straw	Grain	Straw
HB 1	880	1844	2469	4716	2641	5100	1996	3888
HB 3	1112	1869	3148	4863	3278	5610	2514	4118
HB 4	1031	2149	2595	4534	2582	4909	1825	3897
X 3	563	3133	1472	6960	1677	7685	1208	5929

TABLE 4. Economics of fertilisation (per ha)

Variety	Optimum dose	Yield grain kg	Yield of straw kg	Value of produce	Cost of cultivation	Net return Rs.	Net return per kg of N	Response of grain per kg of N
HB 1	127.88	2439	4688	1941	1054	888	15.18	19.07
HB 3	146.00	2870	5200	2269	1092	1177	15.54	19.65
HB 4	147.33	2472	5269	1995	1095	900	13.53	16.79
X 3	273.00	1668	8174	1576	1246	300	5.77	6.10

Value of Grain 0.70/kg and Straw 0.05/kg

In the case of the varieties HB1, HB3 and HB4, maximum response was obtained at 127.88, 146.00 and 147.33 kg N/ha while in the case of X 3, it was around 273 kg/ha. Such a variation in the fertiliser requirement is quite possible due to the differential nature of growth of the varieties. HB1, HB3

and HB4 are short statured varieties yielding less straw than X3. Hence in case of X3 variety, more of nitrogen would have been absorbed and utilised for the vegetative growth of the plant. This has confirmed by the higher straw yield in case of variety X3. Similar observations of variations in respect of

nitrogen requirement have been reported by Mahendra Pal *et al.* (1973)

It is seen from Table 4 that the variety HB 3 gives the maximum return per ha at optimum dose followed by HB4 and HB1 respectively. The response of grain per kg of N also was the maximum in HB 3 (19.65). The lowest return per ha for the investment on the nitrogen was observed when the nitrogen of 273 kg/ha was applied to X 3 variety. Even this was obtained only due to the increase in the straw yield. Further the straw of the pearl millet is not much relished by cattle and gives lesser returns. Considering the above facts, it can be concluded that around 140kg N/ha can be suggested as economical dose for the hybrid varieties of *bajra* HB 3 and HB4 and about 126 kg, ha for HB1 variety for getting maximum and economical yields under Bavani-sagar conditions.

REFERENCES

- MAHENDRA PAL, R. K. CHOWDHARY, MAHABIR PRASAD and S. K. KAUSHI. 1973. Response of Pearl Millet hybrids to nitrogen and economics fertilisation in different agroclimatic conditions. *Indian J. Agron.* 18: 119-24.
- PAL, M. and S. K. KAUSHIK. 1973. Nitrogen fertilisation and plant density in hybrids Pearl Millet under irrigated conditions. *Indian J. agric. Sci.* 43:
- SINGH, H. C. and B. V. MEHTA. 1959. Comparative studies on the effect of Ammonium chloride and other fertilisers on yield and crude protein content of pearl millet (*Pennisetum typhoides*, Stapf and Hubb). *Indian J. Agron.* 4: 105-13.
- SINGH, V. and R. A. MAURYA. 1969. Response of hybrid bajra to varying levels of plant populations and levels of N. *Indian J. Agron.* 3: 246.