

Effect of enriched farmyard manure and fertility level on yield of Japanese barnyard millet (*Echinochloa frumentacea*) under rainfed condition

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ABSTRACT

A field experiment was conducted during the rainy (*kharif*) seasons of 1989 and 1990 under rainfed condition to study the effect of enriched farmyard manure and N, P and K fertilizer on yield of Japanese barnyard millet (*Echinochloa frumentacea* Link), with 3 levels of farmyard manure [0, 5 and 0.75 (enriched) tonnes/ha] and 4 fertility levels (N : P : K @ 10 : 5 : 5, 20 : 10 : 10, 30 : 15 : 15 and 40 : 20 : 20 kg/ha). The maximum grain (16.4 q/ha) and straw (88.1 q/ha) yields were obtained with 5 tonnes farmyard manure/ha. The grain yield (16.5 q/ha) increased with the increasing fertility levels up to 30 kg N : 15 kg P_2O_5 : 15 kg K_2O /ha. There was a significant and positive relationship between yield-contributing characters and yield.

Japanese barnyard millet (*Echinochloa frumentacea* Link) is an important food and fodder crop of Uttar Pradesh hills. Since it is grown under rainfed condition with limited inputs, its yield level can be increased with the application of farmyard manure along with addition of small quantities of balanced amount of N, P and K (Prakash, 1988), especially under multiple-cropping pattern. Hence the present experiment was undertaken with a view to find out the optimum dose of farmyard manure and fertilizer under rainfed condition.

MATERIALS AND METHODS

A field investigation was carried out during the rainy seasons of 1989 and 1990 at Ranichauri. The experiment was carried out in randomized block design with 3 replications under rainfed condition, with 3

levels of farmyard manure [0, 5 and 0.75 (enriched) tonnes/ha] and 4 fertility levels (10 : 5 : 5, 20 : 10 : 10, 30 : 15 : 15 and 40 : 20 : 20 kg N, P and K/ha respectively).

The soil of experimental field was silty clay loam in texture and acidic in reaction, with pH 5.2-5.4. It was low in available nitrogen (145.0 - 160.0 kg/ha) and phosphorus (6.0 - 7.0 kg/ha) but rich in available potassium (380-400 kg/ha) content. Barnyard millet variety 'VL 8' was sown on 23 June and harvested on 30 October in 1989 and it was sown on 23 June and harvested on 19 October in 1990. The experimental site was situated at 1,800-1,850 m mean sea-level facing north. Rainfall received during crop season of 1989 and 1990 was 805.2 and 800.8 mm respectively. Seived-out 0.75 tonne well-decomposed farmyard manure was

Table 1. Yield-contributing characters of Japanese barnyard millet as influenced by farmyard manure and N, P, K levels

Treatment	Plant height (cm)		Effective tillers/m		Ear weight (g)		Grain weight/ear (g)		1,000-grain weight (g)	
	1989	1990	1989	1990	1989	1990	1989	1990	1989	1990
<i>Farmyard manure (tonnes/ha)</i>										
0	92.5	103.0	26.8	32.7	3.8	4.4	3.3	3.5	3.6	3.8
5	96.2	107.6	29.6	41.3	4.7	5.4	3.9	4.7	3.9	4.0
0.75 E	96.4	103.4	26.8	39.8	4.2	5.1	3.7	4.4	4.2	3.9
CD (P = 0.05)	NS	NS	1.3	3.1	0.5	0.4	0.5	0.4	0.3	NS
<i>N : P : K (kg/ha)</i>										
10 : 5 : 5	87.0	98.7	25.9	33.4	3.5	4.2	3.1	3.4	3.6	3.4
20 : 10 : 10	94.1	100.9	26.4	39.1	4.0	4.7	3.4	3.9	3.8	3.9
30 : 15 : 15	98.8	106.6	29.1	30.5	4.8	5.3	3.9	4.7	4.3	4.3
40 : 20 : 20	100.2	112.4	29.4	40.9	4.6	5.6	4.0	4.7	3.9	3.9
CD (P = 0.05)	9.9	6.7	1.5	3.6	0.6	0.5	0.5	0.5	0.3	0.4

*E, Enriched farmyard manure

thoroughly mixed with 5, 10, 15 and 20 kg each of P_2O_5 and K_2O , applied through Mussoorie rockphosphate and muriate of potash respectively. The mixture was put in the bags for a month for incubation. The nitrogenous fertilizer along with enriched farmyard manure was applied at the time of sowing. The estimates of correlation coefficients were calculated as per the methods of Panse and Sukhatme (1967).

RESULTS AND DISCUSSION

Application of farmyard manure increased the effective tillers over the control. Maximum effective tillers (35.5/m) were recorded in the plots receiving farmyard manure @ 5 tonnes/ha. However, treatment of 0.75 tonne enriched farmyard manure was at par during 1990 (Table 1).

The plant height was not significantly affected due to different treatments. The farmyard manure showed a beneficial effect on ear weight and grain weight/ear. The maximum ear weight (5.0 g) and grain weight/ear (4.3 g) were recorded with

farmyard manure @ 5 tonnes/ha. Enriched farmyard manure was found to be at par in case of these attributes. Application of farmyard manure had significant effect on 1,000-grain weight only in 1989 and the maximum weight (4.2 g) was recorded with enriched farmyard manure.

Farmyard manure also increased the grain yield significantly (Table 2). The average grain yield was recorded with farmyard manure @ 5 tonnes/ha, being 30.05% higher than the control. Application of enriched farmyard manure also significantly increased the grain yield over the control and was statistically at par with highest level of farmyard manure. This might have resulted due to similar response recorded in all yield attributes under both these treatments. These results are in conformity with the findings of Prakash (1988) and Singh and Arya (1991).

Effect of fertility level

Increasing levels of fertility increased the plant height and effective tillers significantly. The maximum plant height

Table 2. Yield of Japanese barnyard millet as influenced by farmyard manure and N, P, K level

Treatment	Grain yield (q/ha)			Straw yield (q/ha)		
	1989	1990	Mean	1989	1990	Mean
<i>Farmyard manure (tonnes/ha)</i>						
0	11.3	13.9	12.6	66.4	71.4	68.9
5	14.8	17.9	16.4	88.3	87.8	88.1
0.75 E	13.5	16.4	14.9	82.0	81.4	81.1
CD (P = 0.05)	2.1	1.5	1.5	15.1	8.2	12.2
<i>N : P : K (kg/ha)</i>						
10 : 5 : 5	9.9	13.6	11.8	60.4	68.6	64.5
20 : 10 : 10	12.2	15.4	13.8	76.7	77.9	77.3
30 : 15 : 15	15.8	17.1	16.5	85.2	84.7	84.9
40 : 20 : 20	14.8	18.3	16.6	93.3	89.6	91.5
CD (P = 0.05)	2.4	1.7	1.8	17.4	9.5	14.1

E, Enriched farmyard manure

and effective tillers were recorded with N, P and K @ 40, 20 and 20 kg/ha over 10, 5 and 5 kg N, P and K/ha respectively. However, the difference in 40, 20 and 20, and 30, 15 and 15 kg/ha N, P and K was not significant. The ear weight, grain weight and 1,000-grain weight were significantly increased up to 30, 15 and 15 kg/ha over 10, 5 and 5 and 20, 10 and 10 kg N, P and K/ha respectively. There was an increase in grain yield with increase in fertility levels (Table 2). During 1989 the maximum grain yield was recorded under N, P and K @ 30, 15 and 15 kg/ha, whereas during 1990 the yield was higher under N, P and K @ 40, 20 and 20 kg/ha. On mean basis, the grain yield was significantly increased up to 30, 15 and 15 kg N, P and K/ha, which was 39.46 and 19.35 % higher than 10, 5 and 5; and 20, 10 and 10 kg N, P and K /ha respectively. Further increase in fertility levels up to 40, 20 and 20 kg/ha did not increase the grain yield significantly. These results confirm the findings of Prakash (1988). Almost similar trend was also obtained in straw yield.

Interaction effect of farmyard manure and fertility levels was significant. However, the maximum grain yield was recorded with highest level of farmyard manure, followed by enriched farmyard manure when applied with 30, 15 and 15 kg N, P and K/ha, on mean basis.

A significant and positive relationship was recorded between grain yield and effective tillers (0.9242), ear weight (0.9287), grain weight/ear (0.9949) and 1,000-grain weight (0.8444) on mean basis. Plant height also showed significant relationship with straw yield (0.9322).

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Table 2. Effect of fertility levels on grain and straw yield of barnyard millet under rainfed conditions (Mean of 1989 and 1990)

Grain yield (kg/ha)			Straw yield (kg/ha)			Mean
1989	1990	Mean	1989	1990	Mean	
10.5	10.5	10.5	10.5	10.5	10.5	10.5
15.0	15.0	15.0	15.0	15.0	15.0	15.0
20.0	20.0	20.0	20.0	20.0	20.0	20.0
30.0	30.0	30.0	30.0	30.0	30.0	30.0
40.0	40.0	40.0	40.0	40.0	40.0	40.0
50.0	50.0	50.0	50.0	50.0	50.0	50.0
60.0	60.0	60.0	60.0	60.0	60.0	60.0
70.0	70.0	70.0	70.0	70.0	70.0	70.0
80.0	80.0	80.0	80.0	80.0	80.0	80.0
90.0	90.0	90.0	90.0	90.0	90.0	90.0
100.0	100.0	100.0	100.0	100.0	100.0	100.0