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Economic (Benefit Cost Ratio) Status of Summer Pearlmillet at Different NPK Levels

Neha*, Gautam Ghosh, Preeti Choudhary and Shobha Kumari

Department of Agronomy, Sam Higginbottom Institute of Agriculture, Technology and Sciences, (Formerly Allahabad Agricultural Institute), (Deemed to-be-University), Allahabad - 211 007 (U.P), India
**Corresponding author*

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A B S T R A C T

A field experiment was conducted during Zaid season, 2015 at the Crop Research Farm, Department of Agronomy, SHIATS, and Allahabad (U.P.) to conducted Economics statues of summer pearlmillet (*Pennisetum glaucum* L.) hybrids to different levels of nitrogen. Among the response of different hybrids to levels of nitrogen, treatment T9 *i.e.*, V3 + 100:45:45 kg ha^{-1} NPK, recorded maximum grain yield (3.72 t ha^{-1}), straw yield (6.98 t ha^{-1}), protein content (13.43%)) and harvest index (36.15%). Whereas the lowest value in terms of plant height (164.47cm), dry weight (40.80g), grain yield (2.47 t ha^{-1}) and straw yield (4.62 t ha^{-1}) was observed in the treatment T1 *i.e.*, V1 + 80:45:45 kg ha^{-1} NPK). The highest gross return (78795.00 ha^{-1}), net return (57222.00 ha^{-1}) and benefit cost ratio (2.65) were registered in treatment T11 *i.e.*, N3 (20:60:20NPK) + 0.2% foliar spray of borax at 35DAS (pre-flowering). Whereas the lowest value (48925.50 ha^{-1}), (30075.50 ha^{-1}) and (1.59) respectively in the treatment T1 *i.e.*, N1 (20:40:20 NPK).

Introduction

Pearlmillet [*Pennisetum glaucum* (L.)] is largely grown for grain and fodder purpose under those situations where other crops generally fail. Pearlmillet as a food crop is limited to the developing countries in Asia, and particularly in Africa and ranked sixth in the world following rice, wheat, corn, barley and sorghum (Anonymous, 2010-11). The important pearlmillet growing countries are India, China, Nigeria, Pakistan, Sudan, Egypt, Arabia, and Russia. It is estimated that over 95% of pearlmillet production is used as food, the reminder being divided between animal and poultry feed (7%), other uses (seed, bakery products, snacks, etc.) and waste. The genus *Pennisetum* is distributed throughout the tropics and subtropics of the world. It includes about 140 species, one In India, pearlmillet is popularly known as Bajra, and it is the fourth most important cereal crop after rice, wheat and sorghum. It has the greatest potential among all the millets. Annual planting area of the country under pearlmillet is 9.5 million hectares producing nearly 10.1

million tonnes of grains with productivity of 10.44 q ha^{-1} (Economic Survey of India, 2011). The major producing states are Rajasthan (46%), Maharashtra (19%), Gujarat (11%), Uttar Pradesh (8%) and Haryana (6%), (Sonawane *et al.,* 2010). The nutrient content of pearlmillet compares very well with other cereals and millets. It has high protein content with slightly superior amino acid profile. Pearlmillet grain contains 13-14 per cent protein, 5-6 per cent fat, 74 per cent carbohydrate and 1-2 per cent mineralsThe probable reasons for recording higher stature of growth attributes viz., plant height, leaf area index, dry matter production and number of tillers m^{-2} was observed in different varieties due to increased levels of nitrogen. While all these parameters were at their lowest value with no nitrogen application. Naik *et al.,* (1995) and Basavarajappa *et al.,* (2002) and also similar finding observed in pearlmillet by AICRP Forage Crops (2006).

Materials and Methods

Field experiment was conducted during Zaid season 2015 at Crop Research Farm, Sam Higginbottom Institute of Agriculture, Technology and Sciences (Deemed-to-be-University) Allahabad. The experimental site is located at 250 57 N latitude, 870 19 E longitude and at an altitude of above mean sea level. The soil of the experimental area was sandy loam with moderately alkaline pH; low in organic carbon (0.32%) and available N (188.30 kg ha^{-1}), available P (34.50 kg ha^{-1}) and available K (87.00 kg ha^{-1}) during zaid 2015 respectively.

A recommended pearlmillet variety (Pro Agro 9444, Ganga kaveri 1044 and Pioneer 86M 32) was chosen for the study. The experiment was laid out in Randomized Block Design (RBD) with two factor different levels of Nitrogen and three improved Varieties with nine treatments combination on a plot size of 3 x 3 m^2. Before sowing, line were formed in the field as the spacing in treatments. Pearlmillet was sown in line and covered with the soil. Pearlmillet seeds were hand dibbled. The total quantity of nitrogen, phosphorus and potassium as per treatment in the form of two split application are applied, one at basal and the second application at top dressing.

All the agronomic practices were carried out uniformly to raised the crop. For taking data on yield and yield components on pearlmillet five plants were selected randomly in each plot. Cost of cultivation, gross return, net return and benefit cost ratio was worked out to evaluate the economics of each treatment, based on the existing market prices of inputs and output. The Cost of Cultivation (ha^{-1}) for each treatment was work out separately, taking

The Gross return (ha^{-1}) from each treatment was calculated

Gross return (ha^{-1}) = Income from grain + income from stover

Net return (ha^{-1})

The net profit from each treatment was calculated separately, by using the following formula

Net return = Gross return (ha^{-1}) – Cost of cultivation (ha^{-1})

Benefit cost ratio

The benefit cost ratio was calculated using the following formula

$$\text{Benefit cost ratio} = \frac{\text{Gross return } (ha^{-1})}{\text{Total cost of cultivation } (ha^{-1})}$$

Results and Discussion

Observations regarding the response of different levels of phosphorus and frequency

of boron levels on economics of greengram are given in tables 1–4.

Grain yield (t ha^{-1})

The result revealed that there was significant difference between different treatments and maximum grain yield (3.72 t ha^{-1}) was observed by the application in T9 *i.e.*, V3 + 100:45:45 kg ha^{-1} NPK, whereas the lowest value 2.47 t ha^{-1} was observed in treatment T5 *i.e.*, V2 + 90:45:45 kg ha^{-1} NPK and T1 *i.e.*, V1 + 80:45:45 kg ha^{-1} NPK. And these are partially supporting by Tiwana and Puri (2005). However, treatment, T3 *i.e.*, V1 + 100:45:45kg ha^{-1} NPK, T6 *i.e.*, V2 + 100:45:45kg ha^{-1} NPK was found statistically at par with T9 *i.e.*, V3 + 100:45:45 kg ha^{-1} NPK.

Straw yield (t ha^{-1})

The result revealed that there was significant difference between different treatments and maximum straw yield (6.98 t ha^{-1}) was observed by the application in T9 *i.e.*, V3 + 100:45:45 kg ha^{-1} NPK, whereas the lowest value 4.62 t ha^{-1} was observed in treatment T1 *i.e.*, V1 + 80:45:45 kg ha^{-1} NPK. Jain and Poonia (2003) also observed similar finding.

Table.1 Cost of cultivation (for Agro practices) of per common cost of Cultivation fixed cost of all treatment

	SI. No.	Particulars	Unit	Qty.	Rate/Unit(₹)	Cost (₹ ha^{-1})
A		**Land preparation**				
	1	Ploughing	Hours	3 hr	300	900.00
	2	Disc harrowing	Hours	3hr	250	750.00
	3	Leveling	Hours	4hr	200	800.00
	4	Lay out of the field	Labour	8	100	800.00
B		**Seed sowing**				
	1	Seed	Rate	20 kg ha-1	150	3000.00
	2	Sowing	Labour	4	100	400.00
C		**Fertilizer**				
	1	Urea	Charges	47 kg ha-1	10	470.00
	2	MOP	Charges	34 kg ha-1	20	680.00
D		**Irrigation**				
	1	Irrigation	Number	3	800	2400.00
	2	Labour	Charges	6	100	600.00
E		**Harvesting**				
	1	Harvesting	Labour	15	100	1500.00
	2	Threshing	Labour	8	100	800.00
	3	Winnowing	Labour	6	100	600.00
F		**Depreciation**				
G		**Reatal value of land**	Months	3	750	2250.00
H		**Supervision charges**	Months	3	300	900.00
				Total cost of cultivation(₹ha^{-1})		16850.00

Table.2 Variable cost and cost of cultivation on each treatment

Treatments		Fixed cost (₹ ha^{-1})	Cost of SSP (₹ha^{-1})	Cost of boron (₹ ha^{-1})	Variable cost (₹ ha^{-1})	Total cost (₹ ha^{-1})
T_1	N_1 (20:40:20 NPK)	16850.00	2000.00	-	2000.00	18850.00
T_2	N_2 (20:40:20 NPK)+20 DAS (0.2% FsB)	16850.00	2000.00	1389.00	3389.00	20239.00
T_3	N_1(20:40:20 NPK)+35DAS (0.2% FsB)	16850.00	2000.00	1389.00	3389.00	20239.00
T_4	N_1(20:40:20NPK)+20&35DAS(0.2% FsB)	16850.00	2000.00	2778.00	4778.00	21628.00
T_5	N_2 (20:50:20 NPK)	16850.00	2500.00	-	2500.00	19350.00
T_6	N_2(20:50:20 NPK)+20 DAS (0.2% FsB)	16850.00	2500.00	1389.00	3889.00	20739.00
T_7	N_2(20:50:20 NPK)+35 DAS (0.2% FsB)	16850.00	2500.00	1389.00	3889.00	20739.00
T_8	N_2(20:50:20NPK)+20&35DAS(0.2% FsB)	16850.00	2500.00	2778.00	5278.00	22128.00
T_9	N_3(20:60:20 NPK)	16850.00	3334.00	-	3334.00	20184.00
T_{10}	N_3(20:60:20NPK)+20DAS (0.2% FsB)	16850.00	3334.00	1389.00	4723.00	21573.00
T_{11}	N_3(20:60:20NPK)+35DAS (0.2% FsB)	16850.00	3334.00	1389.00	4723.00	21573.00
T_{12}	N_3(20:60:20NPK)+20&35DAS(0.2% FsB)	16850.00	3334.00	2778.00	6112.00	22962.00
	Urea= 10₹ kg^{-1}, SSP=8₹ kg^{-1}, MOP= 20₹kg^{-1},Boron= 50₹ 100 g^{-1}					

FsB –Foliar spray of Boron

Table.3 Mean grain yield and straw yield grain and straw return and gross return

Treatments		Yield (t ha^{-1})		Return (₹ ha^{-1})		Gross return(₹ ha^{-1})
		Grain yield	Straw yield	Grain	Straw	
T_1	N_1 (20:40:20 NPK)	0.99	2.06	45816.00	3109.50	48925.50
T_2	N_2 (20:40:20 NPK)+20 DAS (0.2% FsB)	1.12	2.28	51566.00	3429.00	54995.00
T_3	N_1(20:40:20 NPK)+35DAS (0.2% FsB)	1.22	2.33	56120.00	3499.50	59619.50
T_4	N_1(20:40:20NPK)+20&35DAS(0.2% FsB)	1.28	2.38	58880.00	3579.00	62459.00
T_5	N_2 (20:50:20 NPK)	1.22	2.33	56120.00	3499.50	59619.50
T_6	N_2(20:50:20 NPK)+20 DAS (0.2% FsB)	1.34	2.46	61778.00	3699.00	65477.00
T_7	N_2(20:50:20 NPK)+35 DAS (0.2% FsB)	1.36	2.67	62836.00	4009.50	66845.50
T_8	N_2(20:50:20NPK)+20&35DAS(0.2% FsB)	1.33	2.67	61180.00	4009.50	65189.50
T_9	N_3(20:60:20 NPK)	1.24	2.43	57316.00	3645.00	60961.00
T_{10}	N_3(20:60:20NPK)+20DAS (0.2% FsB)	1.35	2.48	62238.00	3729.00	65967.00
T_{11}	N_3(20:60:20NPK)+35DAS (0.2% FsB)	1.62	2.85	74520.00	4275.00	78795.00
T_{12}	N_3(20:60:20NPK)+20&35DAS(0.2% FsB)	1.40	2.69	64400.00	4039.50	68439.50
	Sale rate of grain= 46₹ kg^{-1} Sale rate of straw=1.5₹kg^{-1}					

FsB –Foliar spray of Boron

Table.4 Total cost of cultivation (₹ ha^{-1}) gross return (₹ ha^{-1}) net return (₹ ha^{-1}) and Benefit cost ratio

S.No.	Treatments	Cost of cultivation (₹ ha^{-1})	Gross return (₹ ha^{-1})	Net return (₹ ha^{-1})	Benefit cost ratio
T_1	N_1 (20:40:20 NPK)	18850.00	48925.50	30075.50	1.59
T_2	N_2 (20:40:20 NPK)+20 DAS (0.2% FsB)	20239.00	54995.00	34756.00	1.71
T_3	N_1(20:40:20 NPK)+35DAS (0.2% FsB)	20239.00	59619.50	39380.50	1.94
T_4	N_1(20:40:20NPK)+20&35DAS(0.2% FsB)	21628.00	62459.00	40831.00	1.88
T_5	N_2 (20:50:20 NPK)	19350.00	59619.50	40269.00	2.08
T_6	N_2(20:50:20 NPK)+20 DAS (0.2% FsB)	20739.00	65477.00	44738.00	2.15
T_7	N_2(20:50:20 NPK)+35 DAS (0.2% FsB)	20739.00	66845.50	46106.50	2.22
T_8	N_2(20:50:20NPK)+20&35DAS(0.2% FsB)	22128.00	65189.50	43061.50	1.94
T_9	N_3(20:60:20 NPK)	20184.00	60961.00	40777.00	2.08
T_{10}	N_3(20:60:20NPK)+20DAS (0.2% FsB)	21573.00	65967.00	44394.00	2.08
T_{11}	N_3(20:60:20NPK)+35DAS (0.2% FsB)	21573.00	78795.00	57222.00	2.65
T_{12}	N_3(20:60:20NPK)+20&35DAS(0.2% FsB)	22962.00	68439.50	45477.50	1.98

FsB –Foliar spray of Boron

Cost of cultivation

Maximum cost of cultivation (22962.00 ha^{-1}) was recorded in treatment T12 *i.e.*, N3 (20:60:20 NPK) + 20 & 35DAS (0.2% foliar spray of borax), whereas the lowest value (18850.00 ha^{-1}) was observed in treatment T1 *i.e.*, N1 (20:40:20 NPK). The results are in conformity with those of, Obeng *et al.*, (2012), Singh *et al.*, (2003) and Malik *et al.*, (1990).

Gross return: Maximum gross return (78795.00 ha^{-1}) was recorded in treatment T11 *i.e.*, N3 (20:60:20 NPK) + (0.2% foliar spray of borax) at 35 DAS, which was the lowest value (48925.00 ha^{-1}) was observed in treatment T1 *i.e.*, N1 (20:40:20 NPK). Naik *et al.*, (1995) and Rathore *et al.*, (2006) also observed similar finding.

Net return

Maximum net return (57222.00 ha^{-1}) was recorded in treatment T11 *i.e.* N3 (20:60:20 NPK) + (0.2% foliar spray of borax) at 35 DAS, whereas the lowest value (30075.50 ha^{-1}) was observed in treatment T1 *i.e.*, N1 (20:40:20 NPK) and these are partially supporting by Pradhan *et al.*, (2010) and Shaikh (1995).

Benefit cost ratio

Maximum benefit cost ratio (2:65) was recorded in treatment T11 *i.e.* N3 (20:60:20 NPK) + (0.2% foliar spray of borax) at 35 DAS, whereas the lowest value 1:59 was observed in treatment T1 *i.e.* N1 (20:40:20 NPK). The results are in conformity with those of, Totawat *et al.*, (2001), Yadav and Solanki (2002), Panday *et al.*, (2001). The probable reason for increase in economics of treatment T11 *i.e.*, N3 (20:60:20 NPK) + (0.2% foliar spray of borax) at 35 DAS, due to high level of P + 0.2% foliar spray of borax at 35DAS (pre flowering) through application of SSP and borax recorded higher net returns, B:C ratio, protein content, N and P uptake and available phosphorus in soil in field pea than that of DAP and AMF are in the findings of Singh *et al.*, (2005).

The highest gross return (78795.00 ha^{-1}), net return (57222.00 ha^{-1}) and benefit cost ratio (2.65) were registered in treatment T11- N3

(20:60:20NPK) + 0.2% foliar spray of borax at 35DAS (pre-flowering). Whereas the lowest value (48925.50 ha^{-1}), (30075.50 ha-1) and (1.59) respectively in the treatment T1-N1 (20:40:20 NPK).

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