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EFFECT OF TILLAGE PRACTICES AND LEVELS OF NITROGEN ON GROWTH AND YIELD OF PEARL MILLET. (*Pennisetum glaucum* L.)

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ABSTRACT

A field experiment was conducted during Kharif seasons of 1994 and 1995 to study the effect of tillage practices and nitrogen levels on yield and related parameters of Pearl millet. Tillage practices and nitorgen levels exerted significant effect on yield and yield components. Deep tillage and compartmental bunding either alone or in combination with conventional and deep tillage recorded higher values of all attributs and grain yield except plant height. Among the nitrogen levels, 60 kg ha^{-1} produced significantly higher yield than lower levels of nitrogen and at higher dose also. Application of nitrogen at 60 kg ha^{-1} with deep tillage and compartmental bunding markedly improved the growth and yield attributes except test weight. This treatment (60 kg N ha^{-1}) also produced highest grain yield 2390 and 2567 kg ha^{-1} during 1994 and 1995 respectively. Optimum dose of N for maximum grain yield was worked out 69·5 kg N ha^{-1}.

Key words : Tillage, Compartmental bunding, soil environment etc.

Pearlmillet (*Pennisetum glaucum* L.) occupies a prestigious position among millets and ranks fourth among important food crops of India. Pearlmillet crop possesses considerable production-potential particularly in less fertile, intensive heat and chronically moisture deficit areas. This might be due to deeper root system, better extraction of soil moisture and its effcient utilisation. effcient photo-synthetic mechanism and rapid translocation of photosynthates from the leaves to the grains (1). Tillage practices are desirable in situation where a hard layer is present within 20-30 cm depth which reduces infiltration not only to increase run-off and soil loss but also restricts the root growth and adversely affect the crop yield. (2). The concept of tillage is to create a soil environment favourable to plant growth (3). Next to water, the use of fertilizer is one of the most improtant agronomic aspect to improve the crop yield. Nitrogen is the nutrient absorbed by the pearl-millet crop in huge amount (4). and is the most limiting factor for crop

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production. Keeping above in view, the present study was undertaken.

MATERIALS AND METHODS

A field study was carried out during two consecutive Kharif seasons of 1994 and 1995. The experimental crop of pearlmillet was raised in pearl millet-fallow sequence, at NARP, Hazaratpur. The slope of experimental field was 0·25 percent. The soil of experimental field was sandy loam, which was low in available nitrogen (175·0 kg. N ha^{-1}), medium in available phosphorus (25 Kg N ha^{-1}) and rich in available potash (127·5 Kg K_2O ha^{-1}). The depth of ground water table remained below 3 m. from the soil surface during both the kharif seasons.

The soil of experimental field was sandy loam in texture and sufficiently well drained. Chemically, the soil was lightly alkaline in reaction (p^H7·9) A split plot design having tillage treatmetns in main plots and levels of nitrogen in sub plots with three replication. Thus, each replication having 16 treatment combinations. The net plot size was 7·0×3·15 m^2. Row spacing of pearlmillet was kept 35 cm. As per in situ moisture conservation treatments, tillage was applied before onset of monsoon and compartmental bunding was made just after sowing, conventional tiilage was done by country plough while deep tillage done by single disc harrow (tractor driven). All the levels of nitrogen wer applied as basal and top dressing. The seeds of pearlmillet hybrid MBH 115 at the rate of 6 Kg ha^{-1} was sown behind the plough manually (*Kera* metho). Thinning was taken to maintain a plant to plant spacing of 15 cm. Sowing operation were applied on 27 July in 1994 and 28 July during 1995.

RESULTS AND DISCUSSION

Effects of tillage :

Tillage treatments had significant effect on growth attributes and grain yield in both the year. Hawever treatments did not show any significant impact on plant height (Table 1). The treatment deep tillage + compartmental bunding had significantly more number of effective tillers $plant^1$, 1000-grain weight and yield than conventional tillage. The differences in grain yield due to DT and CT + CB were not measurable either in any crop season and in pooled yield as well as. The mean increase in grain yield was higher by 12·5, 17·6 and 37·5 per cent in DT + CB and CT treatments, respectively. DT and CT + CB treatment also recorded appreciably more grain yield than CT, and mean increase was 22·2 and 16·9 per cent, respectively Beneficial effect of deep tillage on crop yield have also been reported (5 & 6). Under deep tillage, the roots of plant penetrated to deeper layers particularly during moisture stress conditions and ulitimately incresed the yield of crop. As mentioned earlier CB also increased the grain yield of pearlmillet over CT. This may be because the CB helped to retain more rain water in situ and increased percolation which resulted in higher crop yield. These results are in agreement with (7 & 8).

Table–1 : Effect of tillage and nitrogen on yield and growth attributes of pearlmillet.

Treatment	Plant height (cm.)		Effective tiller plant^{-1}		Ear head weight (g)		Grain Weight Plant^{-1} (g)		1000-Grain Weight (g)		Grain Yield q-ha^{-1}		
	1994	1995	1994	1995	1994	1995	1994	1995	1994	1995	1994	1995	Pooled
Tillage Practices													
CT	164·90	173·40	2·17	2·26	15·17	15·44	12·09	12·90	6·22	6·36	14·28	15·09	14·69
CT+CB.	169·60	177·80	2·63	2·76	16·71	17·40	15·28	15·93	6·73	6·96	16·64	17·71	17·17
DT	171·10	179·30	2·66	2·83	16·88	17·74	16·16	16·63	6·76	6·99	17·38	18·52	17·85
DT+CB	172·50	180·70	2·77	3·24	17·53	18·52	17·23	18·68	6·78	7·03	19·44	20·96	20·20
SEm±	5·00	5·30	0·10	0·11	0·42	0·46	0·46	0·49	0·12	0·14	0·53	0·57	0·55
CD P=0.05)	**NS**	**NS**	**0·35**	**0·38**	**1·45**	**1·59**	**1·59**	**1·70**	**0·42**	**0·48**	**1·83**	**1·97**	**1·91**
N Levels (kg ha^{-1})													
0	145·30	150·36	1·78	1·94	14·35	14·92	11·85	12·20	6·26	6·38	11·55	12·35	11·95
30	166·60	173·40	2·42	2·65	16·36	17·14	15·34	16·12	6·72	6·96	17·08	18·13	17·61
60	181·00	190·70	2·95	3·23	17·96	18·79	17·45	18·48	6·85	7·18	20·30	21·57	20·94
90	185·20	196·50	3·08	3·25	17·63	18·25	16·08	17·16	6·65	6·82	18·80	20·23	19·52
Sem±	3·70	4·00	0·08	0·09	0·37	0·39	0·37	0·39	0·11	0·12	0·44	0·47	0·45
CD P=0.05	**10·80**	**11·70**	**0·23**	**0·26**	**1·08**	**1·14**	**1·08**	**1·14**	**0·32**	**0·35**	**1·28**	**1·37**	**1·32**

Effect of Nitrogen :

The increasing levels of nitrogen increased yield and growth attributes up to the highest level (90 kg N ha^{-1}). However, the differences were well marked only up to 60 kg N ha^{-1}. The average increase in grain yield with 30, 60 and 90 kg N ha^{-1} was 47·4, 75·2 and 63·3 percent, respectively over control. Similar results were obtained (9).

Table–2 : Interaction effect of tillage practices and nitrogen levels on grain yield (qha^{-1}) of pearlmillet

Tillage practices	Levels of nitrogen (ka ha^{-1})			
	0	30	60	90
		1994		
CT	10·73	15·62	16·34	14·45
CT+CB	11·42	16·88	19·90	18·34
DT	11·71	17·15	21·06	19·59
DT+CB	12·35	18·67	23·90	22·83
			SEm ±	CD (P=2·05)
Nitrogen levels at the same tillage practice			0·89	2·60
Tillage practices at the same level of nitrogen			0·93	2·88
		1995		
CT	11·24	16·39	17·40	15·34
CT+CB	12·28	17·83	18·30	20·02
DT	12·45	18·30	22·14	21·19
DT+CB	13·43	20·02	25·67	24·74
			SEm±	CD (P=0·05)
Nitrogen levels at the same tillage practice			0·93	2·71
Tillage practices at the same level of nitrogen			0·99	3·07

CT-conventional Tillage; CB, compartmental Bunding and DT-Deep Tillage,

Interaction between tillage and Nitrogen :

The conteraction effect of tillage practices and nitrogen levels on grain yield of pearl millet was found to be significant in both the years. (Table 2). In all the three in situ moisture conservation practices, more amount of moisture is available to plants particularly during moisture stress condition which exploited fully the higher soil fertility and there by produced maximum yield than in case of low moisture availibility under conventional tillage.

The regression equation worked out for four tillage treatments and the

corresponding optimum nitrogen dose was 69·5 Kg ha^{-1} which gave maximum net profit of Rs. 2230 ha^{-1} and not return $rupee^{-1}$ spent of R. 5·67.

Based upon the results of present investigation it may thus be inferred that deep tillage along with compartmental bunding was very effective in conserving profile moisture throughout growing season of crop for higher grain yield of pearlmillet. It is also concluded that the crop should be grown with deep tillage along with comparmental bunding and fertilized with 69·5 kg N ha^{-1} for maximum productivity under dry land condition of south western semi-arid zone of U.P.

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