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Ameliorative Effect of NP Fertilization on Ratoon Sugarcane under Intercrops

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Abstract: An experiment on Ameliorative effect of NP fertilization (0-0, 60-60, 120-60, 180-60, 60-120, 120-120 and 180-120 kg/ha) on ratoon sugarcane under intercrops" was conducted during 1999 at NWFP Agricultural University, Peshawar. Number of shoots per stump of sugarcane was significantly increased by the increasing rate of nitrogen. Similarly, number of water shoots per stump of sugarcane was decreased by the increasing rate of nitrogen. In impact of various intercrops sunflower and soybean reduced shoots per stump of sugarcane up to 34 and 25% respectively. Maximum number of water shoots per stump of sugarcane was recorded in sunflower intercrop followed by soybean intercrop. Grain yield (kg/ha) of sunflower increased with increasing rate of nitrogen, while grain yield (kg/ha) of soybean increased with increasing rate of phosphorus.

Key words: Ratoon sugarcane, NP, regeneration, intercrops

Introduction

Sugarcane is an important cash crop of Pakistan, cultivated on an area of about 1056.3 thousand hectares annually with an average cane yield and sugar recovery of 50.3 tons/ha and 10% respectively.

In view of increasing interest among the growers of planting sugarcane, it has become essential to determine the feasibility of ratooning and its associated problem. Harvested sugarcane sprouts at very low rate due to low temperature. In spring season ratoon cane plots remain vacant and growth of sugarcane is almost negligible, the wide spaces thus can be utilized economically till grand growth period is started. It is suggested to grow a suitable intercrop in ratoon sugarcane. Advantages of the system include better soil conservation and reduced weed growth.

Efforts are needed to effectively utilize the land, keeping in view the increasing population of Pakistan. With this problems in view, this study was designed to include an exhaustive crop (sunflower) and a short statured restorative crop (soybean) in the experiment. It could also be observed through the experiment as to how much increase is achievable in the yield of intercrops, to what extent the cane shoots increased or decreased under different NP levels and which of the intercrop and NP level is economically feasible for future intercropping in ratoon cane crop. Recommended doses of NP for ratoon crop are 50, 40 kg/ha respectively. The nutritional requirement of sugarcane is higher than other commercial crops because of its higher dry matter production per unit area. Nitrogen is most important element essential for plant growth. Phosphorus is needed for developing roots and influencing the ripening process. The fertilizer has a remarkable effect on the appearance of the crop (Van Burg *et al*., 1983). Verma and Kumar (1986) determined from their experiment that cane yield was not affected significantly by the amount of N applied to find the optimum quantity for wheat grown as intercrop.

Tillering of sugarcane is also affected, to some extent, by intercrops and different fertilizers. Intercropping reduced tiller production while tiller production and mortality were greater with the higher N rate (Jayabal and Sankaran, 1991). Intercropping of soybean affected cane yield by 6-8% (Ahmed *et al*., 1993). Sathyavelu *et al*. (1991) reported that intercropping with sunflower decreased cane yield from 149 ton/ha when grown alone to 140-141 t/ha when intercropped. Sunflower gave seed yield of 400 kg/ha when intercropped. Kumar and Srivastava (1994) reported that sunflower intercropping in ratoon sugarcane decreased cane yield by 30.7%.

Materials and Methods

An experiment on the "Ameliorative effect of NP fertilization on ratoon sugarcane under intercrops" was conducted at Research Farm, NWFP Agricultural University, Peshawar during the year 1999. The experiment was laid out in RCB split plot arrangement with four replications.

Field after harvesting of sugarcane in March was thoroughly prepared by 4-5 ploughing with cultivator and the ridges worked with Kudal to make soft beds. Intercrops (sunflower and soybean) were randomized in main plots of 6×15 m and different NP levels in sub plots with a sub plot.

The treatments were as under:

a. Main Plots (Intercrops)
- C_1 = Sunflower x R. cane.
- C_2 = Soybean x R. cane
- C_3 = Sole culture of R. cane

b. Sub Plots (NP levels kg ha^{-1})
- NP_1 = 0-0
- NP_2 = 60-60
- NP_3 = 120-60
- NP_4 = 180-60
- NP_5 = 60-120
- NP_6 = 120-120
- NP_7 = 180-120

All phosphorus and half of the nitrogen was applied at the time of sowing. Main plots were seeded manually at the rate of 5 and 50 kg/ha of sunflower cultivar PARSUN-I and soybean cultivar NARC-I respectively.

The following observations were recorded.

Number of shoots per stump of sugarcane (15th March)
Number of shoots per stump of sugarcane (15th May)
Number of shoots per stump of sugarcane (15th June)
Number of water shoots per stump of sugarcane (15th September)
Grain yield (sunflower)
Grain yield (soybean)

All other culture practices were the same for all the plots. Central stump of sugarcane were earmarked for observation at five random spots in each sub-plot and data recorded at month's interval.

The data were recorded and analyzed statistically according to appropriate method of RCB split plot arrangement of treatments (Steel and Torrie, 1981). F-test was used to detect the treatment differences and LSD test was applied for mean separation at 5% level of probability.

Results and Discussion

The results thus obtained from the experiment are presented (Table 1-5) and discussed below.

The data recorded on number of shoots per stump of sugarcane on 15th March (Table 1) was not significantly affected by different NP levels and various intercrops. This might be due to the slow rate of sprouts and inactive growth of ratoon sugarcane, the intercrops emerged satisfactionaly and the nitrogen and phosphorus applied was taken up by the sunflower and soybean.

Number of shoots per stump of sugarcane (15th May): Data recorded on number of shoots per stump of sugarcane on 15th May were significantly affected by different NP levels, various intercrops and their interaction (Table 2). In impact of different intercrops, maximum of 10.22 shoots per stump of sugarcane were noted in sole culture of ratoon, while minimum of 7.16 were recorded in sunflower intercrop. This might be due to the shady effect of sunflower on ratoon crop and due to the up take of the nutrient by sunflower. Confirmatory results were give by Kumar and Srivastava (1994) who reported that intercropping of sunflower reduced cane yield by 30.7%. In impact of different NP levels maximum of 9.96 and 9.79 shoots per stumps were observed in plots fertilized with 180-60 kg NP/ha and 180-120 kg NP/ha respectively, which were statistically at par. This showed that high amount of phosphorus showed no significant effect on number of shoots per stump of sugarcane. However, minimum of 6.63 shoots per stump were recorded in control plots. In case of interaction between different NP levels and various intercrops, maximum of 11.50 shoots per stump were noted in sole culture of ratoon with 180-120 kg NP/ha, while minimum of 5.85 shoots per stump were noted in soybean intercropping in the control plots.

Table 1: Number of shoots per stump of sugarcane (15th March) as affected by different NP levels and various intercrops

Fertilizers NP (kg/ha)	S.F. + S.cane	Soy. + S.cane	Sole S.cane	Mean
0-0	4.51	3.7	3.2	3.80
60-60	3.90	3.6	3.7	3.81
120-60	3.71	4.1	4.5	4.00
180-80	5.20	3.1	2.7	3.72
60-120	3.20	4.5	3.6	3.79
120-120	3.40	4.1	3.7	3.70
180-120	3.40	4.1	3.2	3.61
Mean	3.92	3.88	3.54	

Note: The results are non-significant statistically.

Table 2: Number of shoots per stump of sugarcane (15th May) as affected by different NP levels and various intercrops

Fertilizers NP (kg/ha)	Crops			
	S.F. + S.cane	Soy. + S.cane	Sole S.cane	Mean
0-0	6.02l	5.85l	8.02g	6.63d
60-60	5.90l	6.82k	10.30bc	7.67c
120-60	7.67hi	8.20fg	10.20c	8.69b
180-80	8.80e	10.40bc	10.67bc	9.96a
60-120	6.20l	7.30ij	9.65d	7.72c
120-120	7.00jk	8.00gh	11.20a	8.73b
180-120	8.50ef	9.37d	11.50a	9.79a
Mean	7.16c	7.99b	10.22a	

LSD at 5% level of probability for crops = 0.35 LSD at 5% level of probability for fertilizers = 0.54

LSD at 5% level of probability for C X F = 0.47 Mean not sharing the same letter differ significantly at 5% level of probability

Table 3: Number of shoots per stump of sugarcane (15 June) as affected by different NP levels and various intercrops

Fertilizers NP (kg/ha)	Crops			
	S.F. + S.cane	Soy. + S.cane	Sole S.cane	Mean
0-0	5.85l	6.30k	9.07g	7.07d
60-60	5.92l	8.02j	10.80d	8.25c
120-60	7.90j	8.20ij	12.00b	9.37b
180-80	9.02g	9.90f	12.30ab	10.41a
60-120	6.22kl	8.00j	10.40e	8.21c
120-120	7.90j	8.42hi	11.57c	9.30b
180-120	8.70gh	9.72f	12.47ab	10.30a
Mean	7.36c	8.37b	11.23a	

LSD at 5% level of probability for crops = 0.28 LSD at 5% level of probability for fertilizers = 0.43

LSD at 5% level of probability for C X F = 0.37 Mean not sharing the same letter differ significantly at 5% level of probability

Table 4: Number of water per stump of sugarcane (15 September) as affected by different NP levels and various intercrops

Fertilizers NP (kg/ha)	Crops			
	S.F. + S.cane	Soy. + S.cane	Sole S.cane	Mean
0-0	1.99	1.25	1.25	1.49a
60-60	1.66	1.16	0.91	1.25ab
120-60	1.66	0.91	0.66	1.08ab
180-80	1.00	0.58	0.58	0.72cd
60-120	1.99	0.91	1.00	1.30ab
120-120	1.49	0.83	0.66	0.99bc
180-120	1.08	0.49	0.41	0.66d
Mean	1.55a	0.88b	0.78b	

LSD at 5% level of probability for crops = 0.21 LSD at 5% level of probability for fertilizers = 0.33

Mean not sharing the same letter differ significantly at 5% level of probability

Table 5: Grain yield of sunflower and soybean as affected by different NP levels

NP levels (kg/ha)	Grain yield (sunflower) (kg/ha)	Grain yield (soybean) (kg/ha)
0-0	384.30 d	661.7d
60-60	457.50 c	850.2c
120-60	680.81 b	856.0c
180-80	834.11 b	873.2c
60-120	482.40 c	1116.0a
120-120	1073.20 a	1146.0a
180-120	1249.21 a	990.2b
Mean	184.73	114.5

Mean not sharing the same letter differ significantly at 5% level of probability

Number of shoots per stump of sugarcane (15 June): Data recorded on number of shoots per stump of sugarcane (15th June) are presented in (Table 3). Analysis of variance of the data revealed that number of shoots per stump of sugarcane were significantly affected by different NP levels and various intercrops. The mean of different NP levels showed that maximum of 10.41 shoots per stump of sugarcane were recorded in the plots fertilized with 180-60 kg NP/ha which were statistically at par with the plots fertilized with 180-120 kg NP/ha having 10.30 shoots per stump of sugarcane. However minimum of 7.07 shoots per stump was recorded in control plots. In case of intercrops mean showed that minimum of 7.36 shoots per stump of sugarcane were noted in sunflower intercrop followed by 8.37 shoots per stump of sugarcane in soybean intercrop while maximum of 11.23 shoots per stump of sugarcane were noted in sole culture of ratoon. Similar findings were reported by Kumar and Srivastava (1994) who reported that sunflower intercropping in ratoon sugarcane decreased cane yield by 30.7%. The interaction effect of different NP levels and various intercrops was also significantly affected and having maximum of 12.47 shoots per stump of sugarcane from the sole culture of ratoon plots fertilized with 180-120 kg NP/ha while minimum of 5.85 shoots per stump of sugarcane were noted in sunflower intercrop which received neither nitrogen nor phosphorous.

Number of water shoots per stump of sugarcane: Number of water shoots per stump of sugarcane were significant affected by different NP levels and various intercrops (Table 4). In impact of various intercrops, maximum of 1.55 water shoots per stump of sugarcane were noted in sunflower intercrop, which was followed by soybean intercrop having 0.898 water shoots per stump of sugarcane. This might be due to the less photosynthesis of ratoon due to the shady effect of sunflower. Confirmatory result were given by Ahmed *et al*. (1993) who reported that intercropping of soybean affected cane yield by 6-8%. In case of various intercrops minimum of 0.78 water shoots were recorded in sole culture of ratoon. In impact of different NP levels maximum of 1.49 water shoots were noted in plots, which were not fertilized, while minimum of 0.66 water shoots were noted in plots, which were not fertilized, while minimum of 0.66 water shoots per stump of sugarcane were noted in plots fertilized with 180-120 kg NP/ha. Similar findings were reported by Jayabal and Sankaran (1991) who stated that tiller production and mortality were greater with the higher N rate. The interaction effect of various intercrops and different NP levels on water shoots per stump of sugarcane remained non-significant.

Grain yield (sunflower): Grain yield (kg/ha) of sunflower was significantly affected by various NP levels (Table 5). It might be due to the availability of sufficient nutrients at critical stages, which increased grain yield. Confirmatory results were given reported that grain yield per hectare increased with increase in nitrogen levels while increasing rate of phosphorus had no significant effect on grain yield and yield components of sunflower. Maximum grain yield of 1249.0 kg/ha was recorded in plots applied with nitrogen at the rate of 180 kg/ha and Phosphorus at the rate of 120 kg/ha which was at par with those plots where nitrogen and phosphorus both were applied at the rate of 120 kg/ha having 1073.20 kg/ha of grain yield, while minimum grain yield of 384.0 kg/ha was recorded in control plots.

Grain yield (soybean): Grain yield (kg/ha) of soybean was increased significantly with increase in phosphorus level (Table 5). This might be due to the availability of sufficient amount of phosphorus because phosphorus is needed mostly by the soybean crop as compared to nitrogen. Maximum grain yield of 1146.0 and 1116.0 kg/ha was recorded in the plots applied with phosphorus at the rate of 120 kg/ha with 60 and 120 kg N/ha respectively, while minimum of 661.7 kg/ha of grain yield was noted in the plots without nitrogen and phosphorus.

In view of the data, it could be concluded that soybean intercrop and 180-120 N-P kg/ha improved tiller production and minimized water shoots per stump.

References

Ahmed, M.S., G. Muhammad and K.B. Malik, 1993. Intercropping short duration legume crops in spring cane. Pak. Sugar J., 7: 3-6.

Jayabal, V. and N. Sankaran, 1991. Studies on the effect of intercrops and nitrogen levels on tiller production and tiller mortality in sugarcane. Indian Sugar, 41: 33-35.

Kumar, S. and S.N.L. Srivastava, 1994. Studies on intercropping in sugarcane ratoon from spring harvested sugarcane crop. Cooperative Sugar, 26: 25-27.

Sathyavelu, A., K. Chinnasamy and S. Rajasekaran, 1991. Studies on intercropping in sugarcane with pulses and oilseeds. STSSTA Sugar J., 19: 35-37.

Steel, R.G. and J.H. Torrie, 1981. Principles and Procedures of Statistics: A Biometrical Approach. 2nd Edn., McGraw Hill Book Co., New York.

Van Burg, P.F.J., M.R.J. Holmes and K. Dilz, 1983. Nitrogen supply from fertilizers and manure: Its effect on yield and quality of sugarbeet. Proceedings of the Symposium on Nitrogen and Sugar Beet, February 16-17, 1983, Brussels, pp: 189-282.

Verma, R.S. and R. Kumar, 1986. Nitrogen requirement of wheat grown as companion crop with autumn sugarcane in north central India. Bharattiya Sugar, 11: 49-51.