

STUDIES ON N-FERTILIZATION OF SUGARCANE UNDER THE TISTA FLOOD PLAIN AND THE GANGES RIVER FLOOD PLAIN SOIL CONDITIONS.

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SUMMARY

Studies on nitrogen requirement of some sugarcane varieties were made in the Tista flood plain soils of Jaipurhat Sugar Mills (JSM) farm and the Ganges river flood plain soils of Carew & Co. farm. Five cane varieties namely Co 1158, Co 975, Bo 17, ISD 9/57 and ISD 2/54 were tested against 50, 100, 150 and 200 lbs N per acre. Control plot received no nitrogen. The experiments were conducted during 1975-1976 crop year under rainfed condition in a split plot design.

N-application did not effect germination, but varietal difference in this respect was found to be significant at 0.01 level. Tillers per clump of the cane increased significantly at higher levels of N at JSM farm only though varietal difference in tillers were found significant on both the farms. At Carew & Co., N showed positive influence on cane height and millable cane, varietal differences were also found here in this respect, but such types of manurial or varietal effects were absent on cane height or millable cane at JSM farm. Tons cane per acre increased with increasing N levels and the results were significant at 0.01 level at both the locations. At Carew & Co., 200 lbs N gave significantly higher yield, but at JSM the yield results did not vary significantly among the N-treatments. Varietal difference on cane yield was significant at JSM only. N-application did not affect % sugar recovery at Carew & Co. and brix at JSM farm. At both the locations, 200 lbs N gave highest cane yield indicating higher requirement of N than what is being used now.

INTRODUCTION

Sugarcane is a biennial crop having high demand on nutrients like NPK. Bangladesh falls under the monsoon climatic zone and it receives heavy rainfall creating shortage of soluble nutrient like N due to leaching and other environmental factors in the soil, for which sugarcane crop needs supplementary nitrogen to meet up its requirement for proper growth and development. This is an important aspect of nitrogen fertilization, since dose and time of its application varies under different agroclimatic conditions (Singh and Singh - 1972). But a very limited research on nutritional aspect of sugarcane was done in the past in our country without covering all types of soils and the present dose of 110 lbs N per acre for plant cane may not be the proper dose for all types of soils in Bangladesh.

The soils of JSM farm and Carew & Co. farm fall under the two different physiographic units of the Tista flood plain and the Ganges river flood plain respectively. The soils of the experimental plot at JSM farm contained organic matter 0.69%, N-0.036% and had a pH 6.1. The soils of Carew & Co. farm belongs to the Ganges river flood plain which developed by the Ganges river (Brammer-1971) and contained organic matter-0.90%, total N-0.048% and pH 7.2.,

Since the nitrogen level of the two soils is low, it is apprehended that the present dose of nitrogen is not sufficient for proper cane growth in these types of soils. Under the circumstances, two similar types of experiments were conducted to test the response of five commercial cane varieties against 5 different levels of N on the soils of JSM and Carew & Co. farms, and to determine the proper dose of N for plant cane for these soils.

MATERIALS AND METHODS

Two experiments, one at JSM farm and one at Carew & Co. farm, were conducted separately during 1975-1976 crop year. In both the experiments, 5 commercial cane varieties namely Co. 1158, Co. 975, Bo 17, ISD 2/54 and ISD 9/57 were tested against 5 different N levels such as 0, 50, 100, 150, and 200 lbs N per acre. The treatments numbering 25 were replicated 4 times in a split plot design. The varieties were placed in the main plot and the N levels in the sub plots. Three buded equal number of assorted setts were planted end to end in each plot at the rate of approximately 60 maunds/acre. Plot size was 28 X 28 with 8 rows/plot. Spacing of cane rows were 3.5 and the distances from plot to plot and block to block were 5' and 6' respectively. Present usual doses of 110 lbs P_2O_5 and 97 lbs K_2O for Carew & Co. and 74 lbs P_2O_5 and 97 lbs K_2O per acre for JSM were applied in all the plots. At both the locations, the cane was planted in November, 1975 and harvested in January, 1977 and the experiments were carried out under rainfed condition. Before planting sugarcane, soils of the two experimental plots were analysed for N, organic matter and pH.

From the experiments, data on the following characters were collected and statistically analysed to determine the response of cane varieties to different N-levels: percent germination, tillers per clump, cane height and millable canes at harvest, tons cane per acre and percent recovery of sugar. At JSM farm, due to lack of analytical facilities at the time of the cane harvest, brix readings instead of percent recovery of sugar were taken by Hand refractometer.

RESULTS AND DISCUSSIONS

At both locations, N-application did not affect germination, but varietal difference in germination was found significant at 0.01 level.

Tillers per clump of cane significantly increased at higher N-levels at JSM. This effect was absent in Carew and Co. farm. Varietal difference in respect of number of tillers per clump was found at both locations.

At Carew & Co. farm, N showed positive influence on cane height and millable cane. The difference in varietal response at this location was also significant on these factors but such type of manurial and varietal response on height was not observed at JSM farm.

Data on the effect of different levels of nitrogen on tons cane per acre of JSM farm and Carew & Co. farm are presented in table 1 and 2 respectively. Tons cane per acre increased with increasing N levels and in both experiments the results were significant at 0.01 level. The results also showed linear response to the increasing levels of N. In both experiments, the application

Table-1 : Effect of different levels of N on yield of different varieties of cane (tons/acre) at JSM farm. (Tista Flood plain).

N-levels/ Varieties	O	50 lbs.	100 lbs	150 lbs	200 lbs	Mean
Co 1158	32.50	36.71	36.71	33.71	40.70	36.07a
Co 975	22.81	25.65	25.41	24.46	20.89	23.84d
Bo 17	22.76	30.59	32.51	31.91	32.77	30.11c
ISD 2/45	27.06	30.91	37.88	39.38	42.22	35.49ab
ISD 9/57	24.39	29.36	33.98	34.70	36.51	31.79bc
Mean	25.90b	30.64a	33.30a	32.83a	34.62a	

Figures bearing same letter do not differ significantly at 5% level.

Table-2 : Effect of different levels of N on yield of different varieties of cane (tons/acre) at Carew & Co. farm (Gangatic alluvium).

N-levels/ Varieties	O	50 lbs	100 lbs	150 lbs.	200 lbs.	Mean
Co. 1158	35.57	37.31	44.38	38.41	46.66	40.47
Co. 975	33.55	42.46	36.95	43.45	49.26	41.13
BO. 17	38.93	39.09	41.68	46.90	46.90	41.94
ISD 2/54	34.70	42.25	42.81	44.30	46.67	42.15
ISD 9/57	33.10	34.49	37.33	42.23	41.04	37.64
Mean	35.17c	39.12b	40.63b	42.30ab	46.11a	

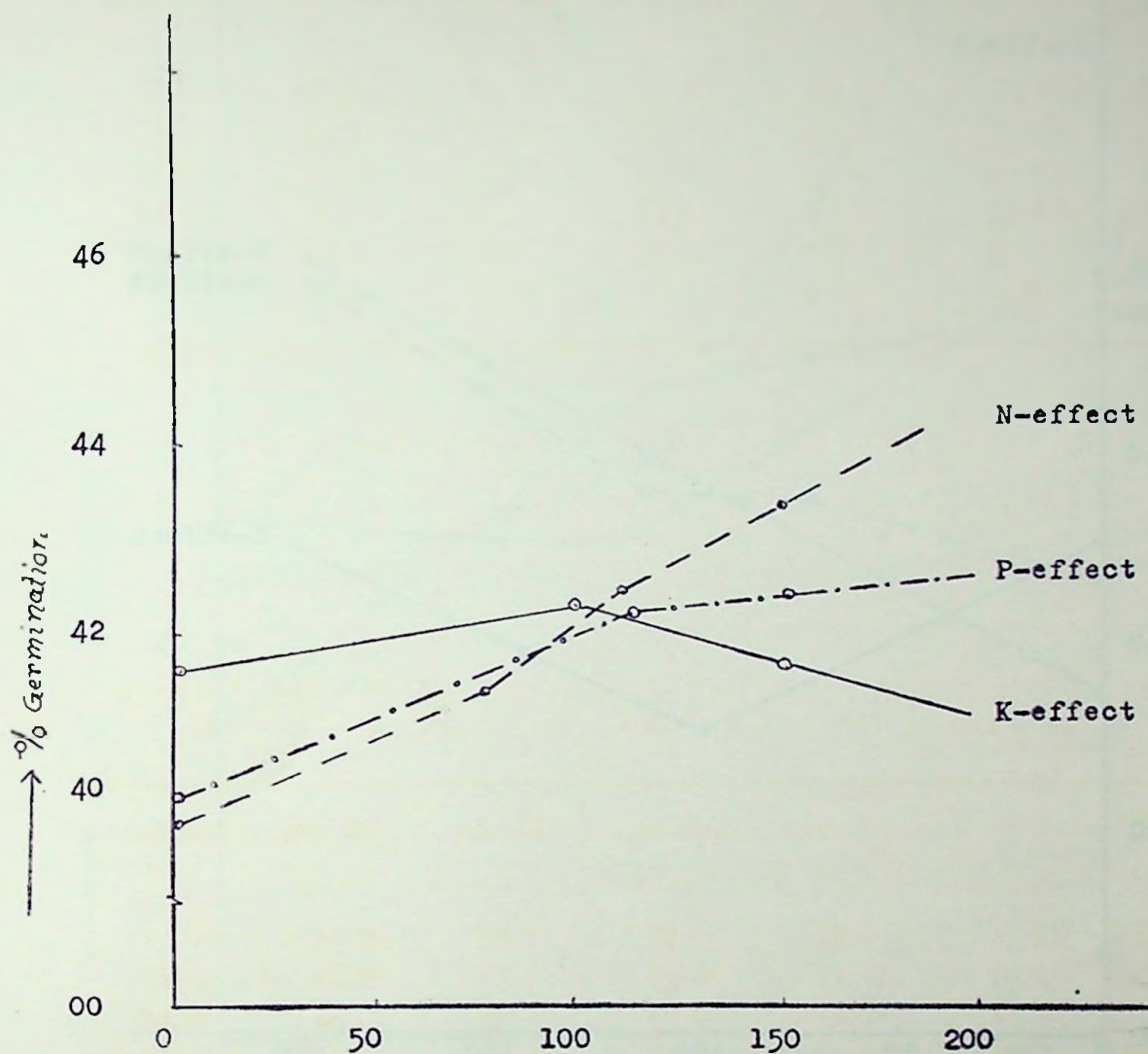
Figures bearing similar letters do not differ significantly at 5% level.

Table-3 : Effect of different levels of N on % brix of different varieties of cane at JSM farm. (Tista Flood plain)

N-levels/ Varieties	O	50 lbs.	100 lbs.	150 lbs.	200 lbs.	Mean
Co. 1158	18.29	18.47	18.19	17.69	18.70	18.27
Co. 975	18.03	20.14	22.54	18.21	19.15	19.62
BO 17	17.14	18.11	19.13	20.27	20.00	18.93
ISD 2/54	18.98	18.06	18.37	20.14	17.30	18.57
ISD 9/57	18.75	19.94	20.83	20.59	18.76	19.77
Mean	18.24	18.94	19.81	19.38	18.78	

Table-4 : Effect of different levels of N on % recovery of sugar of different varieties of cane at Carew & Co. farm (Gangetic alluvium).

Vatieties/ N-levels	O	50 lbs.	100 lbs.	150 lbs.	200 lbs.	Mean
Co. 1158	10.50	10.80	9.55	9.84	10.02	10.14
Co. 975	10.81	10.59	10.08	10.77	10.59	10.57
Bo. 17	10.52	10.57	10.97	10.86	10.46	10.68
ISD 2/54	10.26	10.57	10.35	10.22	10.56	10.39
ISD 9/56	10.64	10.88	10.62	11.03	10.43	10.72
Mean	10.55	10.68	10.31	10.54	10.41	



→ Levels of N, P₂O₅ and K₂O (in lbs/acre) applied.

Figure—1 : Effects of different levels of N. P & K on % germination of sugarcane.

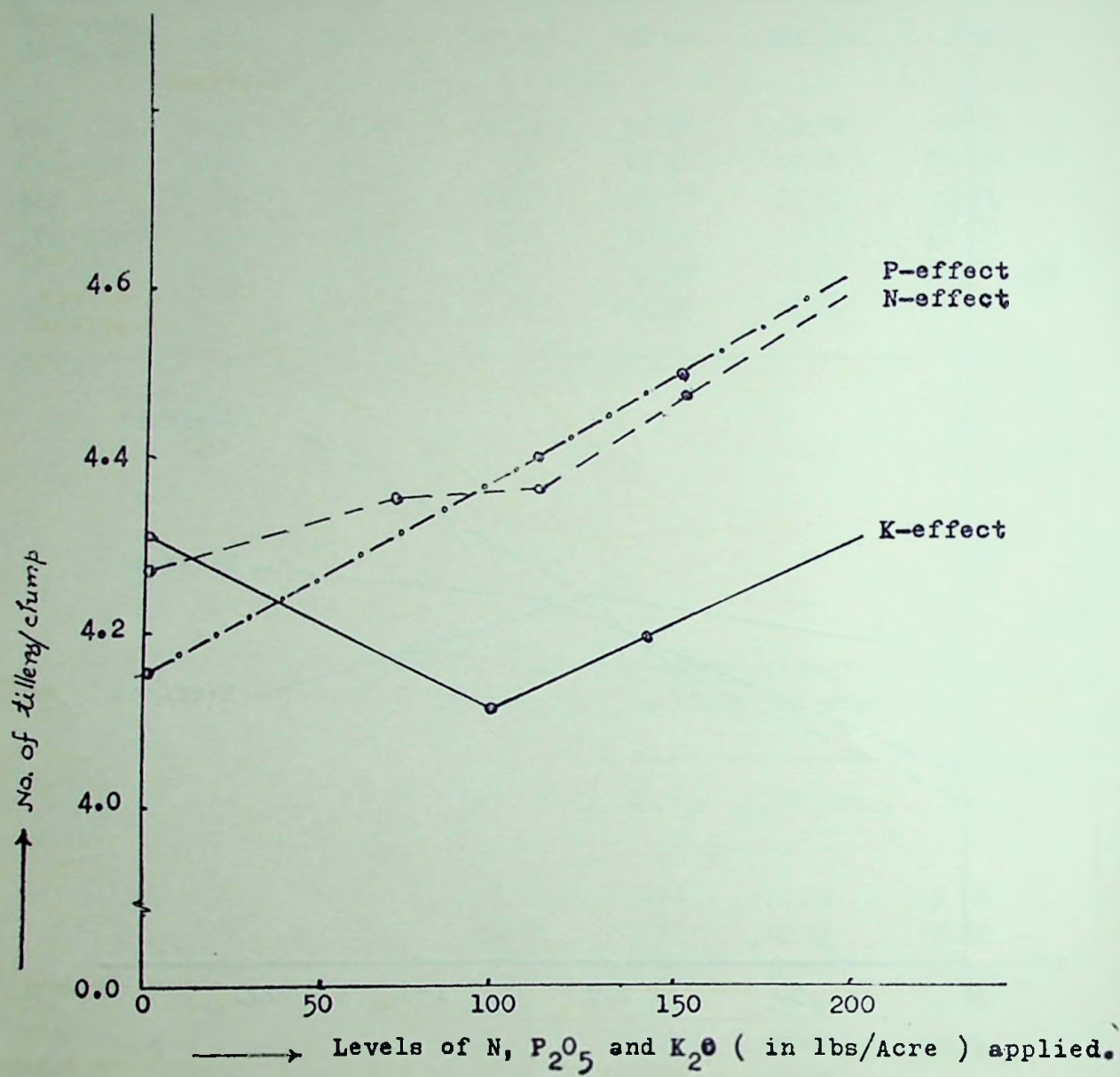


Figure - 2 : Effects of different levels of N. P & K on tillers / clump.

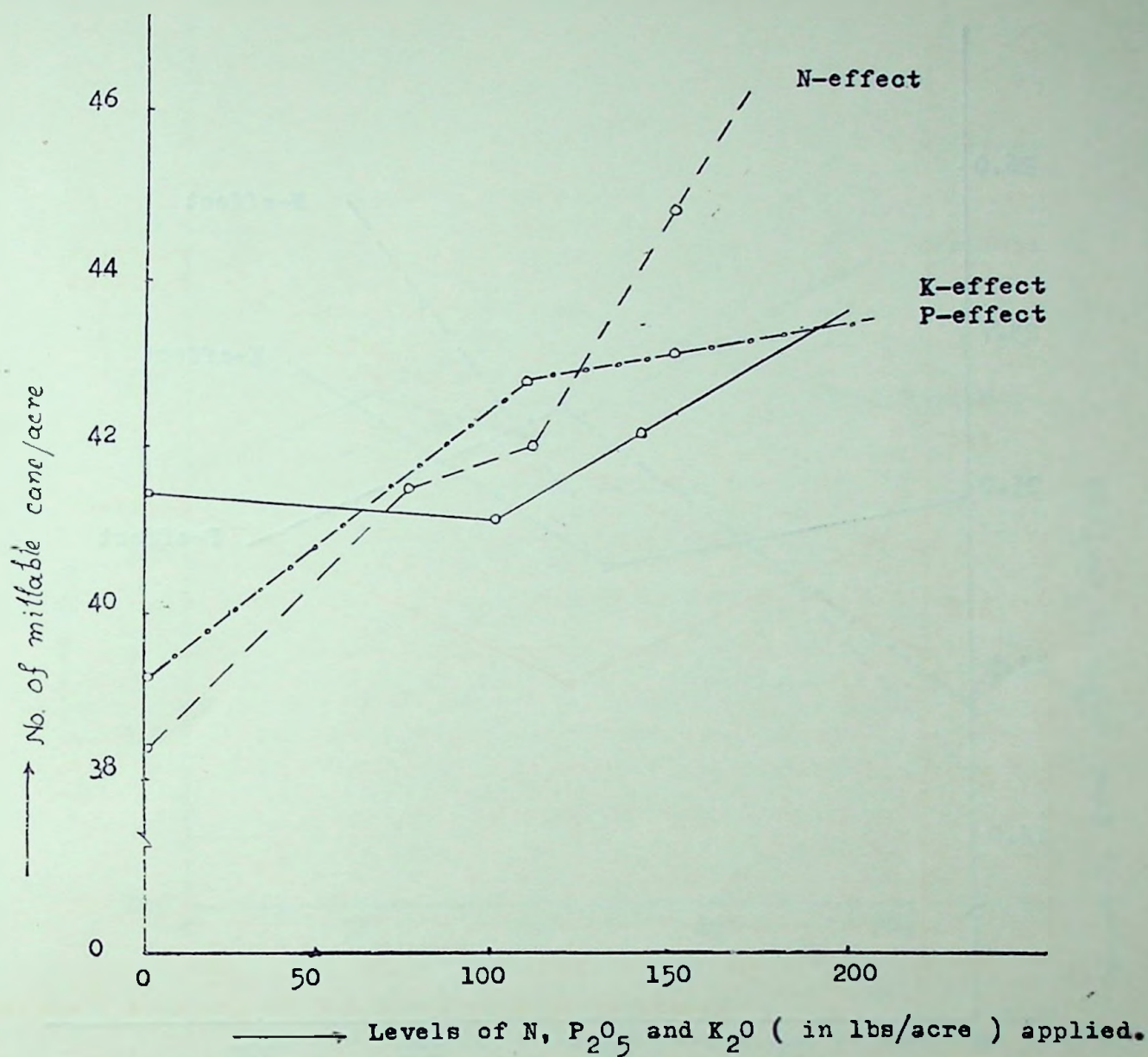


Figure - 3 : Effects of different levels of N. P & K on millable cane/acre.

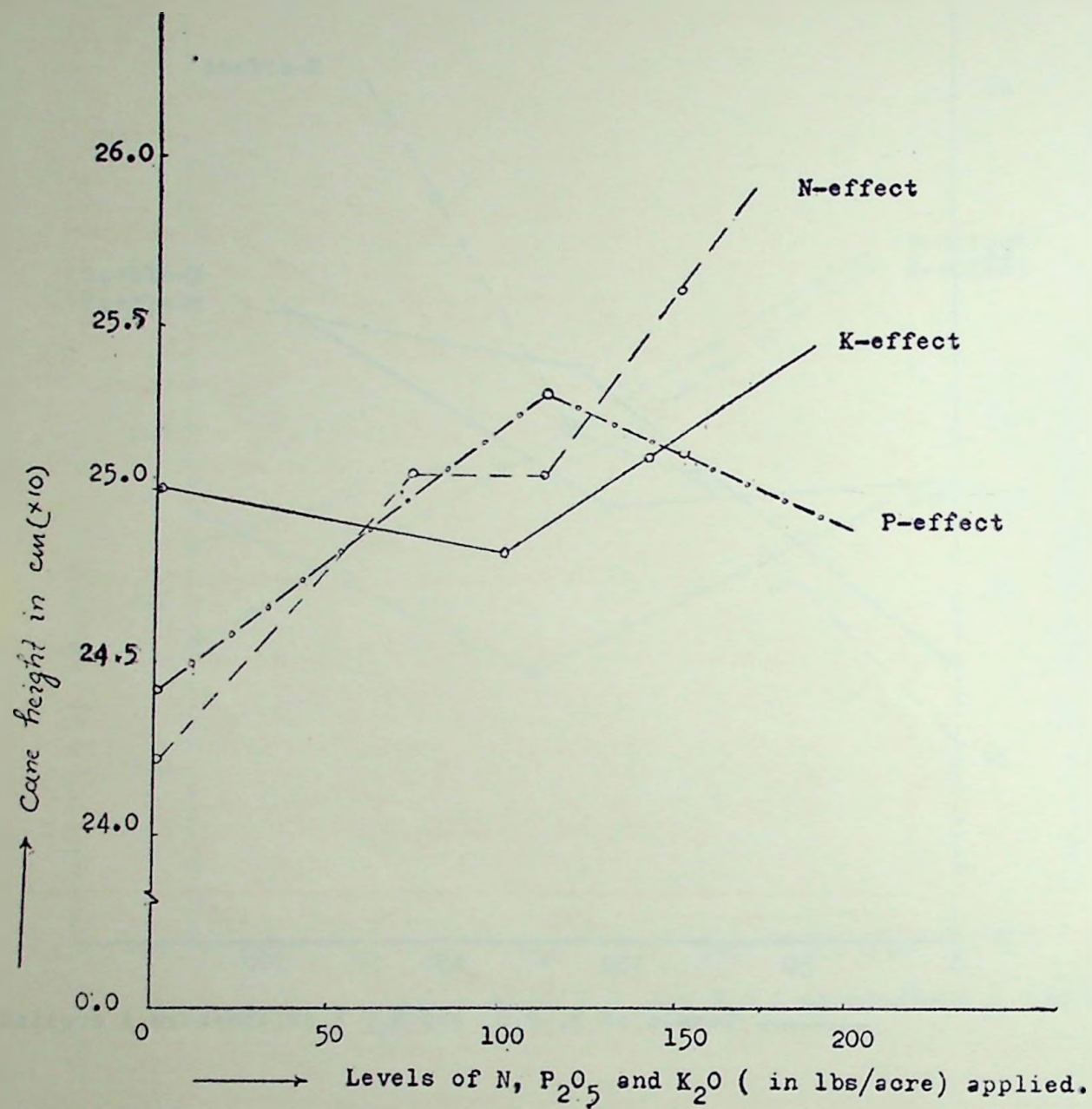
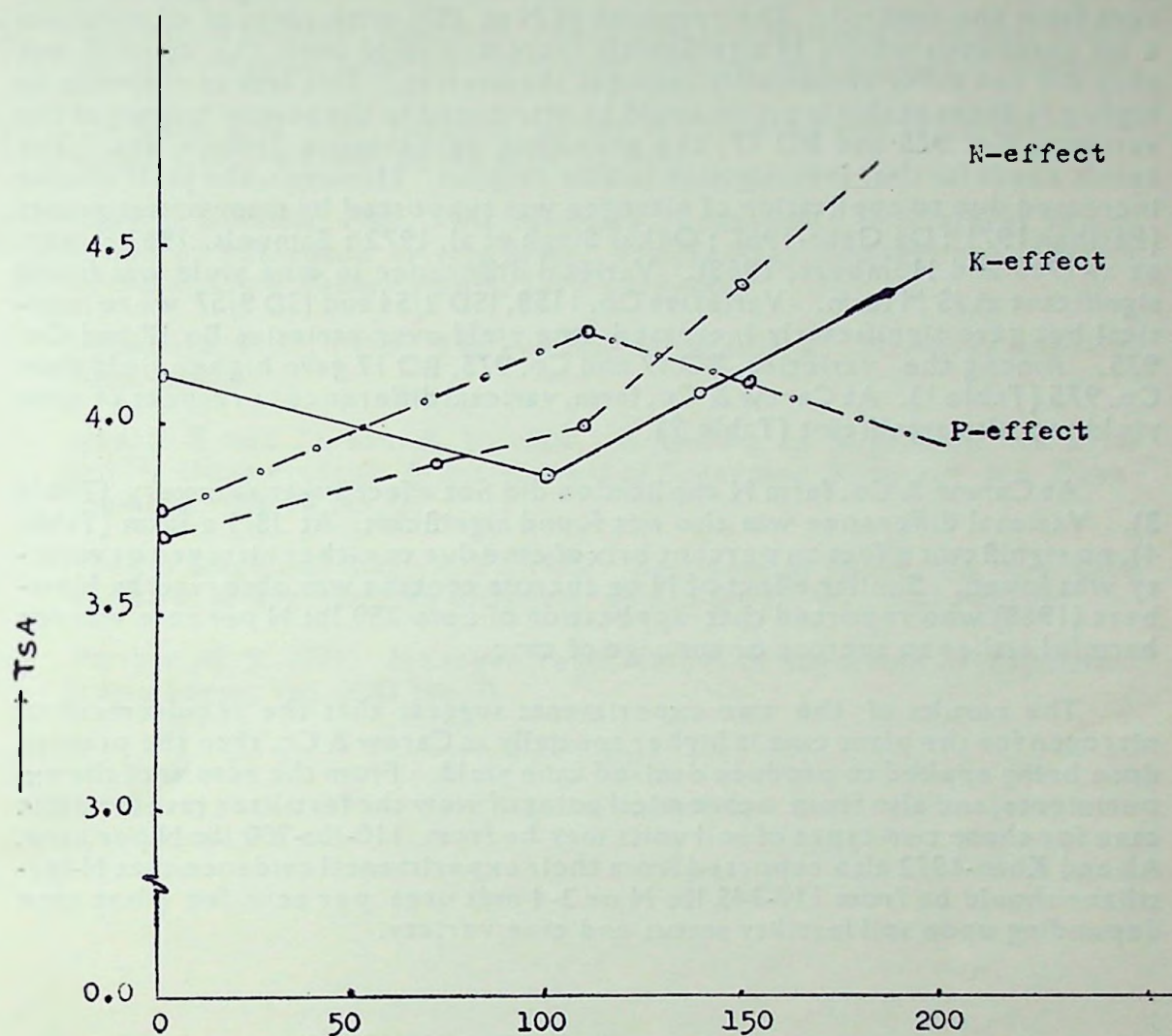


Figure - 4 : Effect of different levels of N. P & K on cane height.



→ Levels of N, P₂O₅ and K₂O (in lbs/acre) applied.

Figure—5 : Effects of different levels of N. P & K on tons sugar per acre.

of 200 lbs N gave highest average yield of cane producing 34.62 and 46.11 TCA at JSM and Carew & Co. farms respectively. At Carew & Co. 200 lbs N gave highest yield among all the treatments, followed by 150 lbs N. 100 lbs N and 50 lbs N gave identical results in respect of cane yield, but significantly different from the control. The response of N at JSM with respect of yield was a bit erroneous where N significantly increased yield over the control but they did not differ statistically amongst themselves. This lack of response to higher N doses at this location could be attributed to the severe lodging of the varieties Co. 975 and BO 17, the prevailing agroclimatic factors etc. The result needs further investigation in this respect. However, the yield of cane increased due to application of nitrogen was supported by many investigators (Parihar 1971 ; De Geus-1967 ; Onkar Singh et al, 1972 ; Samuels, 1967 ; Iyer, et al-1960 and Humbert, 1968). Varietal difference in cane yield was found significant at JS M farm. Varieties Co. 1158, ISD 2/54 and ISD 9/57 were identical but gave significantly increased cane yield over varieties Bo 17 and Co. 975. Among the varieties, BO 17 and Co. 975, BO 17 gave higher yield than Co. 975 (Table 1). At Carew & Co. farm, varietal difference in respect of cane yield was also significant (Table 2).

At Carew & Co. farm N application did not affect sugar recovery (Table 3). Varietal difference was also not found significant. At JSM a farm (Table 4), no significant effect on percent brix of cane due to either nitrogen or variety was found. Similar effect of N on sucrose content was observed by Humbert (1968) who reported that application of upto 250 lbs N per acre was not harmful either to sucrose or tonnage of cane.

The results of the two experiments suggest that the requirement of nitrogen for the plant cane is higher specially at Carew & Co. than the present dose being applied to produce desired cane yield. From the results of the experiments, and also from economical point of view the fertilizer rate for plant cane for these two types of soil units may be from 110-lbs-200 lbs N per acre. Ali and Khan-1972 also reported from their experimental evidence that N-fertilizer should be from 110-145 lbs N or 3-4 mds urea per acre for plant cane depending upon soil fertility status and cane variety.

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REFERENCES

1. Ali, M. Y, and Khan, A. B. 1972. Problems of Bangladesh Sugar Industries and their remedial measures. Atomic Energy Centre, Dacca.
2. Brammer, H, 1971. Geology, Physiology and Hydrology of East Pakistan soil. Report based on the finding of soil survey project of Pakistan.
3. De Geus, J. G. 1967, Fertilizer Guide for Tropical and Sub-tropical farming. Cent. d'Etude de l'Azote, Zurich.
4. George Samuels, 1967. The response of sugarcane to fertilizer application as influenced by irrigation. Proceedings, International Society of Sugar Cane Technologists, 12th congress.
5. Humbert, R. P., 1968. The growing of sugarcane. Elsevier pub. Co. Amsterdam.
6. Iyer, S. S. and Tandon. R. K. 1960. A Review of sugarcane manurial trial in Uttar Pradesh. Indian Journal of Sugercane Research and Development. Vol. IV No. 3.
7. Onkar Singh and Singh B. P., 1972. Response of Midseason and Late Varieties of sugarcane to nitrogen. Indian Sugar, Vol. XXI No. 10.
8. Parihar, N. S. 1971. Nitrogen requirement of sugarcane in Rajasthan. Indian Sugar, Vol. XXI No. 8.