

Amelioration of Deficient Soils in Permanent Manurials.

1. Effect on Grain and Straw Yield and Quality of Grain in Ragi (*Eleusine coracana* Gaertn.)

By

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ABSTRACT

A pot culture experiment with ragi (CO 7) was undertaken to study whether the yield level could be brought up to normal by adding deficient nutrients to soils that have received either one or two of the major nutrients for the past 28 years. Results indicated that the yield level could be increased by adding the deficient nutrients even in the first season in most cases or in subsequent season in some cases.

INTRODUCTION

In the New Permanent Manurials at Coimbatore, irrigated ragi crop (*Eleusine coracana* Gaertn.) supplied with three major nutrients N, P, K, gave highest yield in comparison to other plots receiving only N, P, K, NP, NK, PK and no manure which were all depressed in yield due to lack of one or the other nutrients due to continuous application of one or two or none of the major nutrients for the past 28 years. Anon, (1963). Experiments at Ohio, Rhode Island and Pennsylvania also revealed that continuous application of fertilizers having N, P and K gave higher crop yields than other treatments.

In India no such attempt seems to have been made to bring up the yields in deficient plots either by liming or by adding deficient nutrients. As such an attempt was made at Coimbatore to ameliorate the deficient soils with the addition of the deficient nutrients.

MATERIALS AND METHODS

The experiment was carried out under pot culture employing red soils from different plots of the New Permanent Manurials (Eastern series) wherein no farm yard manure was applied from the inception of the Permanent Manurials and the initial soil fertility status of the different plots is furnished (Table 1).

There were twenty two treatments including the control with two replications in a randomised replicated design. The individual pot containing 10 kg of soil with test crop of CO 7 ragi was treated with manurial doses; all the fertilizers were applied as basal dose. The treatments consisted of application of single; double and treble the usual dose of 24 kg N, 66 kg P_2O_5 and 58.8 kg K_2O /ha, one or two or three of deficient nutrients in no manure, N, P, K, NP, NK and PK soils of the pots, compared with NPK. Three crops of ragi were raised in the year 1963-'64 in succession as furnished in Table 1.

TABLE 1 The soil fertility level before commencement of experiment

Treatments	Available N kg/ha	Available P ₂ O ₅ kg/ha	Available K ₂ O kg/ha	EC (m mhos/cm)	pH
NPK	210	3.6	1020	0.55	8.1
N alone	294	3.6	730	0.45	7.6
P alone	260	4.4	760	0.70	7.7
K alone	224	2.4	895	0.30	8.2
NP	238	4.8	880	0.70	8.1
NK	280	2.4	1160	0.60	8.1
PK	266	3.6	940	0.60	7.9
No manure	196	4.4	810	0.30	8.4

TABLE 2 Date of sowing, planting and harvesting

	Date of sowing	Date of planting	Date of harvest
I crop	25— 6—1963	16— 7—1963	5—10—1963
II crop	28— 9—1963	26—10—1963	Crop failed
III crop	26—12—1963	20— 1—1964	4— 4—1964

The second crop, however, failed due to adverse seasonal condition and pest attack. Consequently the data of the first and third crops were utilised for the study. In this report the results of grain and straw yield are presented and discussed.

RESULTS AND DISCUSSION

Grain yield: In the first crop the grain yield was significantly influenced by the addition of deficient nutrients to the soils. Soil in K treatment to which two levels of N and P have been added (Tr 9) gave the highest grain yield and 23.2 per cent increased yield over control. Addition

of two levels of N and K to soils with P alone (Tr 6) and three levels of K in N P soil (Tr 13) followed in that order in grain yields. The lowest grain yield was recorded in no manure soil (Tr 20) and K alone soil (Tr 8) wherein single level of nutrients were added. In the third crop the N soil applied with three levels of deficient nutrients P and K, ranked first in grain yield and the increase was 50 per cent over control. This was followed by K soil in which N and P were applied with three levels (Tr 10) and gave increased yield of 28 per cent over control. Lowest grain yield was recorded in no manure soil (Tr 20), NP soil (Tr 13) and NK soil (Tr 14) (Table 3).

TABLE 3: Grain and straw yield by addition of deficient nutrients at different levels

Treatment		Mean grain yield (per pot in gm)			Mean straw yield (per pot in gm)		
Name of permanent manurial soil	Level of nutrients added	I crop	III crop	Mean for two crops	I crop	III crop	Mean for two crops
NPK	N ₁ P ₁ K ₁	8.2	7.0	7.60	10.1	7.1	8.6
Control							
N	P ₁ K ₁	8.1	6.6	7.40	11.1	6.4	8.7
N	P ₂ K ₂	7.7	7.5	7.60	9.8	9.8	9.8
N	P ₃ K ₃	6.5	10.6	8.55	9.3	12.5	10.9
P	N ₁ K ₁	6.5	5.8	6.15	10.2	8.6	9.4
P	N ₂ K ₂	8.8	6.0	7.40	10.5	9.7	10.1
P	N ₃ K ₃	5.9	7.6	6.75	10.5	11.8	11.1
K	N ₁ P ₁	5.0	6.1	5.55	9.2	8.1	8.6
K	N ₂ P ₂	10.1	5.7	7.90	12.5	12.0	12.2
K	N ₃ P ₃	8.2	9.2	7.90	10.4	8.7	9.5
NP	K ₁	7.1	7.5	7.30	12.8	8.5	10.6
NP	K ₂	7.3	8.8	7.55	11.6	9.5	10.5
NP	K ₃	8.3	4.9	6.60	12.3	7.5	9.9
NK	P ₁	6.0	4.9	5.45	12.9	7.6	10.2
NK	P ₂	8.0	5.7	6.85	8.7	9.0	8.8
NK	P ₃	6.0	6.7	6.35	10.0	8.0	9.0
PK	N ₁	6.5	6.3	6.40	10.0	7.3	8.6
PK	N ₂	7.0	6.7	6.85	9.0	9.5	9.2
PK	N ₃	5.9	5.9	5.90	9.7	9.0	9.3
No manure soil	N ₁ P ₁ K ₁	4.5	4.7	4.60	8.7	8.5	8.6
No manure soil	N ₂ P ₂ K ₂	5.6	7.2	6.40	9.5	12.6	11.1
No manure soil	N ₃ P ₃ K ₃	6.9	7.4	7.20	7.9	13.5	10.7
S. E.		0.46	0.62	0.51	N.S.	1.1	1.1
C. D. (P=0.05)		1.38	1.82	1.46		3.2	3.2

Note: 1, 2, 3 indicates levels of deficient nutrients added.

Straw yield: In the first crop difference in straw yield was not statistically significant due to addition of deficient nutrients to the soils. In the third crop the difference in the straw yields was significant due to addition of deficient nutrients. The highest straw yield was recorded in no manure soil (Tr 22) added with three levels of N P K. It was followed by no manure soil applied with two levels of NPK deficient nutrients (Tr 21). Lowest straw yield was recorded in N soil applied with single level of P and K (Tr 2). (Table 3).

Thus in both the crops the treatments significantly influenced the grain and straw yields. There was also interaction between levels of deficient nutrients added and deficient soils. Further in all the deficient soils either single, two or three levels of deficient nutrients applied could increase the grain and straw yields to that level of N P K in the first crop itself.

Among the deficient soils in P and K, the yield was higher than in N P K soil even at first crop itself with the addition of two level of deficient nutrients. In all the other soils adding deficient nutrients brought the yield upto the level of N P K soil.

This indicates that soils which are periodically applied with P and K could be made productive by applying only the deficient nutrients. Importance of P and K in the productivity of soil has

been pointed out by the workers Cook (1962), Sanyasiraju (1952), and Sen and Kavitar (1956).

The findings clearly indicate that addition of all the three nutrients is not necessary in all the seasons for getting normal yield of crops. The application of deficient nutrients may be preferred in manuring crops.

Thus the results reveal the possibility of setting right the set back of yield caused by continuous application of either one or two of the nutrients, of N P and K for the past 28 years.

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