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ORGANIC, AVAILABLE AND TOTAL SULPHUR STATUS OF SOIL DUE TO LONG TERM FERTILIZATION AFTER 20 YEARS OF INTENSIVE CULTIVATION

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ABSTRACT

The available, organic and total sulphur content over the profile depth upto 6 cms were investigated in a long term fertilizer experiment, which was continously cropped for 20 years with a crop rotation of finger millet-maize-cowpea. The available S increased from surface (0-15 cms) to sub surface soil (15-30 cms) and again decreased at 30-45 cms and the content was almost the same at 45-60 cms also. The same trend was seen in the case of organic S. But, the total sulphur content was found to decrease from 0-15 cms to 45- 60 cms depth.

KEY WORDS : Long term fertilization, available S, organic S, total S.

Sulphur ranks thirteenth in terms of abundance in the earth's crust. It is one of the 13 mineral nutrients essential for the growth and development of all plants and is indispensable for the synthesis of certain aminoacids besides being involved in various metabolic and enzymatic processes of plants. The total S content of surface soils of India varieds from 19 ppm to 9750 ppm. Most normal agricultural soils contain total S in the range of 50 to 300 ppm. Very high values of total S in excess of 1000 ppm (0.1%) are generally encountered in problem soils such as saline and acid- sulphate soils. (Ganeshamurthy, 1989).

Generally, soil S content is highest in the top soil and decreases with depth following the distribution of organic matter. However, this pattern does not occur where sulphates get accumulated in lower layers. (Tekkar, 1988).

MATERIALS AND METHODS

A study was taken up to review the status of organic, available and total in the existing long term fertilizer experimental field (Fd. No.37, of TNAU Coimbatore). The treatment details are as follows :

1. 50% NPK (Based on Soil Test Values)
2. 100% NPK
3. 150% NPK
4. 100% NPK+Hand Weeding
5. 100% NPK+$ZnSO_4$ @ 25 kg/ha for maize
6. 100% NP
7. 100% N alone
8. 100% NPK+FYM @ 10 t/ha for ragi
9. 100% NPK (Sulphur free source)
10. Control

The post harvest soil samples after the harvest of 52nd crop Ragi were collected at four different depths *viz.*, 0-15 (D1), 15- 30 (D2), 30-45 (D3) and 45-60 (D4) cms and analysed for their status.

Available S (Leon Chesnin and Yien. 1950) Organic S (Evans and Rost 1945) and total S were estimated as per normal methods. (Chaudry and Cornfield, 1966).

RESULTS AND DISCUSSION

Available sulphur

The S in the form of SO_4 is available to crops and it is mainly formd during the mineralisation of organic matter. Balasubramaniam (1974) reported that the content of available S was more in black soils of Coimbatore district compared to red soils.

In the present investigation, the available S content increased from surface (0-15 cm) soil to sub-surface (15-30 cms) soil and again decreased at 30-45 cms and the content was the same at 45-60 cms also. The slight increase in this sub soil may be

Table 1. Sulphur status of long term fetilizer experiment soils (ppm)

Treatments	Available Sulphur				Organic Sulphur				Total Sulphur			
	D1	D2	D3	D4	D1	D2	D3	D4	D1	D2	D3	D4
50% NPK	4.15	6.15	4.25	2.30	194	241	163	143	475	225	206	175
100% NPK	4.85	7.70	5.15	3.10	250	231	213	133	490	235	225	175
150% NPK	7.55	14.55	5.10	1.95	194	229	194	138	495	350	263	175
100% NPK+HW	4.75	13.70	3.95	3.20	213	241	213	138	540	325	320	150
100% NPK+MN	6.0	19.40	3.15	2.30	200	263	181	169	438	250	230	198
100% NP	7.15	9.55	4.30	3.40	219	241	194	181	519	281	238	175
100% N	3.15	3.55	1.70	2.65	150	216	194	143	406	281	188	150
100% NPK+FYM	6.65	18.35	5.10	4.75	235	234	238	213	631	288	213	175
100% NPK (-S)	1.75	2.05	1.70	3.00	175	209	169	169	450	344	141	175
Control	1.95	6.75	2.25	3.15	138	209	206	163	475	306	156	175
Mean	4.80	10.18	3.67	2.98	196.8	231.4	196.5	158.8	491.9	288.5	218	171

due to leaching from the surface soil and accumulation into the sub surface soil (Table 1). At 0-15 cms, the average S content ranged from 1.75 to 7.55 ppm. When 150% NPK was added (T_3), the content was 7.55 ppm and when P was skipped (T_7), the content was 3.15 ppm. When super was replaced with DAP. (T_9), the S content was 1.75 ppm only and in control (T_{10}) it was 1.95 ppm only. The same trend was seen in the Inceptisols of Orissa, where a long term trial is being conducted at Bhubaneswar. It has been reported that the available S status decreased from 20 to 9.5 ppm when S-free NPK fertilizers were used for 13 years whereas it increased to 30.8 and 39.5 ppm respectively, when NPK fertilizers containing 45 & 67.5 kgS/ha/season (Sahoo and Panda, 1985) were applied.

At 15-30 cms also, the available S content was minimum where S free fertilizers were applied. The S content was 3.35 ppm (N alone-T_7) and 2.05 ppm when 100% NPK (-S) was applied (T_9). At 30-45 cms depth, the content ranged from 1.7-5.15 ppm except in treatments which received S-free fertilizers (T_7 and T_9 recorded 1.70 ppm only). The mean S content decerased at 45-60 cms depth compared to 30-45 cms.

Organic sulphur

Organic S is an important fraction in the evaluation of the S status of the soils. The occurrence of S in most of the agricultural soils is in the organic form. The content of organic S in Tamil Nadu soils ranges from 0.01% to 0.23% (Ayyathurai, 1969), Organic S is the dominant fraction in most Indian soils. The proportion of total S present in organic form in surface soil varies from 5 to 98%.

In the present study, the organic S content increased from surface to subsurface soil and again it decreased into the lower depths viz., 30-45 cms and 45-60 cms. (Table 1). At 0-15 cms depth, the organic S content was the lowest where S free fertilizers were applied namely, T_7 and T_9. The same trend was seen in other depths also. Control recorded the minimum organic S content at 0-15 cms.

Total sulphur

The total S content of surface soils of India varies from 19 ppm to 9750 ppm. Most normal agricultural soils contain 50-300 ppm of total S. Total S is generally higher in fine textured soils than in coarse textured soils. Generally, the soil S content is maximum in the surface soil and decreased with depth. (Takkar, 1988). In the investigation carried with the long term fertilizer experiment, soils over the profile upto 60 cms depth also followed the same pattern of distribution. The total S content decreased from 0-15 cms to 45-60 cms depth. (Table 1).

The irrigation water source adds about 20 ppm of S to the soil. Some amount of this may also go into the available and total pool.

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DIRECT AND RESIDUAL EFFECT OF ADDED LEVELS OF BASIC SLAG WITH GREEN LEAF MANURE ON THE AVAILABILITY AND UPTAKE OF NUTRIENTS BY RICE

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ABSTRACT

Field experiments were conducted during the year 1992-93 with different levels of basic slag and green leaf manure, using ADT-36 rice as test crop. The results revealed that the application of basic slag at various levels significantly increased the available P, Ca, Mg and Fe content of soil at all the stages of crop growth. Moreover, the efficiency of basic slag in building the soil nutrients status was more, when it was applied along with green leaf manure. Similarly, the uptake of P, Ca, Mg and Fe by rice was also enhanced by the combined addition of basic slag along with green leaf manure. The basic slag addition along with green leaf manure at higher levels proved its efficiency even after the residual crops.

KEY WORDS : Basic slag, green leaf manure, rice, effect

Basic slag (BS), a calcium silicophosphate obtained as a by product of steel industry is produced to the tune of 1.5 million tonnes annually in India. Many attempts have been made to use the BS as ameliorative amendments in acid soils, since it contains higher proportion of base forming cations, like Ca and Mg. Besides, it is soil ameliorative properties, it also contains appreciable amounts of P and other micronutrients and this can be well utilised for the improvement of crop yields. BS has been in use as a phosphate fertilizer in European countries. The use of BS is limited in India due to difficulties faced in crushing the BS to required fineness, besides it's low P_2O_5 content which varies from 2-6% as against a minimum of 12% in European basic slag. Superiority of basic slag over super phosphate in acid soils have been reported by several workers and the reported results are not always in agreement. The fertilizer value of basic slag depends much on the composition of the material, soil characteristics, crop species and crop successions. It's active Ca content was as effective as the Ca content of $CaCO_3$ (Dev and Sharma, 1970). The present study was undertaken to study the effect of basic slag as a nutrient carrier to rice in combination with green leaf manure in neutral soils.

MATERIALS AND METHODS

Field experiments were conducted on sandy clay loam soils (*Udic Haplustalf*) at the Central Farm of Agricultural College and Research Institute, Madurai during the year 1992-93. The soil has a pH of 7.1 and EC 0.31 dSm^{-1}. The