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MINERALISATION PATTERN OF SULPHUR IN DIFFERENT SOIL TYPES

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ABSTRACT

The rate of mineralisation of sulphur in soils is higher during the first or second week, when the favourable environmental factors such as noisture and temperature are prevailing. Addition of elemental sulphur stimulates the mineralisation process, as it gives energy to the sulphur oxidising organisms. The rate of mineralisation is lowered after two weeks, probably due to the immobilisation of sulphur compounds as they might be assimilated to the microbial tissue.

KEY WORDS: Sulphur, Mineralisation, Soil types.

Sulphur is an essential nutrient for members of both the plant and animal kingdom. The major reserve of this element in soil is the organic fraction which has been estimated to be 80-90 per cent of the total sulphur in most soils. The store house is unlocked and made available to the plants through the process of mineralisation. It is normally measured as the net production of sulphate, brought about predominantly by soil microorganisms and hence the process will obviously be affected by temperature and moisture values (Swift,1985). Gob abd Gregg (1982) reported that substantial amounts of added sulphate are incorporated into organic sulphur fractions over a period of time. The rate of sulphur oxidation may also be quite variable among soils.

In contrast to nitrogen, the mineralisation and immobilization of sulphur has not been studied in any great detail until the last decade. This recent increase in interest reflects an increased understanding of sulphur nutrition requirements of plants and consequently an awareness of the need for greater understanding of the amounts and transformations of soil sulphur. Considering the above facts in mind, an attempt was made to trace out the mineralisation pattern of both native and added sulphur in different type of soils.

MATERIALS AND METHODS

An incubation study was carried out to understand the mineralisation pattern of both native and added sulphur for a period of two months. Two hundred grams of each soil under study (Black, Red Calcareous, Red Non Calcareous and Acid Soils) were taken in plastic beakers and elemental sulphur at the rate of 10 ppm was added to a set of treatments and these beakers were covered with paper and kept at room temperature in three replications. Water was added periodically to maintain their moisture content under field capacity level.

Samples were drawn at 2,4,6,and 8 week intervals of incubation. Extractions with Morgan's reagent were taken and the sulphate sulphur was estimated colorimetrically as prescribed by Palaskar *et al.* (1981). The total sulphur was estimated by the method suggested by Chaudry and Cornfield (1966). Field capacity of the samples was determined with pressure plate apparatus. The pH and EC of the samples were estimated. The organic carbon content of the samples were estimated by the method of Walkley and Black (1934).

RESULTS AND DISCUSSION

The general characteristics of the initial soils under study are given in Table 1. The production of sulphate as influenced by the time of incubation and added sulphur in the different soil types under study are given in Table 2. The following observations were noticed with regard to the mineralisation pattern of sulphur.

The mineralisation of sulphur in the black soil was found to be increased from 18 ppm to 20 ppm after two weeks interval. Then it was reduced to 14 ppm after four weeks and afterwards, it attained a plateau. The increase of sulphate during the first stage may be due to the presence of high-content of moisture (30.1%) as reported by williams (1967) and also due to the organic carbon (0.51%) content as reported by Rajendra Prasad *et al.* (1984). It was noticed that in the sulphur treated sample, the sulphate production was 38 ppm after two weeks; afterwards the trend was similar to non treated samples. The possible reason might be that the high rate of oxidation process brought about the sulphur oxidising organisms on the applied sulphur Burns, 1984.

The mineralisation of sulphur in the red calcareous soil was observed. After two weeks of incubation, the sulphate production was raised to 22 ppm from 20 ppm. As the incubation progresses, the mineralisation rate was found to slow down. In the sulphur treated sample, the rate of oxidation was higher (30 ppm) after two weeks and afterwards, it attained a lower rate.

The initial sulphate sulphur in the red non calcareous soil was 16 ppm on incubation, the production of sulphate registered 20 ppm after two weeks. This might be due to the clay loam texture of the soil, as the heavier soils oxidized sulphur more rapidly than the lighter ones (Burns, 1984). The sulphate content was higher (26 ppm) in the sulphur applied samples after two weeks. Then, it decreased to 20 ppm after four weeks. Again, the sulphate flush was raised to 24 ppm on the sixth week and then, it reduced to 23 ppm. The pH of the treatment was also found decreased to 8.2 from 8.4 after eight weeks, which might be due to the oxidation of sulphate by the sulphur oxidising organisms.

The mean values of the sulphate sulphur content of the acid soil alone and sulphur treated soil, after an incubation of two weeks, were 38 and 40 ppm respectively. The rise of sulphate sulphur in the sulphur treated acid soil might be due to the multiplication of sulphur oxidising organisms contained in the soil after the application of elemental sulphur as reported by Moser and Olson (1953) and Swift (1985). The pH of the sample decreased to 5.7 from 5.9 after eight weeks of incubation, probably due to the oxidation of sulphate. There was a drop of oxidation rate (31 ppm) at the sixth week of incubation on the acid soil treatment, which might be due to the immobilisation of sulphur.

It was observed that there was a rapid rate of sulphate production, on the second week of incubation in all the treatments, and afterwards the increase of sulphate production was in

Table 1. Physical and Chemical characteristics of the initial soil samples

Soil types	Texture	Field capacity (%)	pH	EC m.mhos/cm	Organic carbon (%)	Total sulphur (ppm)	Sulphate sulphur (ppm)
Black Soil	Clay loam	30.1	8.9	1.2	0.51	210	18
Calcareous Soil	Clay loam	15.9	8.6	0.9	0.44	230	20
Red Non-Calcareous Soil	Clay loam	15.8	8.4	0.7	0.27	180	16
Acid Soil	Sandy loam	24.0	5.9	0.5	0.16	280	36.

Table 2 Production of sulphate from native and added sulphur in different soil types (Mean value – ppm)

Treatments	Sulphur recovered as sulphate (ppm)				pH after	Total Sulphur after
	2 weeks	4 weeks	6 weeks	8 weeks	8 weeks	8 weeks (ppm)
1. Black soil alone	20	14	16	16	8.7	190
2. Black soil + Sulphur at 10 ppm	28	23	20	20	8.3	206
3. Red calcareous soil alone	22	21	21	20	8.5	210
4. Red calcareous soil + S at 10 ppm	30	22	24	24	8.6	215
5. Red non-calcareous soil alone	20	20	22	20	8.4	170
6. Red non-calcareous soil + S at 10 ppm	26	20	24	23	8.2	175
7. Acid soil alone	38	36	31	37	5.9	240
8. Acid soil + S at 10 ppm	40	33	37	38	5.7	240

decreasing trend and in some cases it followed a plateau or even reduced considerably. This finding corroborates the findings of williams (1967), Dev and Kumar (1982) and Rajendra Prasad *et al.*,(1984).

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VAMBAN 1 - A YELLOW MOSAIC RESISTANT BLACKGRAM VARIETY

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ABSTRACT

An attempt was made to evolve a blackgram strain with high yield potential combined with resistance to yellow mosaic disease which resulted in the isolation of the culture, NPRB 1. This culture recorded a grain yield of 772 kg/ha with an overall increase of 57 per cent over Co 5. It matures in 60 days with synchronous flowering and fruiting habit. Hence, NPRB 1 was released as Vamban 1 blackgram especially for the hot spot areas of Tamil Nadu where yellow mosaic is a problem.

KEY WORDS : Black Gram, YMV Resistance, Flower synchrory.

Among the pulse crops, blackgram is cultivated in an extent of 1,18,580 hectares which is about 24.0 per cent of the total area of pulses raised in Tamil Nadu. The average productivity of blackgram is about 340 kg/ha which is very low. One of the main reasons is the loss caused by