Influence of Liming on the Biological Activity in the Soil *

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I ATERITE SOILS ARE CHARACTERISED BY LOW pH, poor base status and low availability of nutrients. One of the several beneficial effects attributed to liming acid soils is that it stimulates the microbiological processes in the soil. In the studies reported here an attempt was made to find out how far the biological acticity in the soil measured in terms of CO_2 evolution was influenced by liming and how the same was related to nitrate accumulation in the soil.

REVIEW OF LITERATURE

The evolution of carbondioxide from a soil is a measure of the rate of decomposition of humus, which in turn is an index of microbial activity in the soil. Stoklasa and Ernest (1905) observed that the evolution of CO, in a soil under certain conditions of moisture and temperature during a given time furnishes a reliable measure of microbial activity in the soil. He further reported that maximum evolution of CO_2 occurs most abundantly in neutral or slightly alkaline soils. Russel and Appleyard (1915) considered CO_2 production and nitrate accumulation in soils as related phenomena. Distinct positive correlation between CO.. production and nitrate accumulation in the soil have been reported by Neller (1918).

Waksman and Starkey (1924) considered the microbial activity measured] in terms of CO_2 evolution as an index of soil fertility. They reported an enhanced production of CO_2 in limed soils compared to unlimed soils.

Nair et a! (1957) found that combination of lime, phosphates, and organic matter provides a congenial condition in acid soils for enhanced microbial activity which in turn results in improving the fertility of the soil.

MATERIALS AND METHODS

An acid lateritesoil from Pattambi, Kerala State, having an initial pH of 5.9 was taken up for the study. 25 lbs of sieved soil was taken in glazed pots and given the following treatments.

Lime at 1000 lbs. per acre
1500
" 5000 "
No lime.

The above levels of lime were applied over the basal dressing of 30)bs. N, 45 lbs. P_2O_5 and 15 lbs. K_2O and 5000 lbs of green leaf per acre. The treatments varied only in respect of lime addition and were replicated six times.

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Soil samples were drawn at fortnightly intervals for five fortnights from dummy pots and the final samples after harvest from the pots *in* which the crop (paddy) was raised.

The evolution of **CO,** was studied according to the procedure outlined by Fred and Waksman (1928).

The results are given below:

TABLE I.

CO., evolved from 100 gms. of dry soil

(expressed in mg.)

Period of sampling	0 lime	1000 lb. lime	1500 lbs. lime	3000 lbs. lime
2nd week	5.0	5.8	7.3	7.0
4th ,,	7.0	7.3	8.2	8.0
6th	4.9	6.6	7.8	7.8
8th	5.0	5,7	5.8	5.7
10th ,,	4.4	5.7	5.6	5.1
After harvest	3.9	4.9	5.6	5.8

The results presented above reveal an appreciable increase in CO. production and nitrate accumulation due to addition of lime. The maximum production of CO_2 occurred when lime was added at 1500 lbs. per acre. After 4 weeks there was a slowing down in the production of < 0 in all the cases including control.

DISCUSSION

The results of study on the biological activity in the soil measured in terms of CO_2 evolution indicate the beneficial influence of liming acid soils on the growth and increased activity of soil microflora. According to Lysenko (1957) the fertility of the soil is determined by the conditions that favour the vital functions of appropriate microorganisms. When the conditions are unfavourable or when microbial activity is Sow the fertility status of the soil is impaired.

The present study has shown that addition of lime stimulates the biological activity in the soil. The beneficial effect of liming may be accountable to the resultant favourable soil reaction ideal for microbial growth and development and the availability of Ca.

The periodical estimation of Nitrate N in the soil sample drawn at intervals (vide table No. 2) has shown a distinct positive correlation between the nitrate accumulation and CO. production in the soil, the correlation coefficient obtained being 0.81. This observation is in agreement with the reported findings of Neller (1918).

TABLE II

NO_3 N in the Soil
(per 100 gm. of dry soil)

Period of sampling in weeks	No. lime (control)	1000 lb. lime	1500 lb. lime	3000 lb. lime
2nd week	10.2	13.0	15.6	14.6
4th week	9.8	14.0	19.8	18.5
6th week	7.1	8.9	12.3	11.7
8th week	3.7	10.8	12.4	10.5
10th week	2.3	10.8	9.9	7.8
After harvest of paddy crop raised.	3.0	6.7	7.9	:8.0

The results of pot culture trials in **the yield of paddy under the same treatment (vide table** No. 3) **also have shown** increased **yields in the case of treatments which showed maximum CO_2 production,**

TABLE III

Statistical analysis of yield
(Summary of Results)

	A Control No. lime	B 1000 lbs. lime	C 1500 lbs. lime	D 3000 lbs. lime	S, E,	C. D,
Mean Wt. in gms.						
Grain	8.6	10.8	11.3	9.7	1.72	5.3
Straw	24.4	30.7	30.9	28.7	0.39	2.1

CONCLUSION

Liming acid soils produce beneficial effects in improving the microbial activity in the soil which is reflected in the enhanced nitrate accumulation and increased yield.

SUMMARY

Biological activity in the soil is measurable c terms of CO, produced. The study made with an acid laterite soil with lime addition at various levels has shown the beneficial influence of liming acid soils in stimulating bacterial activity in the soil. Significant positive correlation between nitrate accumulation and CO_2 evolution was observed.

The increased **CO,** production obtained as a result of liming is also reflected in the

increased yield recorded in pot culture

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