

CHEMICAL AND AGRICULTURAL NOTES FROM
THE COCONUT RESEARCH SCHEME,
CEYLON

III. LOSS OF AMMONIA FROM FERTILIZER
MIXTURES CONTAINING SULPHATE OF
AMMONIA AND MINERAL
PHOSPHATES

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THE question of possible losses of nitrogen (as ammonia) when sulphate of ammonia and ground mineral phosphates (such as Saphos, Ephos and Safaga phosphates) are mixed is one of considerable practical importance. It is usually recommended that these constituents may be safely used in manure mixtures, but the possibility of the presence in mineral phosphates of 10 to 15 per cent. of lime as calcium carbonate which will react with sulphate of ammonia under damp tropical conditions should not be ignored.

Akhurst (1), working at the Rubber Research Institute, Malaya, in 1936, using mixtures of sulphate of ammonia with three different types of rock phosphates (Christmas Island, Gafsa and Cheribon), showed that appreciable losses of nitrogen can occur from the mixtures on storage. Losses of nitrogen amounting from 7 to 13 per cent. were observed after six days, and from 16 to 17 per cent. after 13 days.

Very similar results were obtained by Beeson and Jacob (2) working at the U. S. A. Bureau of Chemistry and Soils. Using calcined rock phosphate it was shown that the losses which occur are small when all materials are kept dry, but considerable when the humidity is high, particularly when potash salts are present.

Some results obtained in the Coconut Research Scheme laboratory are worth recording.

Two parts sulphate of ammonia, four parts Saphos phosphate, and two parts muriate of potash, in the proportions generally used in manure mixtures for coconuts were thoroughly

mixed and aliquot portions were stored in small miniature manure bags. Determinations of ammonia were made periodically.

Even at the time of mixing a distinct smell of ammonia was observed. That appreciable losses of ammonia occur is shown by the following data :—

At Mixing.	Nitrogen Per cent.		Loss of Nitrogen Per cent.	
	After 9 days.	After 1 month.	After 9 days.	After 1 month.
5.69	5.40	4.65	5.2	18.3

Beeson and Jacob (*loc. cit.*) report that the loss of nitrogen increases with the relative humidity of the air; and that the rate of loss depends on the initial moisture content and the relative proportion of the mixture exposed to the atmosphere. Mixtures containing below one per cent. of moisture do not lose ammonia when stored in closed containers.

It is not necessary here to discuss the chemical reactions occurring in the mixture, beyond pointing out that the presence of "free lime" in the original phosphate is not essential for the liberation of ammonia. Beeson and Jacob (*loc. cit.*) indeed point out that in the presence of water α tricalcium phosphate can decompose sulphate of ammonia.

Whatever the chemical reactions may be, losses of nitrogen as ammonia are found to occur from fertilizer mixtures containing sulphate of ammonia and mineral phosphates when these are stored for any length of time under the hot and humid conditions of most Ceylon coconut districts. The effect is enhanced by the presence, in the mixture, of potash salts which rapidly absorb moisture. In the trial reported here, the mixture after two months had become a damp, sticky mass resembling puddled clay.

Separate application of the constituents of such a mixture would probably be unobjectionable, but a large proportion of coconut estates use ready-mixed fertilizer mixtures, and since the time of application of manures depends upon the vagaries of weather, long storage is often inevitable. Accordingly, the use of sulphate of ammonia with mineral phosphates in mixed fertilizers is not recommended.

It is possible that different degrees of loss will be found with different grades of phosphate and it is proposed to carry out further investigations in co-operation with the Tea Research Institute.

REFERENCES

- (1) Akhurst, C. G.—A note on the mixing of fertilizers. *Journal, Rubber Research Institute, Malaya*, Vol. 7, No. 1, page 106, 1936.
- (2) Beeson, K.C., & Jacob, K.D.—Chemical reactions in fertilizer mixtures. *Industrial and Engineering Chemistry*, 1938, Vol. 30, page 304.