Using sulphur and iron oxide to aid creation of acid grassland at Minsmere RSPB Reserve, Suffolk, England

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SUMMARY

Nine samples of soil were taken from former arable land at Minsmere RSPB Reserve, eastern England. Sulphuric acid and iron was added. The pH of the soil was reduced, but the iron addition did not appear to have an affect on reducing the quantity of extractable phosphorus.

BACKGROUND

Experiments and field-scale trails have been undertaken on former arable land at Minsmere RSPB Reserve in Suffolk, eastern England to provide suitable conditions for the establishment of acid grassland vegetation. These have involved addition of elemental sulphur to lower soil pH. However, there was evidence that this lowering of soil pH resulted in a release of available phosphorous. One suggestion was that the sulphuric acid produced from the sulphur was reacting with calcium phosphate in the soil to release the phosphorus. Such a release would be considered undesirable since high levels of available phosphorous are likely to encourage competitive ruderal plant species at the expense of slower-growing, more stress-tolerant heathland or acid grassland plants. There is evidence that iron oxide can be added to the soil with the elemental sulphur to lock up the released phosphorus. Quick laboratory tests were carried out to determine whether the addition of iron oxide to reduce levels of extractable phosphorus following soil acidification was worth further investigation.

ACTION

Soil collection: Soil was collected from former arable land at Minsmere RSPB Reserve on the Suffolk coast, England. These fields had been under arable cultivation for at least the previous 150 years.

Table 1. Quantities of iron oxide applied to the nine beakers.

Treatment	Quantity of iron oxide added
Control	*None*
Treatment A	+0.025g FeO
Treatment B	+0.050g FeO
Treatment C	+0.075g FeO
Treatment D	+0.100g FeO
Treatment E	+0.050g Fe2O3
Treatment F	+0.100g Fe2O3
Treatment G	+0.150g Fe2O3
Treatment H	+0.200g Fe2O3

Experimental procedure: The soil from the fields was homogenised and 200 g was placed in each of nine beakers. The soil was packed in the beakers to about 1.38 g/cm³ (natural packing no compaction), resulting in a porosity of approximately 48%. 100 ml of 0.03 M sulphuric acid was slowly added to the soil leaving some liquid above the soil. The iron oxide was then applied to eight of the nine beakers in the quantities shown in Table 1. The ninth beaker was used as a control and had no iron oxide added.

The soils were then maintained in a moist but not saturated condition for two weeks at room temperature. After this, the soils were air-dried, ground and passed through a 2 mm sieve. The concentration of extractable phosphorus contained in each soil was then determined using the Olsen method (MAFF 1986) and the soil pH was measured.

CONSEQUENCES

Addition of the sulphuric acid reduced the pH of the soil from 5.3 to 3.8 and increased the quantity of extractable phosphorus from 30 mg/l to approximately 40 mg/l. There was no evidence from these initial tests, that addition of different quantities of iron II oxide or iron III oxide had any substantive effect of reducing the quantity of extractable phosphorus (Figure 1). No further work was undertaken involving the addition of iron oxide.

REFERENCES

Ministry of Agriculture, Fisheries & Food. (1986) *ADAS Reference Book 427: The analysis of agricultural materials*. HMSO, UK.

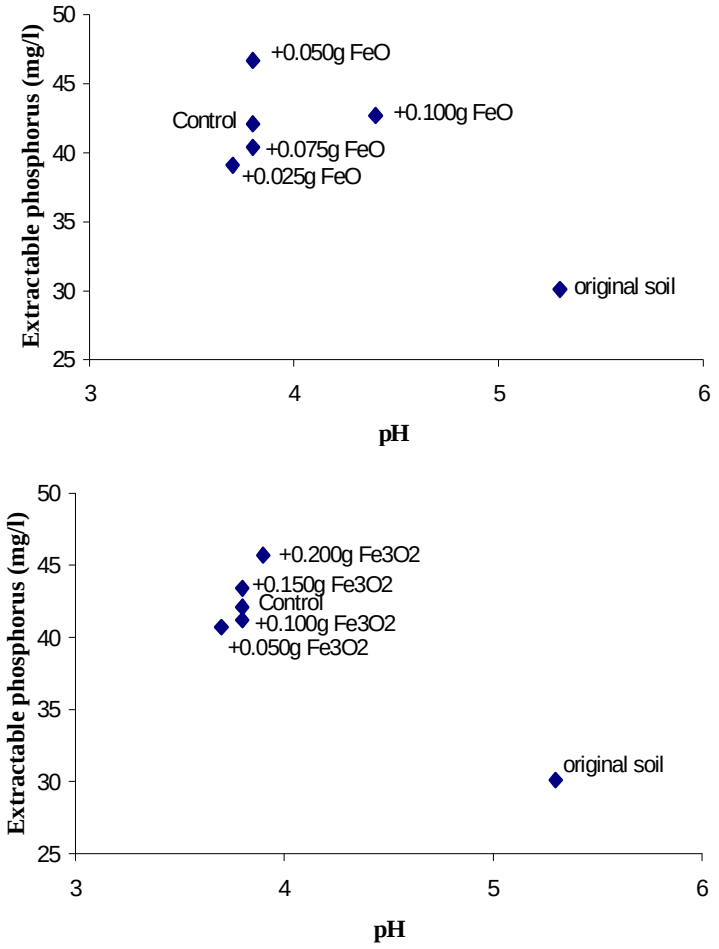

Figure 1. Effects of adding different quantities of Iron II oxide (A) and iron III oxide (B) on soil pH and levels of extractable phosphorus.

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