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SHORT COMMUNICATION

Ammonification in air-dried tropical lowland Histosols

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About 30 million ha of Histosols (organic soils) in south and south-east Asia lie uncultivated or are cultivated with poor results (Ponnamperuma, 1978). Because these soils are permanently waterlogged and subside when drained (Driessen, 1978), wetland rice is the crop best suited to them. But although these soils are high in total N, wetland rice often suffers from N deficiency (IRRI, 1976; Ponnamperuma, 1978) presumably because of the absence of the beneficial soil-drying effect on ammonification described by Mitsui (1956), Ventura and Watanabe (1978) and Sahrawat (1980a). Lantin (1976) observed multiple nutritional deficiencies in rice on a flooded peat and recommended air-drying the soil before transplanting as one amelioration measure.

To ascertain whether the N deficiency observed on Histosols was due to the permanently-waterlogged condition I studied ammonification in four Histosols with and without air-drying before anaerobic incubation.

Tropohemists were sampled to a depth of 15 cm at 4 locations in the province of Laguna, Philippines and analysed (Table 1) (Sahrawat 1980b). Wet samples corresponding to 10 g air-dry soil (1 week at 25–35°C) were placed in each treatment were taken out every 2 weeks. Ammonium was determined in 2 N KCl filtered extracts by the method of Bremner (1965).

The NH_4^+-N content of all soils that had not been air-dried before anaerobic incubation was 5–10 mg kg^{-1} at the start of the experiment and remained more or less constant during incubation (Fig. 1). In contrast the air-dried soils had 50–200 mg NH_4^+-N kg^{-1} at the start, indicating that ammonification had taken place during air-drying. In addition, they showed a surge of NH_4^+ release during the first 2 weeks of incubation (Fig. 1) and, after 4 weeks, had produced 200–500 mg NH_4^+-N kg^{-1} soil.

The results indicate that (1) Nitrogen deficiency in rice on continuously wet Histosols may be due to the virtual absence of ammonification. (2) Moderate soil drying by drainage or ridging may encourage ammonification and may aleviate N deficiency; and (3) It is speculated that excessive and prolonged soil drying before reflooding may lead to heavy losses of N by denitrification as shown by Terry and Tate (1980a,b). Careful water management is necessary to avoid N deficiency on the one hand and excessive loss of soil organic matter accompanying ammonifica-

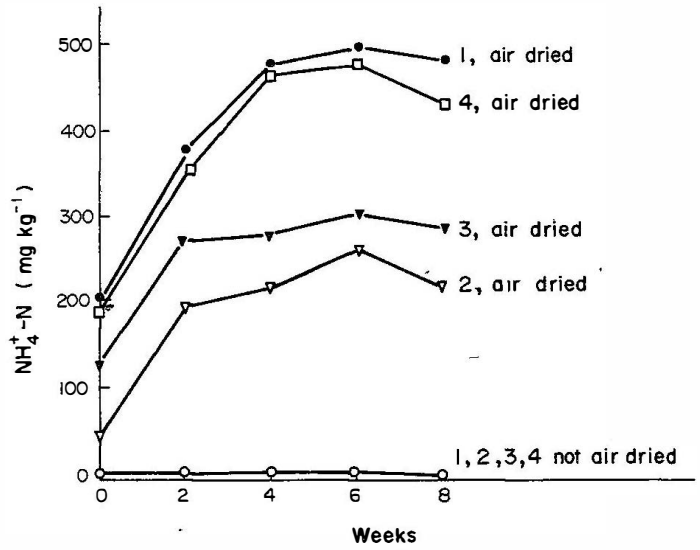

Fig. 1. Effect of air-drying on ammonification in four waterlogged Histosols, incubated anaerobically at 30°C.

125-ml conical flasks and covered with 25 ml distilled water. Ten-g portions of the same air-dry soils were also placed in 125-ml conical flasks and sufficient distilled water was added to give a 1-cm layer of standing water. The mouths of the flasks were covered with aluminum foil and the flasks were then held in an anaerobic incubator at 30°C for 8 weeks. Duplicate incubated (entire 10 g) samples of

Table 1. Some characteristics of the four Histosols

Soil	pH (1:2 H_2O)	Organic matter (%)	Total N (%)
1	6.2	36.7	1.48
2	5.6	22.0	0.56
3	6.1	39.0	1.20
4	5.9	42.0	1.40

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tion on the other when Histosols are used for wetland rice cultivation.

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