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BEHAVIOR AND AVAILABILITY OF AMMONIUM
IN FLOODED SOILS

MONGKORN SOMSUD

June, 1980

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ABSTRACT

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The studies were conducted to find out the native fixed- NH_4^+ , the extent and magnitude of ammonium fixation of some Philippine and Thai soils, ammonium volatilization, availability of native fixed- NH_4^+ and recovery of applied ammonium in the presence of a growing lowland rice.

The values of native fixed- NH_4^+ varied from 5 to 200 ppm of nitrogen, there appeared to have no definite trend in the distribution of fixed- NH_4^+ with soil depths. The amounts of native fixed- NH_4^+ were related to the Orders of soil. The amounts of fixation of applied ammonium ranged from 3 to 108 ppm of nitrogen. Oven-drying tended to fix more applied ammonium than air-drying treatment.

The average ammonia volatilization ranged from 1.79% to 11.06% and 0.13% to 1.97% of applied ammonium in without and with rice plant, respectively. The volatilization was related to the amounts of exchangeable Ca, initial soil pH, and a standing rice crop caused to decrease the volatilization. Volatilization rate was rapid at first, then it slowed down during the second week.

Fixation of applied ammonium at different periods of submergence varied from 0.42% to 85.83% and 10 to 17% of applied ammonium without and with a crop, respectively. The fixation decreased with time of submergence.

The availability of native fixed- NH_4^+ ranged from 2 to 8% and from 5 to 26% without and with rice crop, respectively.

Recovery of applied ammonium by the rice plant ranged from 0.7 to 4.2%. The percentages were quite low owing to the immaturity of the plants.

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INTRODUCTION

Nitrogen has always been considered as the most important input in crop production. The proper management of nitrogen fertilizer is very necessary to attain maximum yields. The development of cultural practices for better utilization of fertilizer and soil nitrogen is largely dependent on the understanding of the fundamental roles of nitrogen transformations in a particular ecosystem.

Ammonium fertilizer is the most favored form to use in lowland soils. Very little basic research has yet been conducted on nitrogen transformations in flooded soils. Recovery of nitrogen is not more than 50 percent of that applied in the fertilizer. The reactions or aspects that control the availability of nitrogen are ammonium fixation, ammonium volatilization, leaching or movement of ammonium away from plant roots, and denitrification-nitrification.

The objectives of the study were to determine:

1. The distribution of native fixed ammonium in some Philippine and Thai soils;
2. The extent and magnitude of ammonium fixation, ammonia volatilization of ammonium in some soils; and
3. The recovery of applied ammonium fertilizer and availability of native fixed- NH_4^+ in the presence and absence of a growing rice crop.