

## Effect of Source and Amount of Nitrogen, the Amount of Calcium Carbonate of Soil and Different Amounts of Alfalfa Residue on Nitrogen Losses as Ammonia

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**Introduction:** Selecting the right source of nutrient in a particular cropping situation requires a consideration of economic, environmental, and social objectives. One of the objectives is to keep all nutrient losses to a minimum. Since the use of nitrogen chemical fertilizers began more than 100 years ago, it has been recognized that it can be lost as gaseous ammonia when an ammonical fertilizer is applied to calcareous soil. A process by which nitrogen exit from the soil in form of ammonia and enter to the atmosphere is called volatilization. Agricultural practices (use of chemical and animal fertilizers) are known as major sources of ammonia volatilization into the atmosphere. Nitrogen losses not only economically but also in terms of environment pollution is important. Ammonia volatilization is one way of the nitrogen losses from agricultural and non-agricultural ecosystems. A variety of soil chemical properties interact with environmental conditions at the site of the fertilizer application to determine the extent of NH<sub>3</sub> loss. This article study some of the major factors that contribute to NH<sub>3</sub> loss from N fertilizer. The aims of this study were to evaluate the impacts of concentrations of soil calcium carbonate (experiment 1), plant residue application (experiment 2), nitrogen fertilizer rate and source on volatilization of ammonia from soil.

**Materials and Methods:** Two factorial experiment with 36 treatments, three replications and 108 experimental unit for 25 days at a constant temperature of 30 ° C were conducted using a completely randomized design. The experimental treatments were three concentrations of soil calcium carbonate (20, 27 and 35% in experiment 1), three alfalfa plant residue application rates (0, 2.5 and 5% w/w in experiment 2), three rates of nitrogen (0, 200 and 400 kg/ha), four sources of nitrogen (urea, ammonium nitrate, ammonium sulfate and urea-sulfuric acid). Fertilizers were added to soil samples in form of solution and the moisture of soils was brought to field capacity. Samples were placed into special jars and amount of nitrogen volatilization were measured.

**Results and Discussion:** The results showed that ammonia volatilization from soil increased as the concentration of soil calcium carbonate, rates of nitrogen and alfalfa plant residues application increased. In first experiment the highest amount of nitrogen volatilization rate, as ammonia (33.21 µgr N/gr soil) was measured from 400kgN/ha soil for urea fertilizer and 35 percent calcium carbonate. Also the lowest amount (11.99 µgrN/gr soil) was obtained from 20 percent calcium carbonate without application of any nitrogen fertilizer. In this experiment, with an increase in the amount of soil calcium carbonate by 15%, the amount of volatilized nitrogen in the form of ammonia were six times. By increasing the amount of soil calcium carbonate of from 20 to 27% the amount of nitrogen losses as ammonia slightly increased but with a further increase of calcium carbonate (from 27 to 35%) the amount of nitrogen losses increased a lot and this increase was higher than the initial increase. The presence of calcium carbonate in the soil increase soil pH and ammonia volatilization. In second experiment the highest amount of nitrogen volatilization rate, as ammonia (32.28 µgr N/gr soil) was measured from 400kgN/ha soil for urea- acid sulfuric fertilizer and 5 percent of plant residues. Also the lowest amount (0.33 µgrN/gr soil) was obtained from soil without application of any nitrogen fertilizer and plant residues. The most of nitrogen losses in the form of ammonia in the amount of 15.34 micrograms per gram of soil was obtained from level of 5% of alfalfa residue. With the 2.5 percent increase in the alfalfa residue rate, ammonia volatilization from soil increased in rate of 3.24 micrograms per gram of soil and by increasing it from 2.5 to 5%, nitrogen volatilization increased in the amount of 8.88 micrograms per gram of soil.

**Conclusion:** The loss of nitrogen as ammonia with application of nitrogen fertilizers and without application of residues was as urea > ammonium sulfate > ammonium nitrate > urea-sulfuric acid and with application of crop residues was as urea-sulfuric acid < ammonium nitrate < urea < ammonium sulfate. It is recommended that in calcareous soils for the supply of nitrogen, urea-sulfuric acid and in the next place ammonium nitrate fertilizer to be used.

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