***Research Article***

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# Effects of ammonium thiosulfate and guanyl thiourea as calcium ammonium nitrate inhibitors on fertilization and plants

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ABSTRACT

The nitrate inhibition effects and decomposition of ammonium thiosulfate and guanyl thiourea, which are nitrification inhibitors, are discussed. When ammonium thiosulfate and guanyl thiourea are used as nitrification inhibitors, leaching of ammonium nitrate from calcium ammonium nitrate in soil is reduced, while the yields and nitrogen intake of the plant are increased. When ammonium thiosulfate and guanyl thiourea are used, labor costs are reduced without any loss of product yield or quality. The use of ammonium nitrate products containing ammonium thiosulfate and guanyl thiourea reduces the nitrogen requirement for maximum efficiency.

## 1. Introduction

In a past study, sodium sulfate ($Na_2SO_4$) was used as an inhibitor and its effect on nitrogen release was evaluated in order to decrease the release of ammonium nitrate (AN) in the presence of an inhibitor, and therefore, reduce the amount of fertilization in agricultural areas. The effect of $Na_2SO_4$ was lost at the end of the first three months when the nitrogen release was accelerated in the first month of application, but $Na_2SO_4$ subsequently decomposed from the AN fertilizer [1].

In order to better utilize the fertilizer nitrogen, other inhibitors were investigated for agricultural application, such as *N*-(n-butyl)thiophosphorictriamide (NBPT), dicyandiamide (DCD), DCD + NBPT, and a maleic and iconic acid polymer (MIP). In this case, the loss of ammonia concentration was up to 85% [2]. Another study to minimize nitrogen loss attempted the addition of dicyanamide (DCD) and NBPT as a nitrification inhibitor to calcium ammonium nitrate fertilizer. Nitrogen loss in the form of ammonia volatilization was different in each case, and the effect of DCD on $N_2O$ emission was small [3].

The effect of nitrification inhibitors on emission release has been examined in various ways, and different inhibitors have been reported to cause 3% ammonia-induced nitrogen loss [4]. In another inhibitor trial, the effect of DCD and 3,4-dimethylpyrazole phosphate (DMPP) on calcium ammonium nitrate fertilizer was studied. The inhibitory effect on nitrogen loss was found to be 42.3 ± 2.2% for DCD and 40.2% for DMPP at the baseline [5]. In another inhibitor assay, a green algae species, Chlorella sp., was studied, and it was found that urea fertilizers maintain their initial nitrogen concentrations up to 6 months [6]. The mechanism underlying the inhibitor action is related to the numerous chemical reactions that occur when using inhibitors as additives for chemical fertilizers. One of these mechanisms involves the accumulation of excess oxalate as a result of such chemical reactions. Various studies have been conducted to prevent the accumulation of oxalate, as it influences coke development [7]. In another study, NBPT was investigated especially for ammonia volatilization and nitrate leakage inhibition from urea fertilizers. In this