COTTON PHYSIOLOGICAL RESPONSES TO APPLICATION OF UREA WITH NBPT AND DCD UNDER NORMAL AND HIGH TEMPERATURE CONDITIONS

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Abstract

Nitrogen fertilization is one the most expensive agricultural practices and crops are known to recover only 30-35% of the N fertilizer applied. Recently, attention has focused on studies to measure and maximize plant N use efficiency. A practice commonly recommended to improve N fertilizer use efficiency is the incorporation of urease and/or nitrification inhibitors into N fertilizers. N-(n-butyl) thiophosphoric triamide (NBPT) is a urease inhibitor that delays hydrolysis of urea fertilizer and thereby diminishes ammonia volatilization losses. Dicyandiamide (DCD) is a nitrification inhibitor that hinders the conversion of ammonium to nitrate lowering N loss by leaching. The objective of this growth chamber study was to evaluate the effect of using NBPT and DCD in urea fertilization on the physiology and growth of cotton (*Gossypium hirsutum* L.) under normal and high temperatures. Treatments consisted of two day temperature regimes, 30^{o}C and 38^{o}C and five nitrogen fertilization applications: (T1) unfertilized control, (T2) 125 kg/ha of urea, (T3) 93 kg/ha of urea, (T4) 93 kg/ha urea with NBPT, and (T5) 93 kg/ha urea with NBPT and DCD. Nitrogen fertilization was split-applied with half incorporated pre-plant, and remaining half side-dressed at the pinhead stage. Measurements were made of protein concentration, dry matter production, N uptake, and N fertilizer use efficiency. There was no two way interaction effect between temperature regime and N treatment, indicating that the N applications methods were not influenced by temperature conditions. As expected, in comparison with N fertilized treatments, the unfertilized control treatment exhibited inferior performance in all parameters recorded. Overall, the best N treatments was the application of 125 kg/ha of urea followed by the treatment of 93 kg/ha urea with NBPT and DCD. On the other hand, addition of NBPT (T4) had significantly higher dry matter production compared with application of urea alone at the same N rate (T3). Furthermore, NBPT addition to urea significantly increased N fertilizer use efficiency of cotton plants. No differences were observed between T4 and T5, indicating that addition of DCD was not effective in this experiment. Additional research is planned to address the potential use of NBPT and DCD to increase cotton N use efficiency for improved fiber yields.