Influence of nitrogen sources and timing on fertilizer uptake efficiency of irrigated cotton (*Gossypium hirsutum* L.) in Central Asia

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Nitrogen (N) is considered one of the most limiting nutrients in cotton (*Gossypium hirsutum* L.) production in Central Asia (CA). In the irrigated regions of Uzbekistan, the efficiency of N-fertilizer use is particularly important as poor N-management leads to losses to the environment via denitrification or leaching, directly causing a decrease in farmers' yield and income. So far, N-deficiencies are met by applying the most affordable N-fertilizers available. Therefore, this study examined the N-fertilizer efficiency under current cotton production practices to optimize its use while minimizing environmental impacts. Cotton was planted in micro-plots on a medium loamy gleyic Arenosol in 2005. A single rate of 120 kg N ha^{-1} was applied. Four fertilizer regimes varying in N-source (DAP+Urea, Urea-only, DAP+NH_4NO_3) and three split-application times, (before seeding; at 2-4 leaves or budding; flowering) were analyzed. ^{15}N-labeled fertilizer was used to quantify N uptake in plant fractions and 0-60cm soil layers. Across all plots, total recovery of ^{15}N-fertilizer in the soil averaged 58% (±9.7%), and in the above ground biomass 35% (±3.6%). Irrespective of timing and N-source, highest fertilizer ^{15}N in the soil was recovered from the top 0.1m layer. Of the plant fractions examined, cotton seeds and leaves always reflected the fertilizer N applied. Soil and plant ^{15}N recovery was significantly affected by N-timing, N-source and its combinations. Highest soil ^{15}N was recovered from the Urea-only regime at any time during the growing season, proving it to be the most immobile N-fertilizer under irrigated conditions. The DAP+NH_4NO_3 plots showed significantly ($p<0.05$) lower ^{15}N content at budding and flowering than the Urea-only plots, indicating N-losses via leaching or denitrification. It is therefore argued that in future mainly urea-N be applied in irrigated cotton production in CA instead of NO_3–containing fertilizers thus reducing environmental pollution and farmers' costs.

Abbreviations: DAP- diammonium phosphate; NH_4NO_3 – ammonium nitrate

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