Title: he effect of timing and placement method of N fertilizer on soil profile NO3-N and NH+4-N fluctuations and distribution in a leached chernozem under spring wheat (Triticum aestivum, Cv. Spectrum)
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Abstract

Field experiments were carried out to determine the effect of timing and N fertilizer placement methods on NO3-N and NH4-N fluctuations and distribution in a leached chernozem under spring wheat (Triticum aestivum, Cv. Spectrum) in 1987 and 1988 summer seasons in Eastern Europe. Spring wheat was grown under rainfed conditions with the following treatments. Control N0P0K0 No fertilizer applied (T1); N90P90K60 applied as incorporated basal fertilizers before planting (T2); N45P90K60 applied as incorporated basal fertilizers before planting and N45 applied at tillering stage by broadcasting method (T3); N45P90K60 applied as incorporated basal fertilizers before planting, N15 at tillering, N15 at stem elongation and N15 at heading stages by broadcast method (T4); N45P90K60 applied as incorporated basal fertilizers before planting, N15 at tillering, N15 at stem elongation and N15 at heading stages by foliar application method (T5) and N45P90K60 applied as incorporated basal fertilizers before planting, N15 at tillering, N15 at stem elongation and N15 at heading stages banded as a solution in the root system zone of both sides of plant rows (T6). Data showed that there was a distinct pattern of nitrate movement down the soil profile as the nitrate bulge became more pronounced with depth across all phenological stages of wheat plants in both years of the study. During the first and second seasons of study soil profile NO3-N content steadily decreased from tillering to anthesis before rapidly increasing just after anthesis to mature stages. Single basal N fertilizer applications before planting (T2) and single split application of N45 at tillering stage by broadcasting (T3) had the most significant decline in nitrate content (0.13 mg/100 g soil) between tillering and anthesis. Comparatively small decreases in nitrate content between the two growth stages were recorded in T5 and T6 (0.07 mg/100 g soil). The decline in nitrate content from tillering to anthesis coincided with peak uptake of N from the soil by wheat plants. Highest and lowest decreases in soil nitrate indicated the lowest and highest NUE associated with the treatments respectively. Wheat plants normally cease uptake of N from the soil by the boot stage even at higher N application rates. N fertilizer placements by broadcasting have been reported to be least efficient in recent reviews on N fertility management. This study, however, recorded the most significant maintenance of elevated amounts of NO3-N in the soil profile even at peak N uptake by wheat plants in plots where triple split applications of N were undertaken by broadcasting (T4). Triple split applications of N fertilizer by broadcasting method maintain comparatively higher amounts of NO3-N in the soil profile than single split N applications by broadcasting (T3). Foliar triple split applications (T5) and triple split applications of N by banding in solution form (T6) had similar effects on the distributions and fluctuations of NO3-N and NH4-N in the soil profile. Soil profile NH4-N accumulations were highest at tillering (3.97 mg/100 g soil) before rapidly thinning out to 0.12 mg/100 g soil in the plough layer in plots where all N was applied as incorporated basal fertilizer before planting in the second season of the study. Single split applications of N45 at tillering stage had significant bulge of NH4-N in both the plough (0.40 mg/100 g soil) and upper subsoil (0.31 mg/100 g soil) compared with triple split applications in rates of N15 in the first season of the study.