Title: The effect of N fertilizer placement and timing on aboveground biomass accumulation and distribution in spring wheat (Triticum aestivum, Cv. Spectrum) on leached chernozem.

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Abstract

The objective of the two-year study was to determine the effect of N fertilizer placement and timing on wheat plant biomass accumulation and distribution in the vegetative and reproductive plant parts of spring wheat (Triticum aestivum L. Cv. Spectrum). Spring wheat was grown under rainfed conditions with four treatments. Results show that there was a significant bulge of aboveground plant biomass in plots fertilized with N across all phenological stages of spring wheat in both years of the study. Results indicate that the raw and dry plant biomass sampled from 0.25 m2 area of each plot at tillering stage was 25.5-90.3 and 6.2-11.3 g higher, respectively for the first season compared with the second season of the study. Single basal application of N fertilizer (N90P90K60) before planting (T2) had comparatively higher aboveground plant biomass at tillering stage in comparison with other treatments in the first year of study. Combined results for both years of the study clearly show that at early stages of growth and development of wheat plants, single basal applications of N fertilizer (N90P90K60) before planting (T2) significantly amplify biomass accumulations (109.7 g raw mass, 19.8 g dry mass) compared with split applications. This is attributed to the relatively rapid root biomass increase by a temporarily elevated availability of N in this treatment, which triggered a bulge in the aboveground biomass (trigger effect). It would appear therefore that N fertilizer applied before planting has a very significant influence on the subsequent plant biomass growth of the wheat crop. In second year of the study treatments effect did not have a distinct pattern at tillering stage. Results show that raw and dry biomass across all treatments increased by about 71-85% (335.1-576.2 g) and 76.9-91.7% (76.1-155.4 g) respectively at heading phenological stage. However, the largest raw and dry substance accumulations were observed in T3 (677.5 g raw mass, 122.5 g dry mass) and T4 (681.5 g and 175.3 g) raw and dry mass respectively, in the first season of study. This pattern was maintained in all the subsequent phenological stages. Research results elsewhere reported enhanced translocation of plant biomass materials from both leaves and stems. However, this study observed a clear pattern of translocation of biomass materials from aging leaves and not stems. In fact, the study distinctively reported net plant biomass increase in stems (28.0-78.2 g raw, 2.2-22 g dry) in the post anthesis period. In the first and second years of study, peak plant biomass bulge in the reproductive organs for grain formation and its maximum depletion (by translocation to spikes for grain formation) in leaves were observed at milky ripe stage. Biomass accumulations of 130.2-232.5 g (raw mass) and 84.8-102.6 g (dry mass) in wheat spikes and biomass depletions of 30.4-83.7 g (raw mass) and 0.3-22.9 g (dry mass) in leaves were recorded in the study at milky ripe stage in the first season and 228.3-292.4 g (raw mass) and 102.4-128.2 g (dry mass) in the second season.