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EFFECT OF LIMITING NITROGEN AT VARIOUS GROWTH STAGES ON GRAIN YIELD AND YIELD COMPONENTS OF SPRING WHEAT (*TRITICUM AESTIVUM* L.)

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ABSTRACT

The effect of timing of N supply on grain yield and yield components of wheat has been a subject of interest to agronomists. In previous reports, effect of N deficiency on grain yield and its component were studied by deferring N supply until certain growth stage but this study was designed to grow plants in optimum N (12 mM) supply and then limited N supply at specific growth stages and examined the effect of N deficiency on grain yield and yield components of wheat. In this growth chamber study, 20° C day/night constant temperature was maintained with photoperiod 14 h and at 400 micromol m^{-2} s^{-1} PPFD. The limited N (2 mM) supply was established at Zadok's growth stage 21, 31, 37 and 49. Limiting N supply at GS 21 reduced grain yield/plant by 79%; straw yield and tillers/plant both were reduced by 70% relative to control. Limiting N supply at GS 31 reduced grain yield/plant by 56% and produced about 41% less tillers and straw yield relative to control. The spikelets initiated/culm and fertile spikelets/culm were unaffected by limited N supply at these growth stages but N deficiency impaired the floret fertility of tillers and significantly reduced grains/fertile spikelet of tillers which resulted less number of grains/culm for tillers. As conclusion, N deficiency affected the grain yield components of spring wheat in the following succession; tillers/plant > number of grains/ear > mean grain weight. Nitrogen deficiency during GS 21 was the most detrimental for tiller Production and tiller survival.

Index words: Nitrogen stress, growth stages, spring wheat, tiller survival, grain yield and yield components.

INTRODUCTION

The excessive use of nitrogenous fertilizers is generally assumed to be a major cause of nitrate pollution and limiting nitrogenous fertilizer use is an over simplistic solution to the problem partitioning of N to grain (Locke, 1991; Zebarth and Sheard, 1992). These reports suggest that multiple N applications are unlikely to be of any economic use. Moreover, in previous reports N was deferred until double ridge stage (Parameswaran, et al. 1981); GS 21,GS 30, GS 32, GS 39,and GS 47 (Darwinkel, 1983) and then application of N fertilizer was made and examined the effects of N supply on grain yield and yield components of wheat and reported that N application at early stages increased gain yield through enhanced tiller production and tiller survival. This study was designed to grow wheat plants in optimum N supply and then to curtail N at easily recognizable specific growth stages which mimics the natural conditions in an arid environment. The specific objective of this study were:

- to identify an easily recognizable growth stage after N application may not be economical, and
- to identify the component of grain yield of wheat affected most by N deficiency.

MATERIALS AND METHODS

A system designed by Snow and Tingey (1985) to apply controlled levels of water stress and adapted by Ashraf, et al. (1994) to control both N and water supply was used to conduct this experiment. Three caryopsis of hard red spring wheat (cv. Yecora Rojo) were planted in each plant sleeve, using pure sand as potting medium. After germination, plants were thinned to one plant/sleeve. The plant sleeves were placed in growth chamber in a fully random design replicated three times at 20° C day/night temperature. The photoperiod was 14 h with 400 micromol m^{-2} s^{-1} PPFD. The experiment was conducted in growth