INTRODUCTION

The importance of leaf growth in wheat (Triticum aestivum L.) and its effect on grain yield has long been understood (Friend et al., 1986). Phytocron interval (PI) is defined as the developmental time it takes for elongation of successive mainstem leaves. Since leaf appearance rate is more strongly correlated with thermal units than it is with chronological time (Gallagher, 1978), PI is measured as the number of growing degree days (GDD) required to complete a mainstem leaf stage (Krenzer & Nipp, 1991). Therefore, the smaller the PI, the faster the leaves are appearing on the mainstem.

Several different environmental and management factors have been shown to influence the PI in wheat, including temperature (Boone et al., 1990), water stress (Baker et al., 1986), and nitrogen availability (Longnecker et al., 1993). However, little is known about the impact of common management practices such as planting date, seeding rate, and starter fertilizer on PI. Since PI is a good indicator of growth environment, understanding the impact of these management practices on PI could help determine the potential these practices have for improving yield in different environments.

OBJECTIVES

1. To examine the effect of starter fertilizer on mainstem leaf growth, phytocron interval, and grain yield.
2. To examine the effect of planting date on mainstem leaf growth, phytocron interval, and grain yield.

RESULTS

Research was conducted during the 2012-13 growing season at a location near Hertford, NC. The experimental design was a split plot design with main plots consisting of two planting dates, and subplots consisting of three starter fertilizers applied to planting. Individual plots were 24.4 m long and 1.98 m wide. The cultivar ‘Dyna-Gro Shirley’ was planted on 16.9 cm rows in a conventional tilled field on 12 Nov and 4 Dec. Three starter fertilizer solutions were applied along with a no-starter check. The starter treatments consisted of 33.6 kg ha⁻¹ of 9-18-9, 233.75 L ha⁻¹ of 11-37-0, and 280.5 L ha⁻¹ of 9-18-9. Rates were selected to achieve the same total amount of N in each treatment. Nitrogen was applied to the check plot and to the starter treatment plots on 22 Mar with rates adjusted so that all plots received a total of 54.4 kg ha⁻¹. Tiller counts were taken on 10 Jan from a 3 m section of row at one location within each plot. Plots were harvested on 15 Jun using a Wintersteiger Delta combine equipped with a Harvestmaster Grain Gage that recorded moisture, grain weight, and test weight.

Five plants were randomly chosen from each plot. Main stem leaves were marked and recorded according to the procedures described by Haun (1973). A leaf’s Haun age is determined by the number of fully expanded leaves plus the ratio of the laminar length of the last visible growing leaf to that of the proceeding leaf. For the November planting, leaves were marked and recorded on 12 Dec, 21 Jan, 6 Feb, 5 Mar, 20 Mar, 3 Apr, and 17 Apr and for the December planting leaf data were taken on 10 Jan, 6 Feb, 5 Mar, 20 Mar, and 10 Apr. The number of Haun scale growth units across the leaf count recording dates was regressed against the number of growing degree days (GDD) accumulated since planting. Phytocron interval was calculated as the reciprocal of this slope (Baker et al., 1986). Tiller counts, grain yield, and PI were analyzed across starter fertilizer treatments and planting dates using the Proc Mixed and Proc GLM procedures in SAS (SAS Institute, 2010). When differences were detected, Fisher’s Protected LSD was used to separate means.

CONCLUSIONS

- Planting date was the key element in this study, with the 4 Dec planting date having a faster rate of leaf appearance, more fillers, and greater yield than the 12 Nov planting date.
- Starter fertilizer had less of an impact on PI, tiller density, and yield than planting date; however, the application of 9-18-9 at the later planting date resulted in the highest yield.
- The length of the phytocron interval is an integral factor in determining grain yield. There was a strong negative correlation between PI and yield. r² = -0.897, p = 0.0025.
- Maximizing the rate of leaf appearance and shortening the phytocron interval is paramount to achieving high yields.

REFERENCES


