RESPONSE OF SEMIDWARF HARD WINTER WHEATS TO SEVERAL ENVIRONMENTS IN KANSAS

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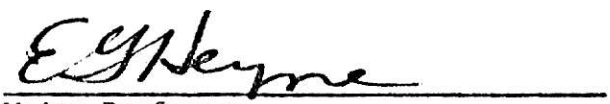

Major Professor

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INTRODUCTION

The introduction of Norin wheats (Triticum aestivum L. em. Thell.) from Japan and Seu Seun from Korea provided basic germplasm for breeding semidwarf wheats in the United States. The term "semidwarf" is used in the present study to describe short statured, agronomically useful wheat selections. Outstanding performance of cultivars such as the winter wheat 'Gaines' and Mexican spring wheats 'Pitic 62' and 'Siete Cerros' have given semidwarfs a reputation for high yield, disease resistance, and lodging resistance. About ten percent of world wheat plantings involve Mexican semidwarf spring wheats (CIMMYT Review, 1975).

In the United States many semidwarf wheat cultivars have been produced and evaluated (Heyne and Campbell, 1971; Johnson, Schmidt, and Mekasha, 1966; McNeal et al., 1960; Porter et al., 1964; Vogel et al., 1956, 1963). Briggle and Vogel (1968) extensively reviewed characteristics of semidwarf wheats and reported that most semidwarf wheats now grown in the United States have greater yield potential in their area of adaptation than standard commercial cultivars. Part of this yield advantage is inherent, part is due to performance under higher fertility levels and resistance to lodging.

Research on semidwarf wheats began in Kansas in 1949 using 'Norin 10', PI 156641, and 'Norin 66', PI 155276 (Heyne and Campbell, 1971). Later, other sources of short germplasm were crossed with adapted cultivars. Under Kansas conditions Reddi, Heyne, and Liang (1969) and Mallott (1970) found one-gene semidwarfs and especially two-gene semidwarfs had larger number of kernels and lower test weight than standard height segregates from crosses

of Norin 10 backcrossed to 'Kaw' and 'Pawnee' three to five times. These segregates tended to lodge by straw breakage at the top node at or just before combine-ripe. Thus breeding for semidwarf wheats in this backcross program under Kansas climatic conditions was not promising. Semidwarf lines isolated from direct crosses involving CIMMYT semidwarfs gave more promise. These semidwarf lines have performed well since 1971 and have been encouraging in that acceptable kernel type and standability have been combined with good yields (Heyne, 1974).

The continental climate of Kansas fluctuates greatly from year to year and within seasons. Wheat production is highly variable with highly variable environmental conditions. In Kansas the success of a new cultivar is as dependent on its capacity for performing well over a range of environments as on its yield potential. Therefore, the goal of the wheat breeding program is to develop cultivars that produce stable high yields in a wide range of environments. One of the objectives of this study was to determine if these newly developed semidwarf lines were more responsive to nitrogen application than the older and taller standard cultivars. Another objective was to determine if any of the components of yield were associated with grain yield.