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Project Title: Improvement of Soft Winter Wheat for Fusarium Head Blight Resistance.

PROJECT 2 ABSTRACT

(1 Page Limit)

The overall goal of this research effort is to alleviate as soon as possible, wheat production and grain quality losses caused by Fusarium head blight (FHB). The objectives are: 1) develop soft winter wheat cultivars that have low-FHB incidence and type I and/or type II resistance, resistance to other important diseases, and adapted in Indiana, 2) phenotype and genotype lines with specific combinations of FHB resistance QTLs, and verify resistance in greenhouse and field tests, and 3) determine DON in wheat lines with different types and levels of FHB resistance.

To enhance our ability to select for consistently low FHB severity most seasons in the field we seed nurseries in disced corn residue and at several locations throughout Indiana, and we provide misted conditions to a portion of our head row nurseries, including entries in various regional nurseries and our yield nurseries, to enhance disease development. We also point inoculate in field and greenhouse nurseries to ensure disease development for selection. We conduct two consecutive-generation cycles of crossing in the greenhouse each year, and we grow F₁ populations in late summer-early fall in the greenhouse so that we can seed F₂ nurseries in late October at Evansville, IN--gaining one generation each year, accelerating the inbreeding of populations for selection and cycling them as parent lines.

We are combining FHB resistance QTL from a number of donor parent lines, phenotyping for resistance and genotyping with DNA markers associated with specific resistance QTL, increasing the effectiveness of resistance compared to partially resistant parent lines with one or another resistance QTL (Table 1). Recently released cultivars, INW0411 and INW0412, perform competitively with other cultivars, even when FHB is negligible (Tables 2 and 3), and essentially all basic seed of these cultivars produced by Ag Alumni Seed in 2006 is sold. Line 99840, and line 011007, which also has yellow dwarf virus resistance (Table 2), are being increased for release. Eight of 10 Purdue lines in the 2005 NUWWSN and PNUWWSN had low FHB index (Tables 5 and 6 of 2005 report). We are developing closely related wheat lines, both by backcrossing into backgrounds that have specific resistance QTL, and resistant backgrounds having as yet unmapped resistance, like Truman. By identifying closely related progeny that contrast for specific resistance QTL and segregates that are susceptible, we will determine augmentation between specific resistance QTL, and types of FHB resistance. We participate in various regional performance and FHB regional nurseries to provide data on advanced and released winter wheat lines from breeding programs in the region, so that information on FHB resistance of cultivars is available to wheat producers. We are determining DON content on 'non-tombstone' kernels of lines with different combinations of resistance QTLs, at maturity and at delayed harvest at Lafayette, and Evansville to determine possible effects of environmental conditions on DON content, and to identify possible causes of inconsistencies in DON determinations.