Resistance gene pyramiding for Fusarium head blight (FHB) in wheat by backcrossing.

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A project pyramiding resistance genes for FHB on new wheat lines was initiated in July 2011 at Embrapa Trigo, using a backcrossing method. The objective was evaluate plants from the first generation of backcrossing (BC_1) that came from crossing germ plasm resistant vs. susceptible to FHB. This research was done at Embrapa Trigo, Passo Fundo, RS, Brazil. The recurrent parent was the commercial cultivar BRS Guabiju. The donor parental was the cultivar Sumai 3. Crosses between the recurrent and donor parents were made during the winter, 2011. The F_1 offspring was backcrossed with the recurrent parent in the summer of 2011, producing the first backcross generation (BC_1). Plants from the BC_1 were evaluated for reaction to FHB. Seeds of BC_1 were sown in plastic plots in the green-house. At the flowering time (Feekes and Large scale 10.5.1), a spore suspension of the *Gibberella zeae* isolate 6047 was sprayed over the spikes at a concentration of 100.000 spores/mL applied at 25°C ± 2°C and 80% humidity. Ten days after the inoculation. the plants were evaluated for incidence and severity of FHB. The methodology applied for this research was efficient fpr screening the BC_1 population for FHB resistance level. The genotypes were separated into six classes of FHB severity, from 0 to 100% (Fig. 2). We evaluated 165 spikes, of which 92 showed no FHB symptoms. Hence, the frequency of spikes resistant to FHB (0% of severity) in the BC_1 generation was 56%. The cross 'BRS Guabiju/Sumai 3' is a good source of genetic variability for resistance to FHB.

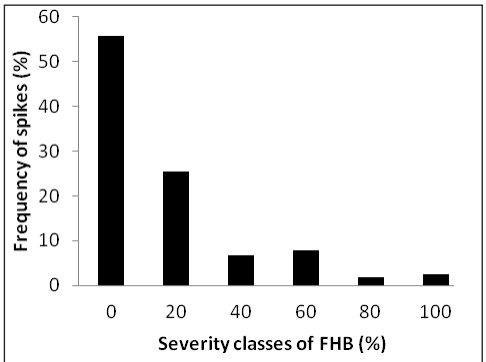

Fig. 2. Frequency of severity of Fusarium head blight in wheat spikes in a backcross (BC_1) population inoculated under greenhouse conditions (Passo Fundo, Brazil, 2012).

Response of wheat cultivars to inoculant use in southern Brazil.

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Inoculation of wheat seeds with *Azospirillum brasiliense* bacteria has resulted in an increase in wheat grain yield in southern Brazil. However, the effect of inoculation with this facultative endophytic bacterium, capable of fixing nitrogen from the atmosphere and providing part of the associated N required by the plant, has been dependent on the wheat cultivar. To identify the cultivars most responsive to the association with *A. brasiliense*, 32 wheat cultivars of southern Brazil were evaluated with and without seed inoculation. The experiment was carried out at Embrapa Wheat (lat 28°15'S, long 52°24'W, alt 684 masl), in Passo Fundo, state of the Rio Grande do Sul, Brazil, in a randomized block design with three replications. Each plot consisted of three 3-m rows with 0.17 m spacing between rows (1.8 m^2). The variables studied were aerial part dry mass, grain yield, harvest index, plant height, and number of spikes per area. Data were subjected to analysis of variance and the treatments with and without inoculation were compared by the t test ($P < 0.05$) for each wheat cultivar. Inoculation of wheat seeds with *A. brasiliense* bacteria resulted in an increase of grain yield in wheat cultivars Turquesa (+1,535 kg/ha or +43%), TBIO Itaipu (+971 kg/ha or +35%), CD 123 (+800 kg/ha or +40%), TBIO Alvorada (+775 kg/ha or +24%), CD 1550 (+675 kg/ha or +22%), BRS 331 (+607 kg/ha or +22%), BRS 374 (+570 kg/ha or +16%), Fundacep Raízes (+544 kg/ha or +20%), TBIO Seleto (+458 kg/ha or +14%), TEC Frontale (+367 kg/ha or +10%), Marfim (+361 kg/ha or +12%), Ametista (+356 kg/ha or +12%), CD 114 (+296 kg/ha or +10%), JF 90 (+272 kg/ha or +9%), TBIO Mestre (+267 kg/ha or +7%), TBIO Pioneiro (+172 kg/ha or +4%), and CD 122 (+84 kg/ha or +3%). Only for cultivars CD 123 and TBIO Alvorada was the difference in grain yield mean with and without inoculation statistically significant by the t test ($P < 0.05$). The most responsive cultivars to inoculation with *A. brasiliense* will be used in wheat breeding programs in southern Brazil.