Relative Performance of Four Midge-Resistant Wheat Varietal Blends in Western Canada

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Abstract

Orange wheat blossom midge, *Sitodiplosis mosellana* (Géhin), causes significant yield losses to spring wheat in western Canada in severe infestations. To mitigate losses, midge-resistant wheat varietal blends, consisting of cultivars carrying the *Sm1* midge resistance gene and 10% interspersed midge susceptible refuge, have been made available to farmers. To test their performance relative to conventional midge-susceptible cultivars, four varietal blends were grown during four consecutive years, at eight locations in the provinces of Manitoba Saskatchewan and Alberta, in comparison to four conventional, midge-susceptible cultivars. Midge damage was higher in 2007 and 2010 than in 2008 and 2009. In general, the varietal blends, as a group, yielded more grain than the susceptible cultivars, especially when grown in environments with high midge pressure (5.5 - 35% seed damage). In environments with low midge pressure (0 – 2.6% seed damage), the varietal blend average yield advantage was smaller but still significant, indicating that some of the varietal blends had additional superior attributes, in addition to midge resistance.

Material and Methods

Four midge-resistant varietal blends (Fieldstar VB, Goodeve VB, Shaw VB and Unity VB) and four conventional midge-susceptible cultivars (AC Intrepid, CDC Teal, Katepwa and Waskada) were grown during four growing seasons (2007-2010), at eight locations in the provinces of Manitoba (Brandon), Saskatchewan (Indian Head, Melfort, Regina, Saskatoon and Swift Current) and Alberta (Lacombe and Lethbridge). Experimental design was a randomized complete block design, with 4 replications. Environments (year-locations) were categorized into three midge pressure groups.

Results and Discussion

Seed yield was lower (3425 kg ha^{-1}) in environments with high midge pressure (5.5 - 35% seed damage) than in environments (4822 kg ha^{-1}) with low midge pressure (0 – 2.6% seed damage). Midge-resistant wheat varietal blends did not completely escape the effect of the orange wheat blossom midge insect, but seed damage on resistant blends was much lower (3.7 %) than that experienced by midge-susceptible cultivars (8.5%).

In general, the varietal blends, as a group, yielded more grain than the susceptible cultivars, especially when grown in environments with high midge pressure, but in environments with low midge pressure the comparative yield advantage of the varietal blends was smaller but still significant (Fig. 1).

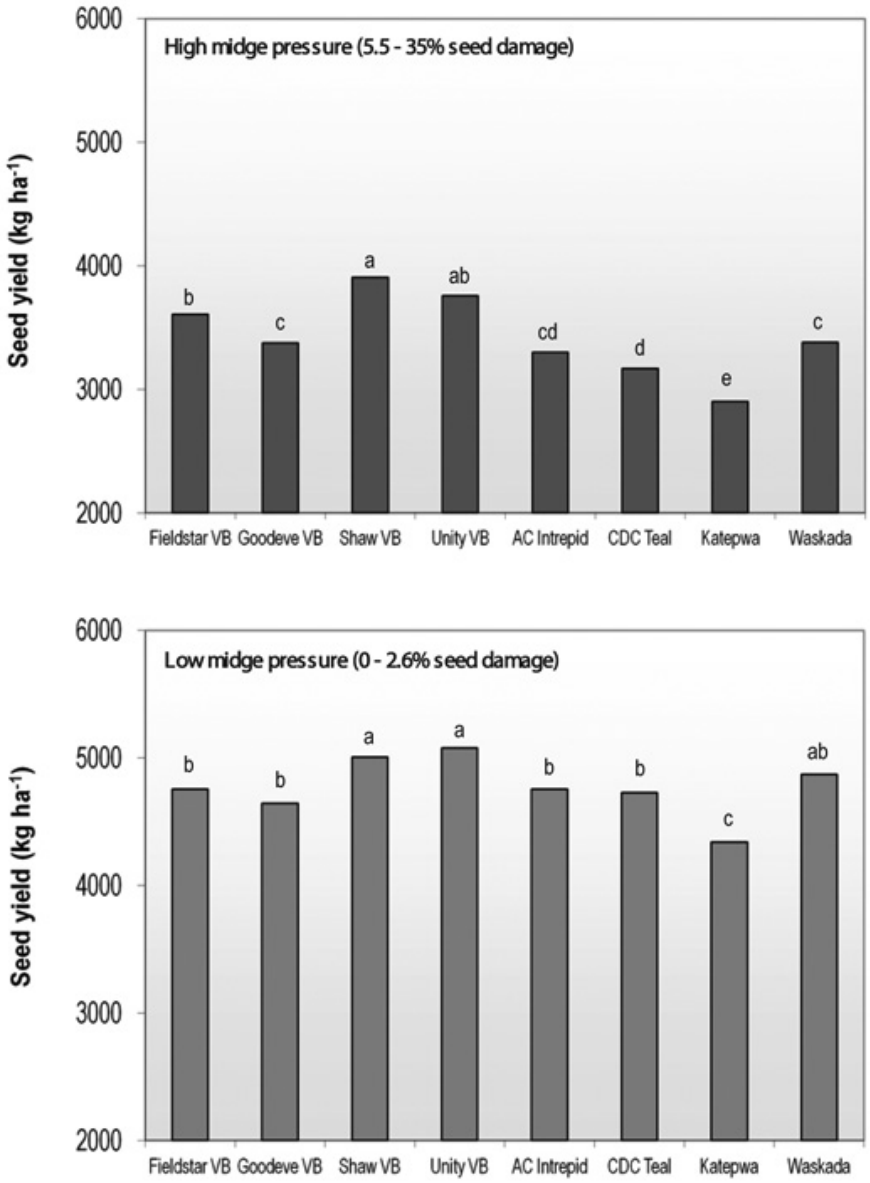

Figure 1. Seed yield for four midge-resistant wheat varietal blends (Fieldstar VB, Goodeve VB, Shaw VB and Unity VB) and four midge-susceptible wheat cultivars (AC Intrepid, CDC Teal, Katepwa and Waskada) , grown at eight locations in the three prairie provinces of Canada during the period 2007-2010, at two levels of midge pressure. Columns with same letters do not differ significantly, based on t-test at $P \leq 0.05$.

Conclusions

The wheat midge-resistant varietal blends used in this study were affected to a lesser degree by the midge insect than the midge–susceptible cultivars with which they were compared, and, as a group, they significantly out-yielded (15%) the midge-susceptible cultivars, even in environments with low midge pressure (4%), an indication that most of these new cultivars may have additional attributes, beside their resistance to midge.

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