Multi-Year Small Plot Trials: Soybean Disease Control and Yield Enhancement

Background

The Atlantic Grains Council (AGC) has been jointly funding the Agri Science Project Initiative of Growing Forward 2, "Focused Research for Atlantic Grains and Oilseeds Producers", with Agriculture and Agri-Food Canada (AAFC) and Atlantic provinces. In 2016, the third year of four years of small plot field studies was conducted to evaluate the agronomic effects of foliar and seed fungicide treatments on soybean at the Charlottetown Research and Development Centre, AAFC in PEI (Fig.1). Dr. Adam Foster, a research scientist and plant pathologist from AAFC, currently coordinates this work at the Harrington Research Farm.

Fig 1. Small plot soybean trial at the Harrington Research Farm 2016.

Trials

Three trials were conducted from 2014-2016 that examined the effect on yield, disease and agronomic factors of:

1. Foliar fungicide effect on yield
2. Fungicide seed treatment effect on yield
3. Cultivar specific response to yield after fungicide seed treatments

Foliar fungicide effect on yield

A range of foliar fungicides that are commercially available in Atlantic Canada were tested in this trial on a pair of popular commercially available cultivars. At the Harrington Research Farm experimental site disease pressure was low for all 3 years of the study and no statistically significant treatment effects were observed (Fig.2).

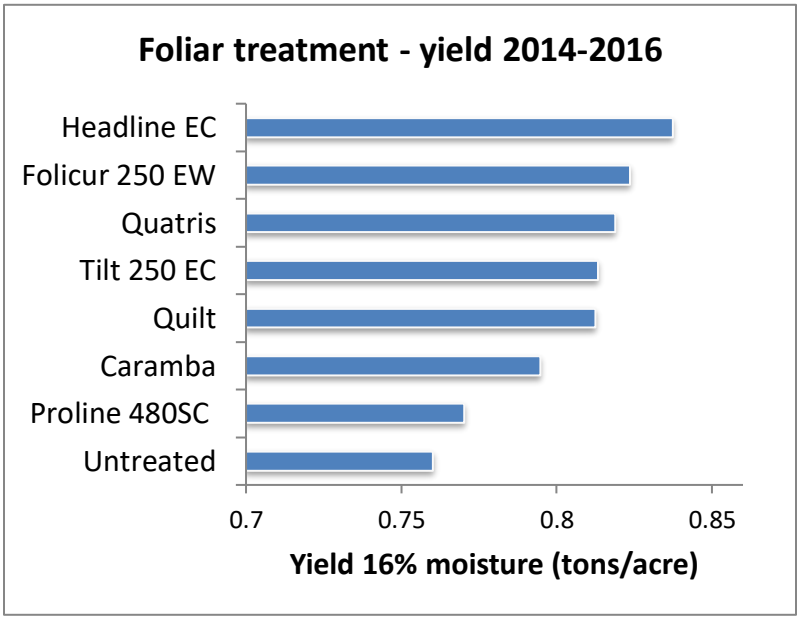

Fig 2. Effect of foliar fungicide on soybean yield in small plot trials. Bars show the mean yield response combined for 2 cultivars for all years 2014-2016. No significant differences in yield were observed between treatments. Treatments: Quatris (azoxystrobin 250 g/L) 500 ml product/ha; Quilt (azoxystrobin 75 g/l, propiconazole 125 g/L) 1000 ml product/ha; Tilt 250 EC (propiconazole 250 g/L) 500 ml product/ha; Folicur 250 EW; Caramba (metconazole 90 g/L) 700 ml product/ha; Headline EC (pyraclostrobin 250 g/L) 600 ml product/ha; Proline 480SC (prothioconazole 480 g/L) 210 ml product /ha.

Fungicide seed treatment effect on yield

Different commercially available fungicide seed treatments were tested. Despite having little visual disease symptoms, the roots, stem leaves and pods on soybean plants of some seed treatments caused a statistically significant difference in yield when compared with plants grown from untreated seed (Fig. 3). Seed treated with either Cruiser Maxx Beans (1.95ml/kg seed) or a combination of Dynasty 100FS (0.2ml/kg seed) and Cruiser Maxx Beans resulted in the highest yields, where the combination treatment resulted in a 20% increase in yield.

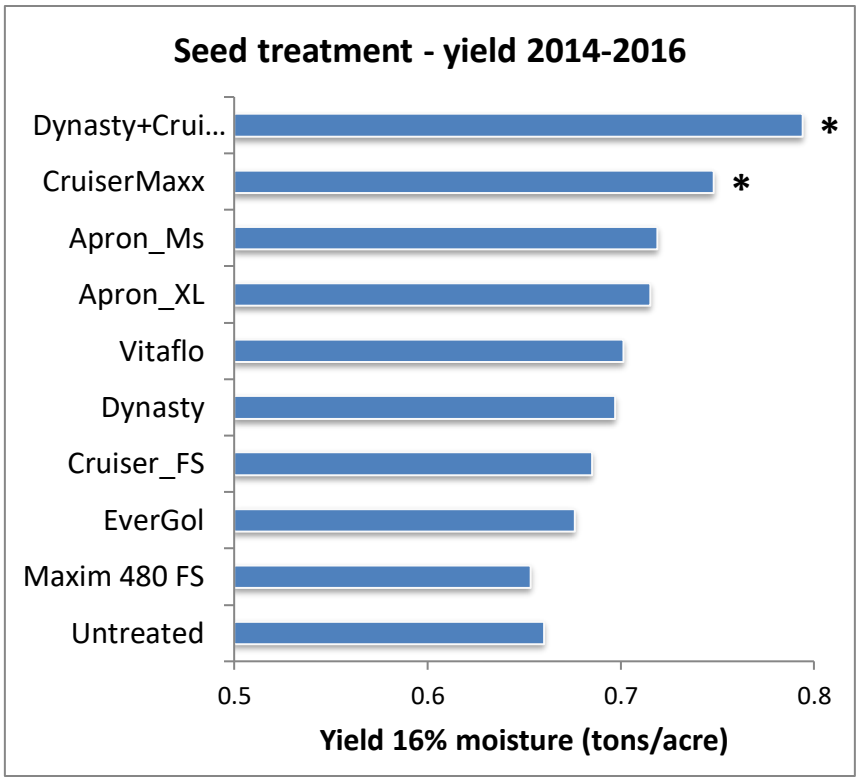

Fig 3. Effect of fungicide seed treatment on soybean yield in small plot trials. Bars show the mean yield response for all years 2014-2016. Bars lighted with * indicate a statistically significant difference in yield compared with untreated. Treatments: Vitaflo 280 (carbathin 15.59%, thiram 13.25%) 3.30 ml product/kg seed; Apron XL LS (Metalaxyl-M and S-isomer 33%) 0.40 ml + 2.9 ml H_2O/kg seed; Apron MaxxRFC (Fludioxonil 2.31% and Metalaxyl-M and S-isomer 3.46%) 1 ml plus 2.3ml H_2O/kg seed; Maxim 480FS (fludioxonil 40%) 0.1 ml / kg seed + 3.3 ml H_2O; Cruiser 5FS (insecticide – thiamethoxam 29.9%) 0.83 ml/kg plus 2.5 ml H_2O; Cruiser Maxx Beans (thiamethoxam 22.6%, metalaxyl-M and S-isomer 1.70% and fludioxonil 1.12%) 1.95 ml/kg seed; Dynasty 100FS (azoxystrobin 100 g/l) 0.2 ml/kg + 3.0 ml H_2O; Dynasty 100FS plus Cruiser Maxx Beans at recommend rates above; EverGol Energy (penflufen 38.4 g/L, prothioconazole 76.8 g/L, metalaxyl 61.4 g/L) 0.65 ml/kg seed.

Cultivar specific response to yield after fungicide seed treatments

This trial was conducted to determine if different soybean cultivars would react differently to a range of seed treatments. However, no cultivar had a different response to seed treatment in any of the 3 years of this trial. Of the 4 cultivars tested, Atwood, Bicentennial, DH401, and DH863, the highest yielding was Bicentennial regardless of seed treatment. Bicentennial was also the cultivar with the longest days to maturity of those tested.

Conclusions

The results presented here indicate the expected yield response of soybean to fungicide treatment when environmental conditions generate low disease pressure. In a year where disease pressure is high, plants treated with foliar and fungicide seed treatments could potentially produce a larger difference in yield when compared with untreated plants.