

Oat results in Saskatoon, Crop Sequence, Experiment 1 (2018-2020)

Oat (CDC Ruffian) was included in the crop sequence experiment of CAP I at the Saskatoon site from 2018 to 2020 (Experiment 1). Oat was grown in year 1 (2018) and again in year 2 (2019). In year 3 (2020), summarized here, durum wheat was grown on all previous crop stubbles. The 2018 season was very dry at Saskatoon and as a result little FHB was detected in any of the cereal crops; oat yield was 5087 kg/ha in 2018. Among the *Fusarium* spp. isolated on oat kernels in 2018, *F. poae* was predominant with a frequency of isolation from the kernels of 1.6% (*F. graminearum* isolation frequency was 0.3%); neither *F. culmorum*, nor *F. avenaceum* were isolated from oat that year since they generally prefer cooler, more moist conditions. In year 2, conditions were more conducive to FHB than in 2018 (more precipitation during anthesis) and FHB index was greater than in 2018, but there was still not a severe epidemic. Isolation frequency of *F. graminearum* from oat kernels was 0.4%, while for *F. poae*, *F. culmorum* and *F. avenaceum* it was 0.2%. In 2019, oat yield, quality or frequency of isolation of *Fusarium* spp. from oat kernels was not affected by the previous 2018 crops; yield of oat in 2019 was 2907 kg/ha (averaged over all previous stubbles).

In year 3 (2020), the FHB severity was considered moderate in the durum as there was warm temperatures and a number of rain events during flowering of the cereal crops.

FHB index: when durum was grown after oat in 2020, the durum had a similar FHB index (>25%) following oat as it did following durum and barley (Figure 1). FHB index of durum was somewhat lower when grown on or other crop stubbles including canaryseed and the non-host crops canola, pea and lentil. FHB index of durum was lowest following maize.

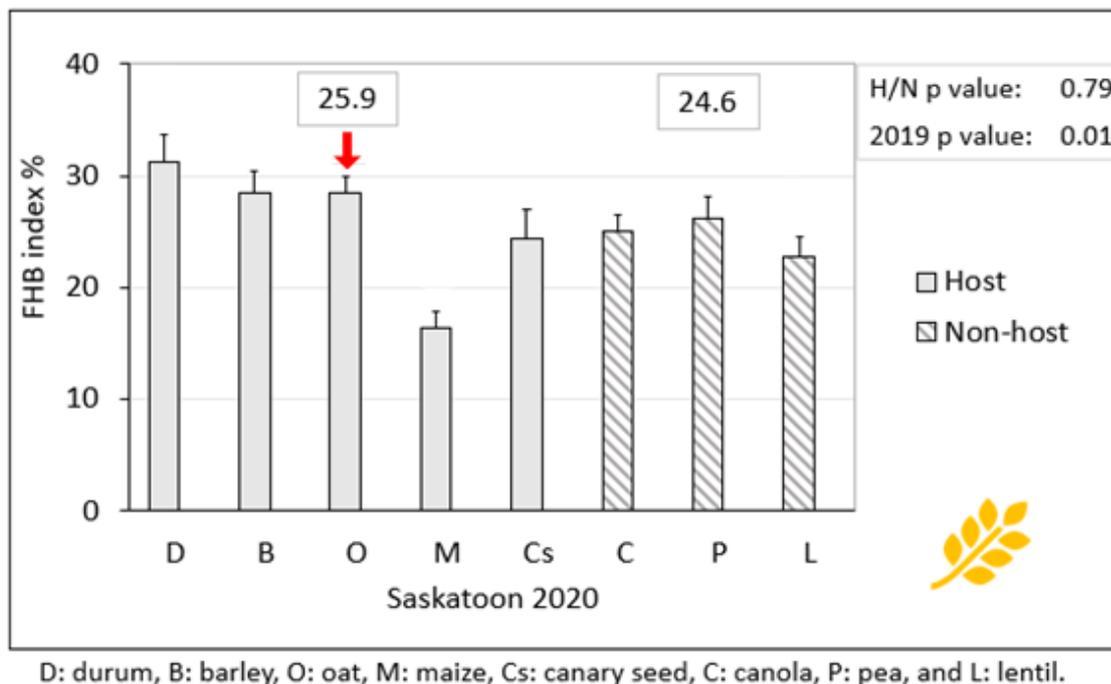


Figure 1. FHB index (%) of durum grown in Saskatoon 2020. FHB host crops are shaded and non-host crops in diagonal stripes; values above columns are the means of the host and non-host crops. Data are the means of three replicates. The p values are for the H/N test and differences among 2019 crop stubble individually. Flax stubble was not measured due to early spike maturation during the season. D: durum, B: barley, M: maize, O: oat, Cs: canary seed, C: canola, P: pea, and L: lentil.

***Fusarium* spp. and mycotoxin content:** *Fusarium* spp. isolated from durum kernels did not vary among host and non-host crops (data not shown), but differed statistically among individual

previous stubbles ($p=0.02$). Durum grown on oat stubble had an isolation frequency which was similar to durum, barley, and maize (~2.5%), in contrast durum on canary seed stubble had the highest isolation frequency of *Fusarium* spp. (3.8%).

Mycotoxin content was >1 ppm in durum when grown on oat stubble, which was higher than on most other stubbles ($p= 0.01$) (Figure 2). No difference was found for mycotoxin content between host and non-host crops. The higher DON concentration on oat-durum sequence might be explained with the accumulation that can occur on oat after maturation.

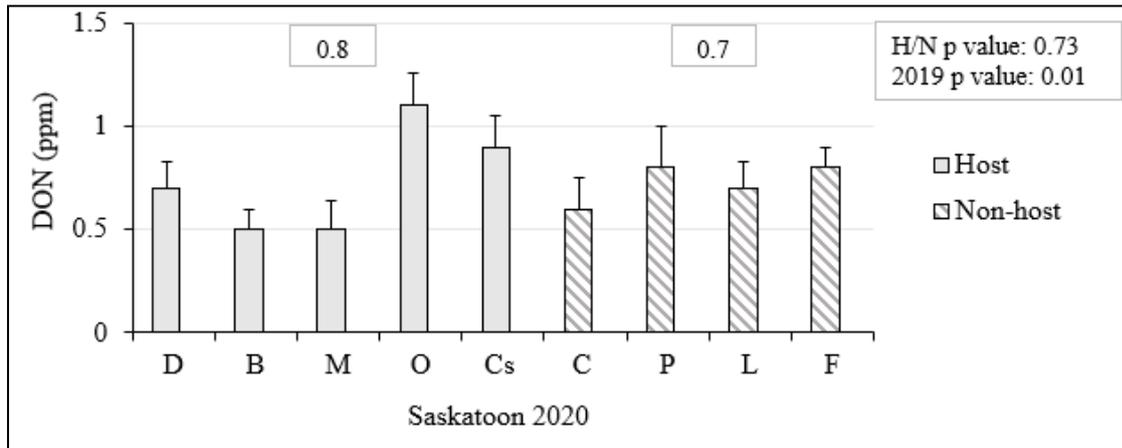


Figure 2. DON content (ppm) of durum grown in Saskatoon 2020. FHB host crops are shaded and non-host crops in diagonal stripes; values above columns are the means of the host and non-host crops. Data are the means of three replicates. The p values are for the H/N test and differences among 2019 crop stubble individually. D: durum, B: barley, M: maize, O: oat, Cs: canary seed, C: canola, P: pea, and L: lentil.

Leaf spot diseases: leaf spot diseases of durum grown on oat stubble was <10% severity, compared to host crops like durum grown on durum stubble, which had a severity of 31% (data not shown). There was no difference among host and non-host crops, but there was a difference among some individual previous stubbles that affected durum grown in 2020 ($p=<0.001$).

The frequency of isolation of *C. sativus*, cause of spot blotch on durum leaves differed among previous crop stubbles and between host and non-host crops (Figure 3). Frequency of isolation was higher on durum grown after oat (11.7%) and canary seed (12.3%) than after other host or non-host crops, except flax. *Cochliobolus sativus* is a pathogen of cereals including oat and can be transmitted through consecutive cereal growth, although it is not believed to sporulate on canary seed.

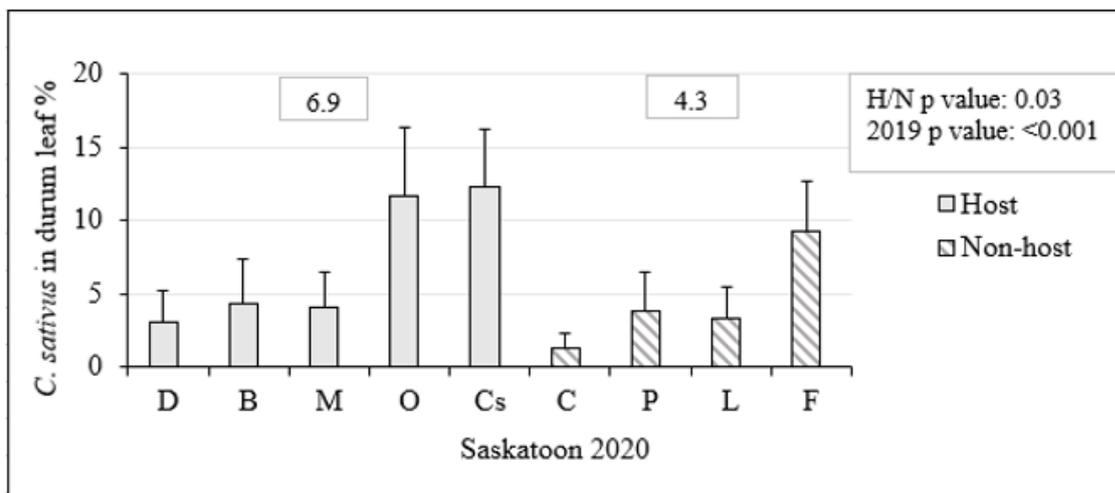


Figure 3. *C. sativus* (%) isolation frequency of durum grown in Saskatoon 2020. FHB host crops are shaded and non-host crops in diagonal stripes; values above columns are the means of the host and non-host crops. Data are the means of three replicates. The p values are for the H/N test and differences among 2019 crop stubble individually. D: durum, B: barley, M: maize, O: oat, Cs: canary seed, C: canola, P: pea, and L: lentil.

Yield of durum: yield of durum differed among host and non-host crops (Figure 4), plus the effect of previous stubbles. Durum grown after oat had reduced yield (2773 kg/ha) compared to non-host crops like pea and lentil (>3500 kg/ha), but was comparable to durum grown on canary seed stubble (3182 kg/ha). Yield of durum grown on oat stubble did not differ among other cereal crops.

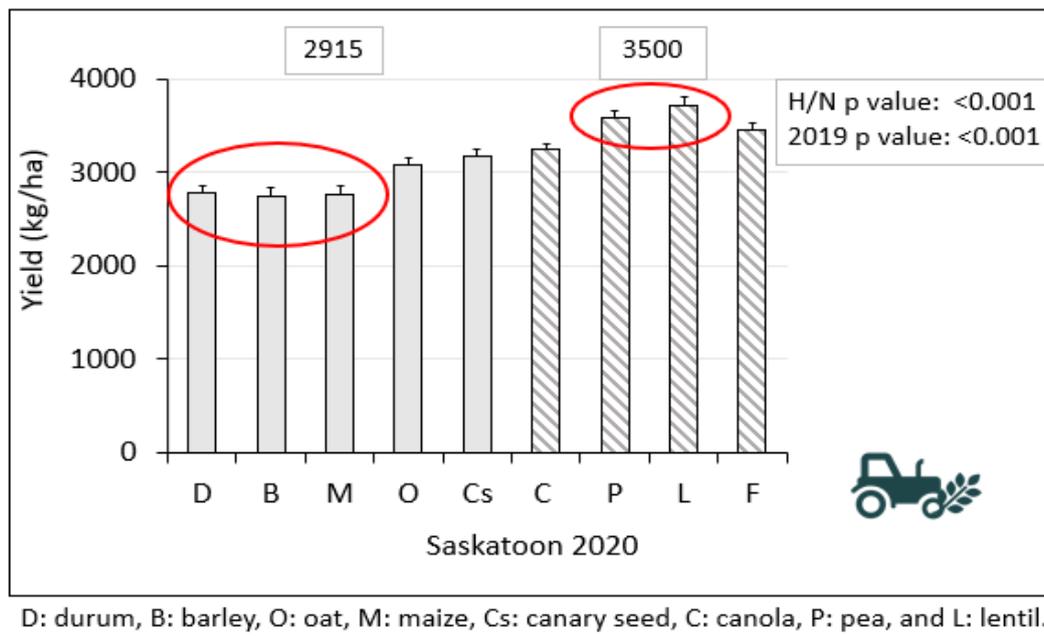


Figure 4. Yield (kg/ha) of durum grown in Saskatoon 2020. FHB host crops are shaded and non-host crops in diagonal stripes; values above columns are the means of the host and non-host crops. Data are the means of three replicates. The p values are for the H/N test and differences among 2019 crop stubble individually. D: durum, B: barley, M: maize, O: oat, Cs: canary seed, C: canola, P: pea, and L: lentil.

Final remarks:

- A crop sequence of durum grown on oat stubble had similar FHB index when grown on barley and durum stubbles, which was higher than when durum was grown on other crop stubbles.
- *F. poae* was the predominant species isolated from oat kernels, especially in dry years like 2018 and 2020.
- DON content of durum increased when oat and canary seed are included in the rotation.
- Durum grown on oat stubble did not have increased leaf spot severity in Saskatoon in 2020. However, a higher isolation frequency of a particular leaf pathogen, *C. sativus*, was found in durum grown on oat stubble.
- Yield of durum was lower when rotated with oat (and other cereals) compared to a rotation with non-host crops like pulses and oilseeds.