

Environment and Herbicides Effects on the Quantity of Covered Grains in Naked Oat

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Introduction

- Naked oat can be used as feed for animals, as food for human consumption, or in pharmaceutical and cosmetic products. Unfortunately, the expression of naked grain character is rarely complete.
- Genotype and environment influenced the expression of naked grains character (Kirkkari et al., 2004).
- Cool growing conditions increased covered grains (Lawes and Boland, 1974). Small grains retain more firmly the husk thus, grain filling capacity is very important to the expression of the naked trait (Kirkkari et al., 2004).
- The herbicides 2,4-D or dicamba+MCPA applied at tillage stage increased significantly the quantity of covered grains (Marshall et al., 1992).

Objectives

- Evaluate the effect of environment, herbicides, and their application stages on the quantity of covered grains in naked oat.

Materials and methods

- Two factorial experiments with randomized complete blocks design and three replications were set up during two years (2006 and 2007).
- The first trial had four environments, four weeding treatments, and eight naked oat genotypes.
 - Environments were chosen because they are located in different climatic area for the cereal production in province of Quebec, Canada: Normandin (2300 DD¹), Princeville (2800 DD), St-Augustin (2800 DD), and St-Hyacinthe (3270 DD). ¹DD: degree-days
 - Weeding treatments were: hand weeded check, bromoxynil/MCPA, dicamba/MCPA, and thifensulfuron methyl/ tribenuron methyl. Herbicides were applied at Zadoks 12-13.
 - Genotypes selected express variability for naked grain characteristics: 05ANS01, AC Baton and Shadow can show a lot of covered grains, Hi Prot and AC Fregeau develop much less while, Navaro, MF2010-17 and VAO-2 have only a few.
- The second trial had two environments, two application stages, three herbicides and three genotypes.
 - Application stages were Zadoks 12-13 and 22-23. Same herbicides than the first trial were applied as well as the three genotypes that produced a lot of covered grains. The environments were Princeville (2800 DD) and St-Augustin (2800 DD).

- Subsamples of 50 g were used to separate naked and covered grains. Each part was weighted and the percentage of covered grains was calculated.

Results and discussion

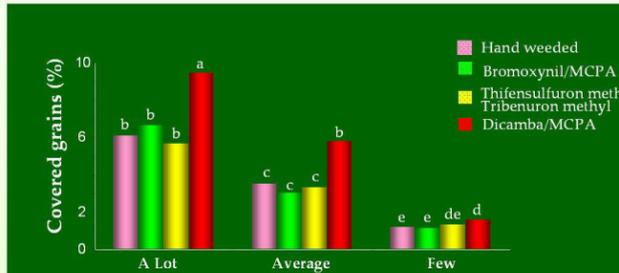


Fig 1: Herbicides*Genotypes interaction in 2006 (F-protected LSD, p < 0.01)

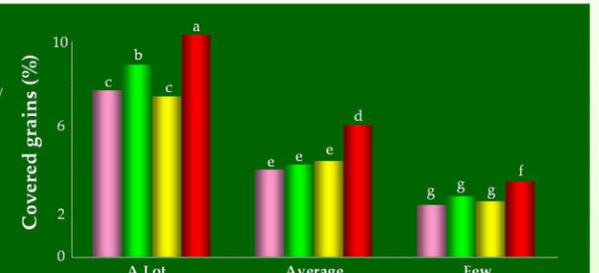


Fig 2: Herbicides * Genotypes interaction in 2007 (F-protected LSD, p < 0.01)

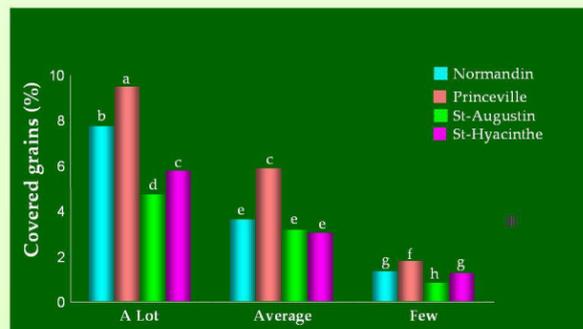


Fig 3: Environments * Genotypes interaction in 2006 (F-protected LSD, p < 0.01)

→ Dicamba/MCPA herbicide application gave more covered grains (Fig. 1, 2).

→ Genotypes that produced few covered grains continued to give few after the dicamba/MCPA application (Fig. 1, 2).

→ Genotypes that produced few covered grains continued to give few covered grains in each environment (Fig. 3).

→ Quantity of covered grains given by genotypes that produced a lot varied with environments and herbicides (Fig. 1, 2, 3).

→ Application of dicamba/MCPA at Zadoks 22-23 increased the quantity of covered grains. Differences were observed in genotypes reaction (Fig. 4).

→ Bromoxynil/MCPA and thifensulfuron methyl/tribenuron methyl: few differences were observed whether applied at Zadoks 12-13 or 22-23 or compared with the hand weeded check (Fig. 1, 2, 4).

Quantity of covered grains

- Quantity of covered grains varied with environment (Fig. 3).
- Normandin, the coolest environment site, never gave the highest quantity (Fig. 3). St-Hyacinthe, the warmest environment site, gave the highest quantity in 2007 (data not shown).

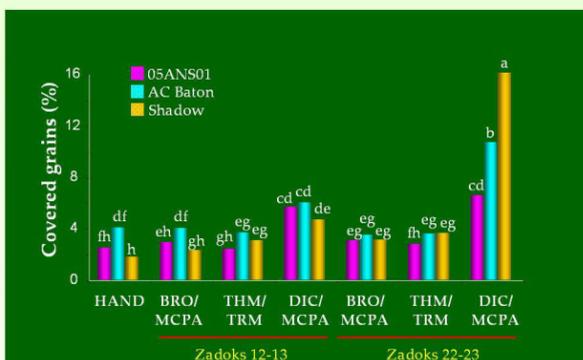


Fig 4: Application stages * herbicides * genotypes interaction in 2006 in St-Augustin (F-protected LSD, p < 0.01)

Conclusion

- Environments and herbicides had an effect on the quantity of covered grains produced by naked oat genotypes.
- Genotype is very important in the quantity of covered grains harvested.
- Growing varieties with less tendency to retain hull and avoiding herbicides with phytotoxic effects such as dicamba/MCPA can reduce the quantity of covered grains in naked oat.

Acknowledgements

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References

- Kirkkari et al., 2004. Agric. Food Sci. 13:198-211.
- Lawes and Boland, 1974. Euphytica 23:101-104.
- Marshall et al., 1992. Oat Sci. and Tech. #33 p.191-221.



Naked and covered grains after harvest