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# Effect of hairiness of Brassica lines on flea beetle feeding behavior

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# Flea beetles

Most chronic and economically important Brassica pests in the Canadian prairies.



Adults are 'shot hole' leaf feeders. Cause seedling mortality, reduce plant stand, reduce seedling growth, delay maturity and lower seed yield.

Annual losses \$130-300M.

Management: Early seeding, large size/vigor seeds, 0-tillage, high seeding density & wide rows, and insecticide seed treatments (neonicotinoids since 2003)

> 95% of canola seed treated in Canada (18+ million ha)

Foliar sprays at >25% leaf damage (ET)



# Flea beetle damage - seedling mortality



*B. napus* seeded May 12, 2003 – B. Elliott, Saskatoon Research Centre



# Flea Beetle Species Common to the Prairies



**Striped flea beetle,**  
*Phyllotreta striolata* (F.)



**Crucifer flea beetle,**  
*Phyllotreta cruciferae* (Goeze)



**Hop flea beetle**  
*Psylliodes punctulata* (Melsh.)



# New challenges in flea beetle management

## Population shift from crucifer to striped flea beetles

Striped flea beetles less susceptible to seed treatments (Tansey et al. 2008, Elliott pers. comm.) & use of seed treatments may be selecting for striped flea beetles.

Striped flea beetles 1-4 weeks earlier than crucifer flea beetles

Most IPM were developed for crucifer flea beetles

## Ban on neonicotinoids

Re-evaluation by PMRA (due by Dec 2019), bans on some neonic foliar sprays by 2021-2022, water residues data still being analyzed...Seed treatments ?

## Public push for healthier environment and food



**Other management alternatives**

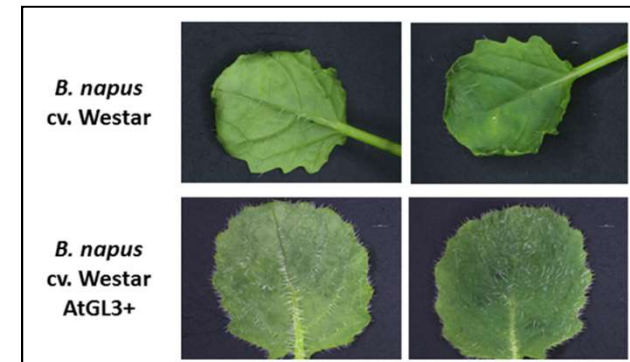


# Hairy canola

**Other management alternatives:** stubble heights, aggregation pheromone, parasitoids, hairy canola (*might be used against other insect pests*).

**Hairy canola: “Hairy” transgene reduced damages by crucifer FB** (Gruber et al., 2006; Soroka et al., 2011; Alahakoon et al., 2016).

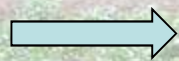
**Genetic diversity study:**



**Hairy *B. napus* lines (DOS)**  
(Self pollination/double haploid)



**Hairy *B. villosa* (Bvil)**



**Bioassays on striped flea beetle**

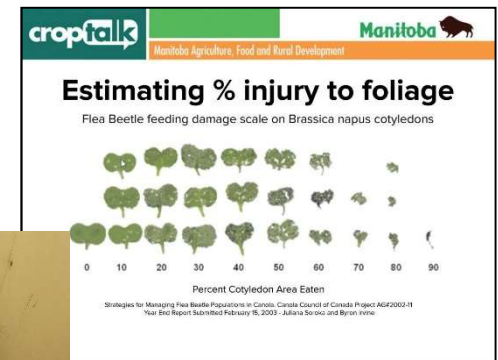
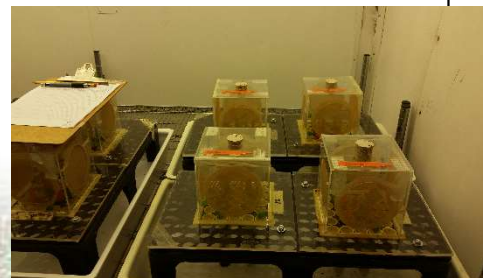


# Bioassay-Feeding damages

## Set-up:

4 plants & 10 fb/cage (flea beetles collected in the fields);  
2 growth stages (cotyledons, 1&2 leaf); 22°C night/25°C day  
Choice / No choice

➔ Feeding damages after 72hrs in choice and no-choice bioassays with Ac Exel, DOS, *B. villosa*, AtGL3+ transgenic plants. Partial results...repetitions still in progress.



# Bioassay-Distribution

## Hourly flea beetle location

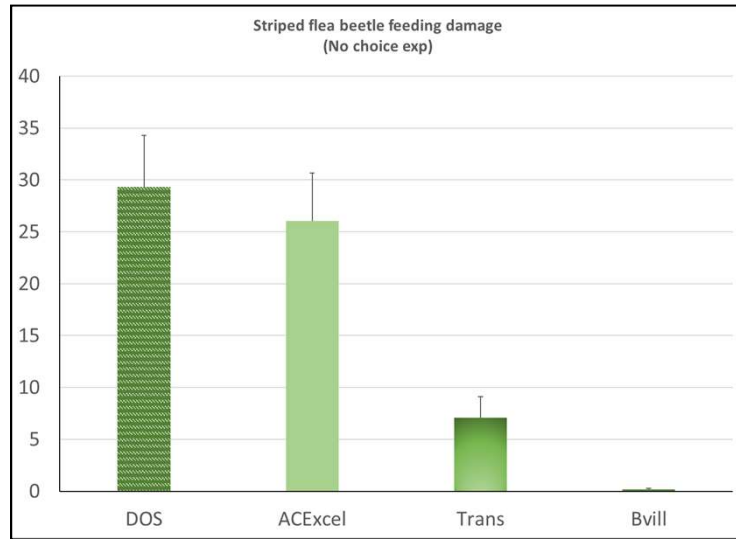
Use of the feeding damages bioassays.

Hourly observation (7hrs): wall, stem, cotyledon, leaf, petiole.





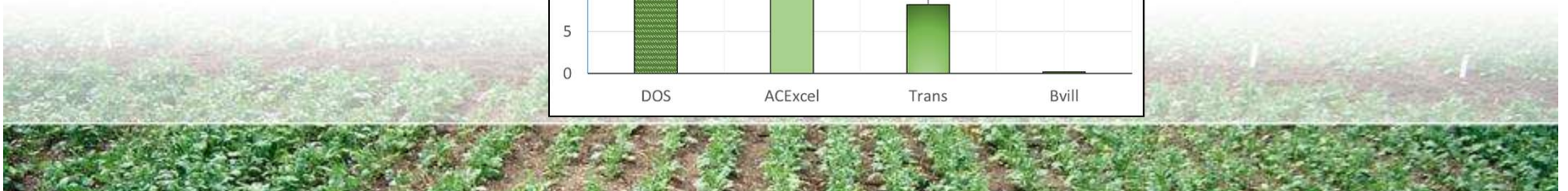
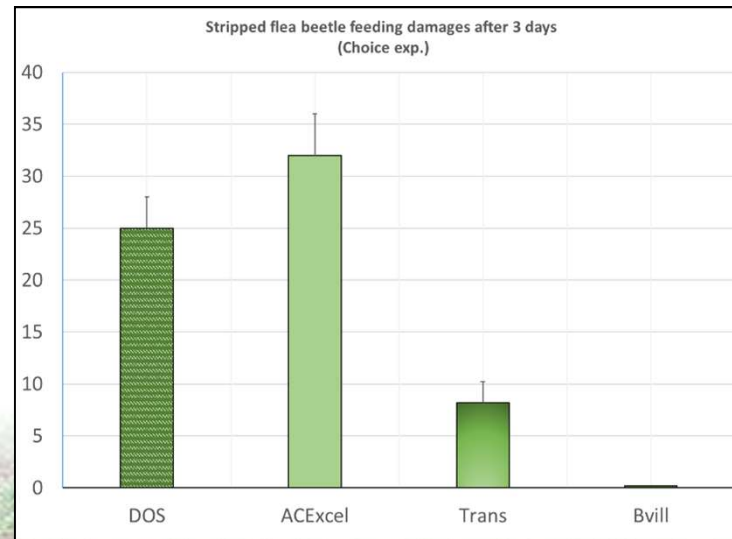
# Feeding damages - results



Little to no feeding on *B. villosa* and AtGL3 plants in choice/no choice bioassays.

Feeding in DOS and ACExcel similar in no choice bioassays.

Less feeding damages on DOS as compared to ACExcel in choice bioassays.



# Feeding damages - results

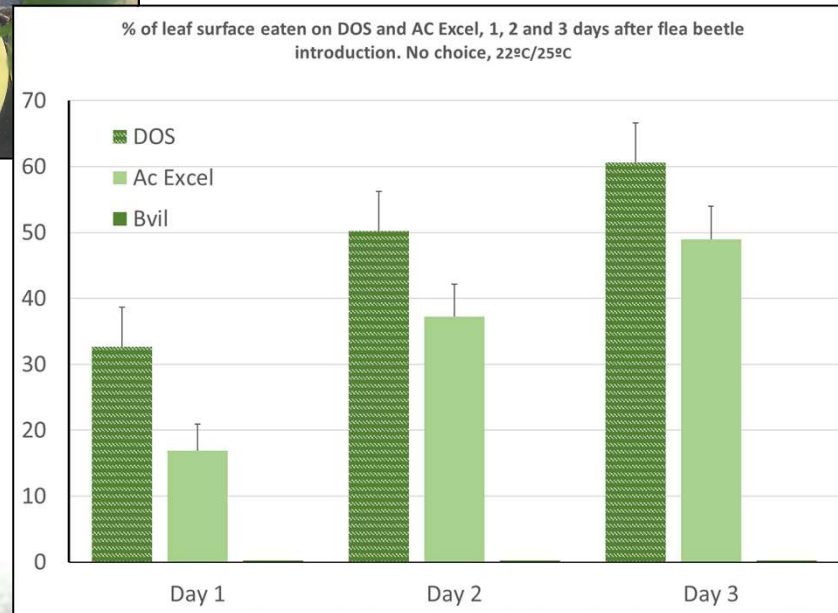
DOS plants tend to be clipped by flea beetles at the stems and petioles, as compared to AC Excel. Flea beetles do not clip/eat Bvil.



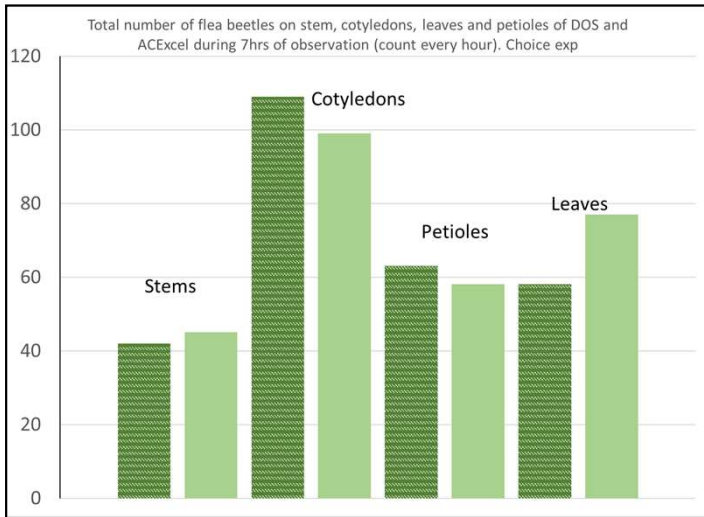
DOS



ACExcel



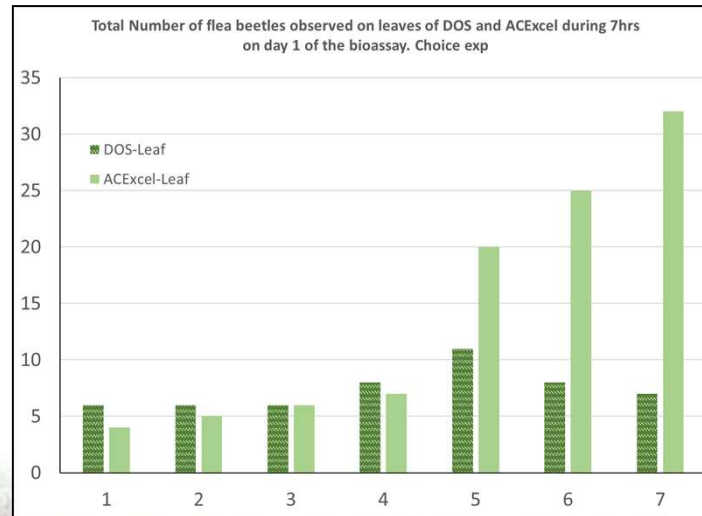
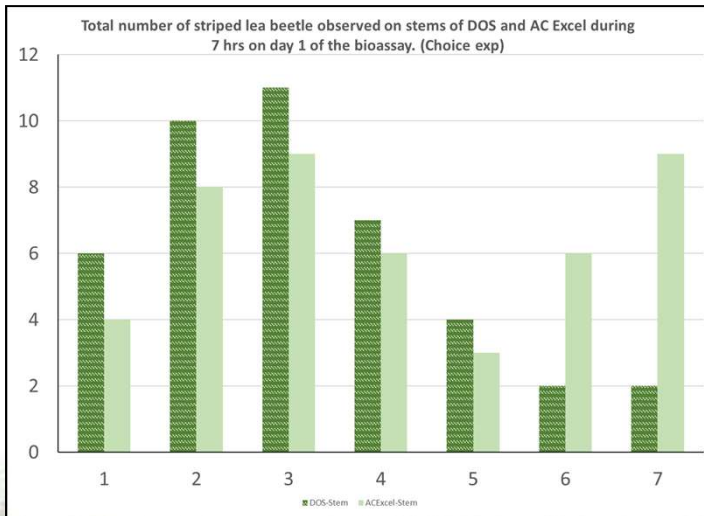
# Distribution - Results



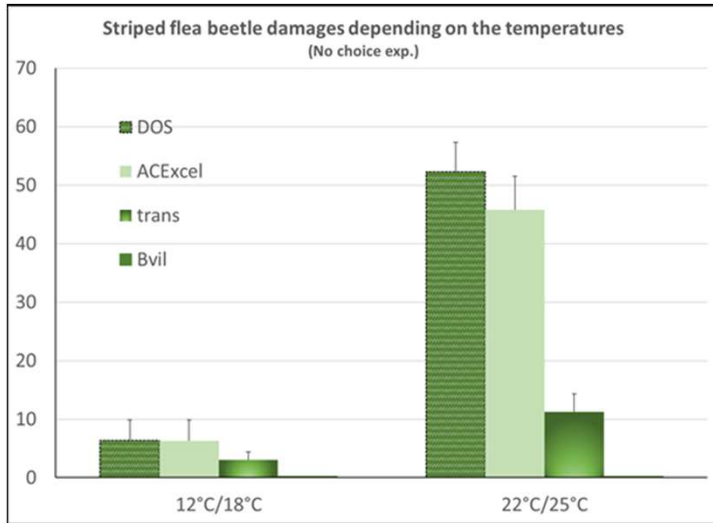
**Flea beetles more observed on cotyledons as compared to other tissues.**

**Flea beetles more observed on stems of DOS during 1-5 hours, as compared to ACExcel.**

**Flea beetles more observed on leaves of ACExcel as compared to DOS, after 5hrs: avoiding the hairy parts?**

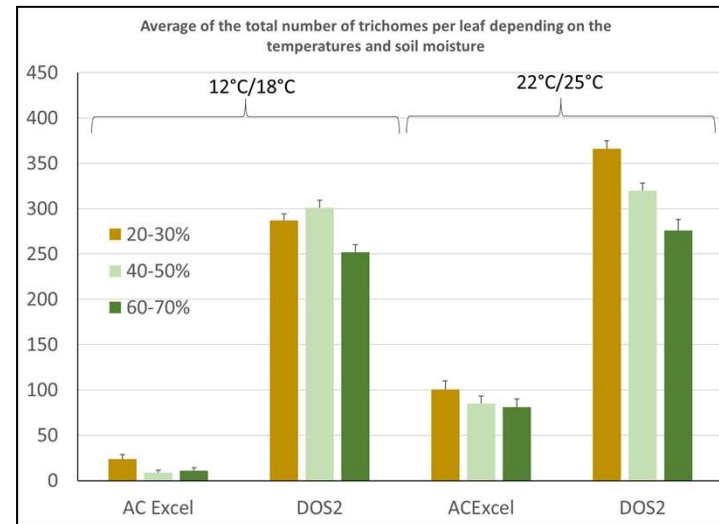
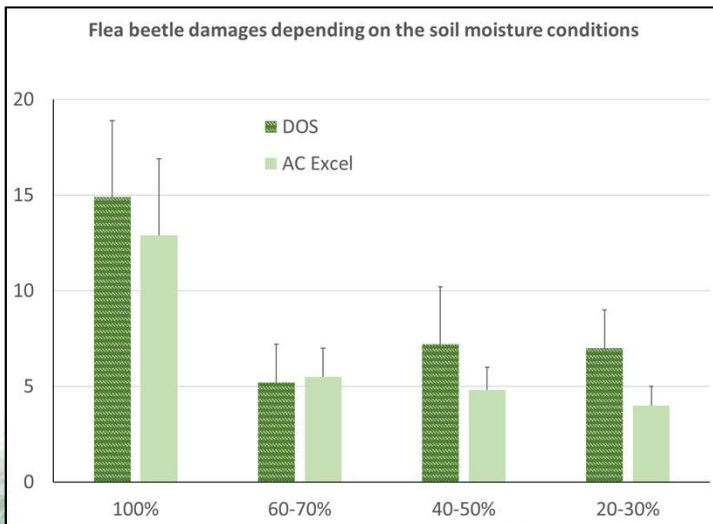


# Feeding damages - results



## Flea beetle damages higher

- in warm temperatures as compared to cold temperatures.
- In saturated soils as compared to drier soils.
- Related to total nb of trichomes?



# Conclusion

Little to no feeding on *B. villosa* and AtGL3 plants in choice/no choice bioassays. Flea beetles avoid feeding on *B. villosa* and AtGL3+.

Higher damages on DOS because of stem clipping on days 1 & 2, but similar losses in % of foliar damages in DOS and ACExcel in choice/no choice bioassays at 3 days.

Flea beetles more observed on stems of DOS and leaves of ACExcel, indicating that flea beetles seem to avoid hairy leaves of DOS.

2 years to go....

More bioassays with *B. villosa* seeds

Field trials

Statistical analysis remain to be done.



# Acknowledgments

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## Questions?

