Canadian Agronomist

DIGGING INTO RESEARCH

Pollinators increase yield and mitigate drought impacts

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Pollinators increased yield by promoting earlier flowering and reducing loss associated with drought. However, pollinators were unable to compensate for suboptimal seeding rate or low nitrogen fertility.

Get more bang for your buzz. This project consisted of three experiments that investigated whether pollinators could help maintain yield under drought (which they could, to an extent) or while reducing inputs like fertilizer and seed (which they couldn't).

Experiment 1: Higher yield with pollinators

In a greenhouse experiment 23 varieties (9 open-pollinated and 14 hybrid) were grown in the presence or absence of pollinators. Total canola yield and quality were higher in canola plants exposed to insect pollination, even though the presence of pollinators reduced plant size. By shifting peak flowering earlier, pollinators increased yield, and reduced the crop's dependency on aborted pods (scars) or later reproduction (branch pods).

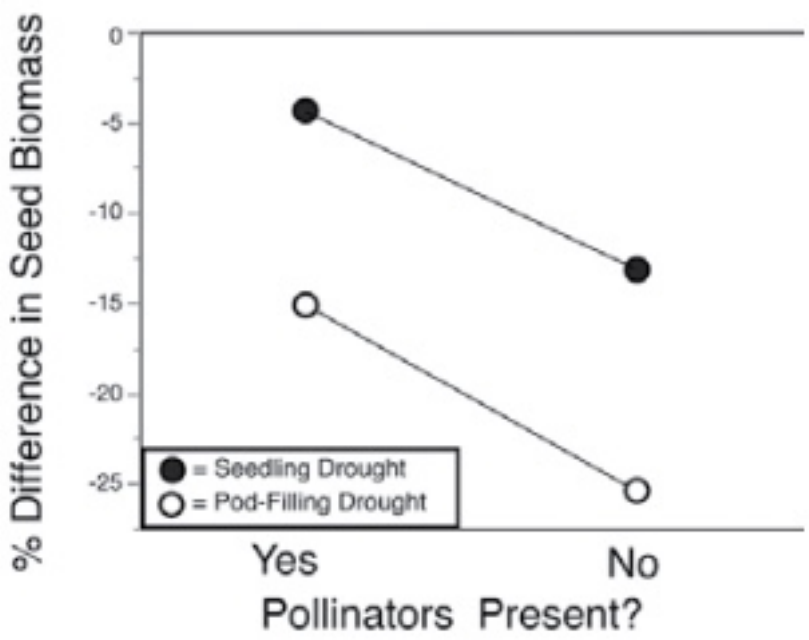
Experiment 2: Pollinators increase yield by 20% during drought

In this greenhouse experiment comparing pollinators with non-pollinator treatments, canola was subjected to moisture stress by receiving 30% of normal watering at the vegetative stage (from the

fourth leaf to the first visible petal; called “seedling drought”), and the pod-filling stage (end of flowering to harvest; called “pod-filling drought”).

Pollinators reduced the negative effects of drought with approximately 20% higher yield, regardless of whether the drought was experienced during the seedling or the pod-filling stage. The fitness “bump” provided by pollinators was accomplished primarily by shifting the plant’s flowering phenology earlier and narrower.

Pollinators help plants under drought stress



Pollinators can help preserve canola yield when plants encounter drought at seedling and pod-filling stages. The top of the graph ("0") represents baseline yield. Points on the graph show the seed biomass drop from drought when pollinators are present (left) or not (right)

Experiment 3: Pollinators could not compensate for poor plant stands

This field experiment examined three treatments using four hybrid varieties of canola grown in 80 experimental plots at the AAFC Research Station in Beaverlodge, Alberta. Two plant spacing treatments (half-conventional = 75 seeds/m^2, conventional=150 seeds/m^2) and two fertilizer rates (none, conventional) were compared with pollinators present or absent (screen tents installed just before 10% bloom).

In the field over two summers, pollinators did not buffer yield in the face of less costly inputs (lower seeding amounts, lower N fertilization). Instead, pollinators were usually associated with equal or lower yields relative to plants in a screen tent. Pollinators marginally reduced the oil content of unfertilized plants, and marginally reduced the protein content of fully fertilized plants.

The research found that nitrogen was the principal determinant of plant yield and seeding rate was the second biggest factor. Overall, the importance of pollinators in the Experiment 3 field trials was dwarfed by the strong driver of canola yield: nitrogen.

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Getting more bang for your buzz: Does pollination compensate for canola yield lost under sub-optimal soil moisture, nitrogen fertilization and/or seeding rates? 2018. Ralph Cartar, University of Calgary.

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