Lead Researcher:
Dr. Genevieve Labrie, CEROM

Activity 12 Factsheet

Integrated Pest Management Strategies Against Insect Pests of Canola in Eastern Canada

Objectives

The objective of this activity is to develop integrated pest management strategies against the flea beetle, pollen beetle and cabbage seedpod weevil (CSW) in Eastern Canada, while helping canola to reduce their use of insecticide and improve canola yield.

Methodology

This activity includes trials in Prince Edward Island and three locations in Quebec to assist in the: 1) Seeding date trials - evaluation of the influence of seeding date against flea beetles, CSWs and pollen beetles; 2) Insecticide trials - evaluation of the efficiency of chemical control against flea beetles; 3) Economic threshold analysis - determination of the economic threshold for CSWs through its introduction into trials with consideration of parasitism. This trial included evaluation of damage by CSW and parasitism rate in Quebec canola fields, insecticide trials and introduction of CSW and parasitoids in cages; and 4) Economic threshold analysis - determination of the economic threshold and efficiency of insecticides for pollen beetles. This trial included introduction of pollen beetles in cages to evaluate yield loss and economic threshold and trials of insecticides against pollen beetles.

Results

Flea beetles. In Year 1, seeding dates and insecticides trials identified highest defoliation on first seeding date and lowest damage with application of insecticides. However, damage by flea beetles (FB) in all plots did not reach the economic threshold of 25% of defoliation, which could explain the lack of differences in canola yield in all trials. The three insecticides used were effective in reducing FB pressure and damage. The impact of seeding date was not clear, as highest damage by FB was observed, but also highest yield. A late seeding date in 2013 could explain these conflicting results. In year 2, second seeding date showed highest defoliation, and sites presented highest yield at 1st and 2nd seeding dates. Temperature during spring is the main factor explaining the presence of FB in the experimental plots (highest abundance of FB observed when air temperature reaches 15°C). As threshold was not reached in insecticides trials, no differences were observed in yield between the products and untreated plots. Air temperature seems to be a good predictor of emergence of FB and damage. In Year 3, FB were most abundant in the first and second seeding dates, which corresponds to temperature conditions during the spring. The threshold of 25% defoliation was not reached and no differences in yield were observed. The trap cropping trial added in Year 3 was efficient to attract the FB in the trap crop and to reduce the defoliation in the rest of the field without treating all the field with insecticide. The trap cropping could thus be a good alternative to attract FB in only one area and to reduce the use of insecticide. The seeding date and trap cropping trial demonstrates, however, that a predictive model including temperature, phenology of canola and biology of FB will be an important tool for the IPM of this insect. Trap cropping could not be effective without knowing when the insects will emerge and when to seed the trap inside a field. In Year 4, FB were at their lowest abundance since the start of the project with less than 5% defoliation on both sites and trials. Yield differences were not linked to pressure from flea beetles.

Cabbage seedpod weevil. In Year 1, cabbage seedpod weevil (CSW) reached economic threshold of 2 CSW/sweep in many trials, however, no significant damage was observed. An increase of parasitoid presence in Quebec has been observed (2011 – 33%, 2013 – 60%). Our experiments in cages demonstrated that, in absence of parasitoids, high levels of damage could be observed when CSW abundance is two to six times above threshold. In the presence of parasitoids, consumption of canola seed inside pods could be reduced between 38 and 53%. Presence of parasitoids and high parasitism rate in many experiments could explain the lack of differences in yield of canola between treated and untreated plots. In Year 2, CSW reached economic threshold at only one site. Significant differences in yield were observed after insecticide treatment, and on first and second seeding date. Observations in 2014 demonstrated that in the presence of parasitoids, consumption of canola grains inside pods could be reduced between 19 and 53%. Our experiments in cages demonstrated that, even at 7 times (14 CSW/sweep) above western Canada threshold (2 CSW/sweep), we did not reach damage threshold of 25 to 40% of damaged pods. In our cage experiments, no differences in yield were observed with introduction of parasitoids, but parasitism was very low (2.87 – 7.81%) compared to what was observed in Quebec fields. In Year 3, CSW was captured in 75% of the fields, but no fields reached the economic threshold of nor 25% of damaged pods. Parasitoids were observed in 45.8% of the fields monitored, an increase of 7% from 2014 and the parasitism rate varied between 38 and 100%. Percentage of grains consumed by CSW was 25% less in pods with parasitoids. This increase of parasitism year after year since 2009 demonstrates that this natural control is successful to control this pest and that no chemical control is necessary. In Year 4, CSW was captured in 80% of fields with one site reaching the economic threshold. No site reached 25% damaged pods, however two fields reached 17-23% damage and these locations had less than 20% of parasitism. Parasitoids were observed in 50% of fields monitored, and increase of 5% from previous year. However, parasitism rate was less than in 2015 and varied between 6.8 – 50%. Portion of grains consumed by CSW was 56% less in pods with parasitoids.

<u>*Pollen beetles.*</u> In Year 1, different levels of pollen beetle (PB) abundance were observed on the three experimental sites, but those populations are considered low compared to observations in Europe. Insecticides performed differently on the three sites, with efficiency of the three products only on the PEI trial. This pest species has developed resistance to many insecticides rapidly in Europe. In Year 2, introduction of PB in cages demonstrated the highest number of larvae in flowers at 320 PB/cage, which corresponds to 3.2 PB/plant. Thresholds in Europe varied between 1 and 3 adult/plant at bud stage. However, no yield differences were observed between different introduction rates. PB adults could have played the role of pollinators in our cages, increasing yield in cages with 80 and 160 pollen beetles/cage. Insecticide treatments failed to reduce the abundance of PB at all experimental sites and no yield differences were observed. However, population was very low at all sites, which could explain this lack of difference. In Year 3, PB in cages demonstrated highest number of larvae in flowers at 8 PB/plant. While no statistical differences were observed in cages with 2 or 8 PB/plant compared to the control, there were between 495 and 662 kg/ha more yield in control cages. All insecticides succeeded to reduce the abundance of PB adults in two out of three experimental sites, while Matador and Success were successful in PEI. These sites did not reach the threshold and no yield differences were observed, however, some insecticides are demonstrating efficiency against this pest. In Year 4, cages introduced resulted in 9 PB per plant with almost 100% of buds with larvae. No statistical differences were observed compared to control, but there was an increase in yield of 336 kg/ha in treated cages (again, potentially from pollination).

Funding for this activity has been provided by the Agri-Innovation Program's Research and Development stream, under the Growing Forward 2 policy Framework. Les fonds pour cette activite proviennent du volet Recherche et developpement du programme Agri-innovation, une initiative du cadre strategique Cultivons l'avenir 2. Major funding provided by Vittera Inc. and Bunge Limited.