Integrated Management of Insect Pests of Canola at Saskatoon, Canada

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Background

Scientists at the Saskatoon Research Centre, Agriculture and Agri-Food Canada, have recently come together as a team (Ecological Crop Protection) to develop crop protection technologies for weeds, insects and diseases. Independently, each of the pest management units had a successful track record in developing control tactics. The collaboration of the three disciplines results in better delivery of pest management technologies to the canola industry.
In consultation with the agricultural industry, the scientists developed four scientific programs (Table below). The primary clients of the programs are the producers, the extension agencies, and the crop protection industry.

This paper reviews the challenges facing the canola industry in western Canada, specifically in relation to insect pests.
Table 1. Overview of the crop protection programs at the AAFC Research Centre at Saskatoon:

1) Integrated Management of Pests. The objectives are to: develop and implement monitoring technologies; develop forecast and risk assessment technologies; determine ecological relationships that influence pest status; and integrate control tactics.

2) Host Plant Resistance. The objectives are to: determine and quantify host plant - insect interactions; and identify germplasm with morphological and biochemical traits that confer resistance to crucifer pests.

3) Biological Control of Weeds. The objectives are to: explore, identify and characterize pathogenic micro-organisms of weed populations in western Canada; evaluate the biological activity of these agents for the control of weeds in field crops; and develop those with good potential.

4) Biological Control of Insect Pests. The objectives are to: isolate, discover and characterize insect parasitoids and pathogenic micro-organisms in native populations of insect pests; evaluate the biological activity of these agents for the control or suppression of insect pests in field crops; and to develop those with good potential.

Overview of Insect Pests of Canola

Current practices for canola production in western Canada require inputs to ensure plant protection from several insect pests. These pests include flea beetles, diamondback moths, bertha armyworms, cabbage root maggots, grasshoppers, lygus bugs and cabbage seed pod weevils.

Flea beetles, including the crucifer flea beetle, *Phyllotreta cruciferae* (Goeze), and the striped flea beetle, *P. striolata* (Fab.), are the most serious pest of canola in the central and eastern regions of Saskatchewan (Burgess 1977). Feeding by the adults on young seedlings results in reduced crop establishment and plant growth, delayed maturity, and lower seed yields. Most of the canola seed in Saskatchewan is treated with an insecticide-fungicide mixture which provides protection from flea beetles for about 7-10 days after seedling emergence. Lamb and Turnock (1982) estimate that flea beetles reduce yield of canola grown from treated seed by 8-10%. Data collected from test plots at Saskatoon between 1991 and 1996 support this estimate (Elliott, unpublished). Flea beetle populations declined markedly in the mid 1990's but increased in 1996. Flea beetles in canola are managed primarily by seed dressings. However, granular insecticides and foliar applications are also used in severe outbreaks. Recent research has indicated that large seed contributes significantly to seedling vigour, which in turn, reduces damage potential of flea beetles.

Diamondback moth, *Plutella xylostella* (L.), is a sporadic pest of canola and mustard (Anonymous 1995a). This is because the insect can overwinter only to a limited extent at northern latitudes (Dosdall 1994). Infestations result primarily migrant moths carried on winds from the southern USA and Mexico in May and June. The insect is multivoltine and may undergo two to three generations during the growing season under favourable conditions. Diamondback moth in canola is managed primarily by pesticide sprays. Diamondback moth had a major impact on canola production in Saskatchewan in 1995. That year, chemical sprays were applied to approximately 1.3 million hectares (WCCP 1995), much of that being applied in south eastern Saskatchewan.

Bertha armyworm, *Mamestra configurata* Walker, is also a sporadic pest of canola and mustard in Saskatchewan (Anonymous 1995b). The insect has only one generation a year and overwinters as a pupa in the soil. The last two larval instars are the most destructive, feeding on leaves, flowers, stems and pods when leaf senescence begins (Bracken and Bucher 1977). Bertha armyworm also had a major impact on canola production in western Canada in mid 1990's. Approximately 150,000 and 650,000 hectares were treated with insecticides to control bertha armyworm in 1994 and 1995, respectively (WCCP 1995). In response to the increased threat from bertha armyworm, a network of traps, baited with sex pheromones, was established in across western Canada to monitor moth populations. Cumulative moth count data is then compiled to develop risk maps for larval infestations with the aid of Geographic Information Systems software. Bertha armyworm in canola is managed by a combination of control tactics. In most years, populations are moderated by weather conditions, fall tillage and biological agents. When these fail, pesticide sprays are used to control outbreaks.

Root maggots, *Delia* species, are considered a significant pest of canola primarily in Alberta. The insect has one or two generations a year. The larvae feed on the roots of canola plants causing direct damage by tunnelling into the root and also through secondary infections from plant pathogens. Heavy infestations can shorten the flowering period, cause plant lodging and reduce yields. A survey of canola fields from 1995- 1997 indicated that root maggot populations were endemic throughout the region surveyed (Soroka *et al.* 1997). However, damage to roots, based on a rating system (Dosdall *et al.* 1994) was most significant in Alberta and to a lesser extent in Saskatchewan and Manitoba. Controlling the maggot in canola is difficult. Cultural control appears to be the best strategy at present. Increased seeding rates, tillage prior to seeding and control of cruciferous weed species can lessen the impact of maggots. Although some early-season control is obtained from in-furrow application of granular insecticides, there are no registered insecticides for control of maggots later in the season.

Emerging pest of canola include lygus bugs (*Lygus* spp.), grasshoppers (Acrididae) and cabbage seed pod weevil (*Ceutorhyncus assimilis*). Lygus bugs have been reported in only isolated areas of the canola growing area of western Canada (WCCP 1995). In 1997, lygus bug infestations in canola have increased in severity, with insecticide applications required for its control in Alberta and Saskatchewan. Lygus bug infestations are more common in alfalfa but the infestations in canola may require more attention in the future. Grasshopper populations have been relatively low over much of western Canada in the 1990's. However, as canola production expands into the more arid regions, it is anticipated that producers are going to be faced with grasshopper management issues in canola. The cabbage seed pod weevil was recently discovered in an isolated area of Alberta in 1996. By the summer of 1997, weevil populations were found in canola throughout the surrounding area. The weevil is a serious pest in northwest USA, where pesticide sprays are the primary method of control. The life cycle of the weevil is well synchronized with winter canola. However, recent developments in fall-seeded canola, which emerges early, may provide the synchrony required for infestations of the cabbage seed pod weevil in the future.

Concluding Remarks

An identifiable pest management focus at Saskatoon provides a single-source delivery of crop protection technology for the canola industry (producers, extension, agro- chemical) in the area of crop protection. The Saskatoon Research Centre is central to the production of oilseed crops in western Canada and provides a regional support to the industry .

Current insect pest management practices include monitoring, assessing risk, forecasting damage potential, and cultural and chemical control methods. The overall aim of the pest management group is to address the industry's desire to remain competitive and sustainable, and society's desire to reduce the negative impact of agricultural pesticides on the environment.

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