Impact of Insect Pests on Canola Production

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Introduction

In a recent survey of growers in the province, low canola yields in 1994 and 1995 were attributed to several factors including inclement weather, diseases, weed problems and insect damage (Brandt 1996). In this paper, we will discuss the impact of key insect pests on canola production, crop losses from insect damage in 1994-95 and prospects for damage in 1997. Crucifer root maggots are discussed elsewhere so this paper will focus on flea beetles, diamondback moth and bertha armyworm.

Canola Yields

In order to assess the impact of insect pests on canola production, it was important to identify areas in the province where canola yields were below average. Average yields in each rural municipality between 1986 and 1995 were obtained from Saskatchewan Agriculture and Food. Yields in 1994 and 1995 were then compared with the IO-year average using a GIS software package (POTMAP™ module, SPANS™; Tydac Technologies).

In 1994, canola yields were below average in several regions of Saskatchewan (Figure 1). Yields were abnormally low in the northwest where conditions were very dry. Yields were also below average in the north east and eastern regions of the province where above-average precipitation occurred. In 1995, below average yields occurred throughout most of the canola-growing region. Yields were below average in the northwest where drought conditions occurred during May and June. Abnormally low yields also occurred in east-central and south-east regions where spring moisture and precipitation were above average.

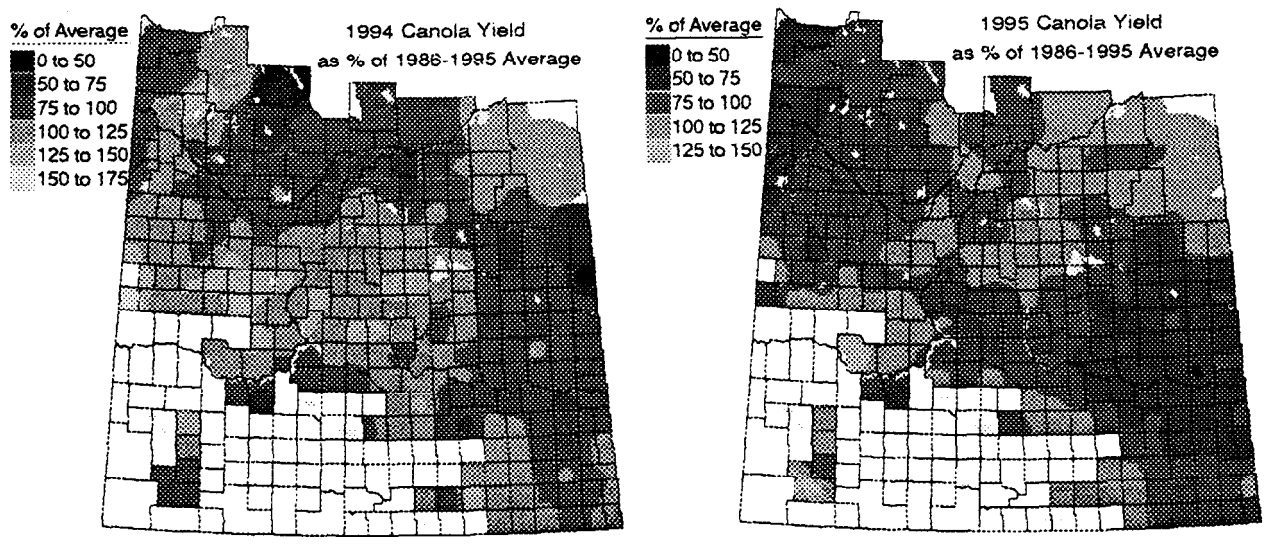

Figure 1. Canola yields in Saskatchewan in 1994 and 1995.

Flea Beetles

Flea beetles including the crucifer flea beetle, *Phyllotreta cruciferae,* and striped flea beetle, *P. striolata, are the* most serious pest of canola in regions of central and eastern Saskatchewan (Burgess 1977). Adults overwinter in non-crop areas and migrate into emerging canola fields in May and June. Feeding damage to young seedlings results in poor crop establishment, reduced plant growth, delayed maturity and lower seed yields. Larvae also feed on root hairs causing reduced plant vigour and seed yield. Cultural practices and natural control agents provide limited regulation of flea beetle populations (Burgess 1980) so producers are reliant on chemical control. Most seed is treated with an insecticide-fungicide mixture which provides protection from flea beetles for about 7-10 days after seedlings emerge. Granular insecticide may also be applied in-furrow during planting. The insecticide is absorbed by the roots and translocated to the leaves where it provides control and protection for about 2-3 weeks after emergence. A field spray may be required when more than 20% of the leaf surface is damaged by flea beetles. Lamb and Tumock (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. Compared with untreated seed, yield in Argentine canola increased by 10% with a seed treatment alone and by 21% with a seed treatment and granular insecticide.

No reliable procedures are currently available to estimate flea beetle populations. Traps baited with ally1 isothiocyanate are used to collect flea beetles in early spring and to identify overwintering sites. However, the traps are not effective when placed near canola plantings. At the Research Centre, we have been assessing flea beetle damage to seedlings grown from untreated and treated seed to estimate the abundance

of flea beetles, impact of damage on agronomic performance and yield improvements with different levels of pesticide inputs. Assessments are done cotyledons and true leaves roughly 21 days after planting. Damage ratings in Argentine canola varied greatly between 1991 and 1996 (Figure 2). Damage exceed economic injury levels in 1991, 1992, 1993 and 1996.

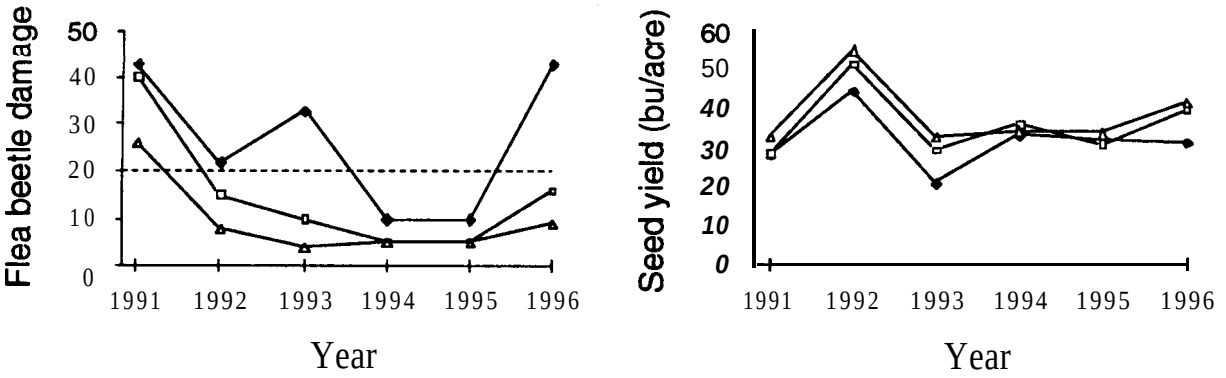

Figure 2. Estimated flea beetle damage and seed yield of Argentine canola grown with different pesticide inputs at Saskatoon, 1991-1996. Dotted line shows economic injury level for spraying. Symbols: untreated —◆—, seed treatment —□—, seed treatment and granular insecticide -A-.

However, damage in 1994 and 1995 averaged less than 10%. Results suggest that flea beetle populations declined markedly in 1994, remained low in 1995 and increased sharply in 1996. If similar fluctuations occurred in other regions of the province then flea beetles had relatively little effect on canola production in 1994 and 1995. Comparison of seed yield in plants grown from untreated and treated seed support this conclusion. However, the rapid increase in damage and high populations of flea beetles in the fall of 1996 suggest that canola crops will be at considerable risk to flea beetles in 1997. If comparable data could be obtained in varietal tests throughout the province then forecast maps could be prepared to identify areas at most risk to flea beetles.

Diamondback Moth

Diamondback moth, *Plutella xylostella,* is a sporadic pest of canola and mustard (Anonymous 1995a). The insect can over-winter to only a limited extent at northern latitudes (Dosdall 1994) so infestations result primarily from migrant moths carried on winds from the southern U.S.A. in May and June. The insect is multivoltine and under favourable conditions may undergo two or three generations per growing season. Diamondback larvae are relatively small (<1.3mm in length) so canola plants can tolerate high populations on the foliage before yield is affected. However, when leaf senescence begins in July, second generation larvae feed on floral parts and surface or tips of seed pods. The damage reduces seed-set, pod-fill and predisposes pods to

shattering. The action threshold for applying insecticide is lower when damage occurs during the early flowering stage than during the advanced pod stage (Anonymous 1995a). Population increases are limited by cool wet weather, a pathogenic fungus and several species of parasitic wasps.

Diamondback moth had a major impact on canola production in Saskatchewan in 1995. Chemical sprays were applied to approximately 1.3 million hectares (WCCP 1995). Infestations were highest in southeastern Saskatchewan between the U.S. border and Indian Head where some fields required two treatments. Infestations were also high between Regina and Davidson, around Saskatoon and in the Kindersley-Rosetown district. Control costs and reductions in yield or grade in untreated fields were an estimated $180-200 million. Prospects for damage in the current year will depend on prevailing winds during May and June. A monitoring system utilizing pheromone-baited traps will be initiated in 1997 to provide early detection of immigrant moths in western Canada.

Bertha armyworm

Bertha armyworm, *Mamestra configurata* Walker, is a sporadic pest of canola and flax in Saskatchewan (Anonymous 1995b). Rapeseed, mustard, and alfalfa are also susceptible to attack. However, in most years, populations are kept in check by weather conditions, fall tillage and biological agents. The insect has only one generation per year and overwinters as a pupa in the soil. Depending on temperatures, adult moths emerge from mid-June until early August. The moths are nocturnal and appear to be attracted to canola fields that are in bloom (Tumock 1984). Eggs are laid in clusters of 20-200 eggs on the underside of leaves and hatch within a week. Young larvae are pale green whereas older larvae are variable in colour ranging from dark green to brown or black. Larvae require about six weeks to complete development. The last two larval stages are the most destructive, feeding on leaves, flowers, stems and nutrient-rich seed pods when leaf senescence begins (Bracken and Bucher 1977). Therefore, it is important to inspect fields before the larvae reach these stages. Depending on spray costs and canola prices, a chemical spray is advised when populations reach 10 to 35 larvae per square metre (Anonymous 1995b)

Bertha armyworm had a major impact on canola production in Saskatchewan over the past three years. Chemical sprays for control of larvae were applied to roughly 150,000 hectares in 1994, 650,000 hectares in 1995 and 300,000 hectares in 1996 (WCCP 1995, 1996). Crop losses in the three years were estimated to be $7-9 million, $30-40 million and $15-20 million, respectively. Damage in 1994 occurred primarily in southeastern Saskatchewan extending from the U.S. border to Kamsack

and as far west as Lampman. Early detection of infestations is critical to minimizing crop damage so a federal-provincial program was initiated in 1995 to monitor Bertha armyworm throughout western Canada. Traps, baited with sex pheromone, were placed in canola fields to estimate populations of male moths. The monitoring program identified areas where populations were high and alerted producers that fields should be inspected for evidence of larval feeding activity. Moth counts in 1995 were highest in southeastern Saskatchewan, northwest of Regina and west of Saskatoon (Figure 3). In these areas, cumulative counts averaged more than 1500 moths per trap. In 1996, infestations expanded and were highest in southeastern

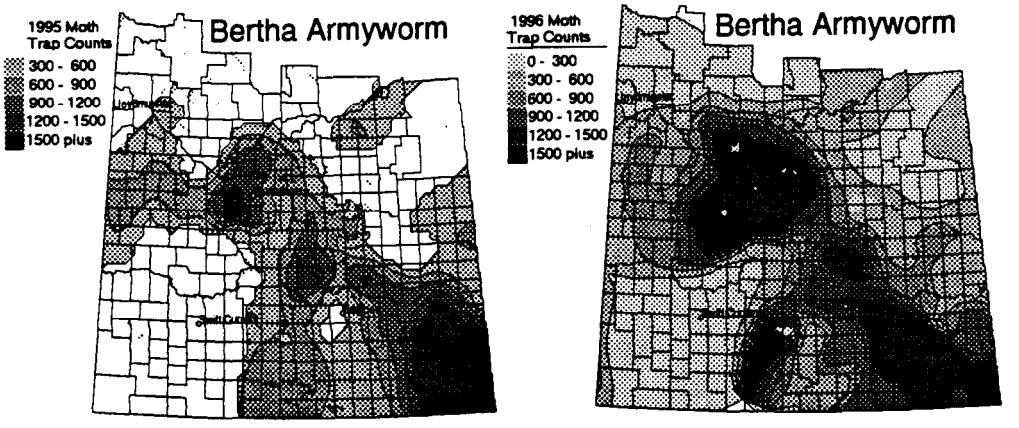

Figure 3. Cumulative moth counts of bertha armyworm in Saskatchewan in 1995 and 1995.

Saskatchewan and around Saskatoon. These areas are potentially at greatest risk to damage in 1997. However, damage will depend on the overwintering survival of pupae, weather conditions during egg-laying and effectiveness of natural agents such as a parasitic wasp, polyhedrosis virus and pathogenic fungus. These agents along with populations of Bertha armyworm will be monitored in 1997.

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