XX CABBAGE SEEDPOD WEEVIL TRIAL

Objective: To evaluate the effectiveness of management tools, such as seeding date, seeding rate and insecticide application, in minimizing cabbage seedpod weevil damage.

Background: ***History:*** The cabbage seedpod weevil (***Ceutorhynchus obstrictus***) was first introduced into the lower mainland of British Columbia from Europe in the 1930's. From there, the insect spread into the Pacific Northwest region (PNW) of the United States. Up until 1995, with the exception of a few reports of spraying for the weevil in the Creston valley of British Columbia, it was believed that the insect remained isolated in the PNW region. Yield losses in the Pacific Northwest from the weevil have been as high as 35 %. In 1996, the larvae of the weevil were found feeding on seeds during an examination of pods at the Lethbridge Canola Production Centre (Canola Council Agronomist: Doug Moisey). Bob Byers and Rick Butts of Agriculture Canada later identified the larvae as ***Ceutorhynchus obstrictus***. Since 1996, pod weevil numbers have steadily increased. According to Alberta Agriculture surveys, the weevil has spread as far north as Olds, Alberta and as far east as Medicine Hat, Alberta. In 2000, seedpod weevils were identified in southwestern Saskatchewan.

Life Cycle: The cabbage seedpod weevil attacks plants within the ***Brassicaceae*** family. In the early spring over-wintering adults emerge and begin feeding on stinkweed, flixweed, volunteer canola and wild mustard. The weevils begin to move into the fields once canola reaches the bud stage. Damage is inflicted by both adults and larvae. The adult weevils first feed on the flower by piercing the centre of the bud. The resulting damage can either be an aborted flower or damage to petals on fertile flowers. Feeding continues until females reach sexual maturity.

Adults then begin to search for developing (1-2 cm long) pods and begin egg laying. Each female will lay between 60 - 70 eggs. Eggs are typically laid on one side of the pod, but can be laid on both sides of the septum. The larvae hatch within the pod and begin to feed on developing seeds. Each larva consumes approximately six seeds. They then burrow out of the pod, leaving an exit hole. Infection of the pod from fungal agents can occur depending on environmental conditions.

Larvae migrate to the ground to pupate in the soil. A week to ten days later emergence of the next generation of adults begins. Under normal conditions these new adults feed on late maturing canola and other host plants. If the crop is delayed in maturity, the new adults will begin feeding on the immature seeds within the pods. The adults extract the nutrients from the centre of the seed leaving an outer shell.

Control: Presently the only control method is to apply an insecticide at early bud or bloom stage. Seed treatments and varietal resistance are being examined.

Methodology: InVigor 2153 was seeded at three rates (1lb/ac, 3lb/ac and 5lb/ac) on two seeding dates. All treatments were doubled. This allowed for spraying if cabbage seedpod weevil populations were above threshold levels. The trial was made up of four replicates in a randomized complete block design. Each of the treatments were monitored over the growing season for weevil populations and exit holes. Emergence traps were set up within each treatment to monitor populations of new adults.

LETHBRIDGE (IRRIGATION)

Methodology: This trial was seeded May 3 and 10. The treatments were sprayed at the 2-leaf stage with a tank mix of Liberty and Select. Duplicate treatments were sprayed with the recommended rate of Matador at 10 % bloom. Three pan traps per plot were set up after crop emergence to monitor over wintering cabbage seedpod weevils entering the field. At pod set, emergence traps were set up in the unsprayed treatments of the trial to monitor numbers of emerging second generation weevils. At harvest, branches, pods and exit holes per pod were counted on 20 plants per plot.

Observations: The early seeded portion of the trial emerged rapidly. The normal seeded treatments did not emerge until an application of irrigation water. Pan trap samples revealed high numbers of over wintering adults. Sweep sampling conducted at bolting, revealed weevil levels at six per sweep, which was above threshold levels of three per sweep. The weevils were feeding on the newly emerging buds. After spraying, sweeps of the sprayed portions revealed no weevils. The unsprayed treatments contained above threshold levels (six per sweep) of the weevil. High temperatures and wind caused blossom blast across all treatments. The early seeded treatments appeared to suffer more. Pod assessment at harvest showed that the sprayed portions of the trial had very few exit holes in the pods. Conversely, the unsprayed portions contained high numbers of exit holes. It was also observed that as seeding rate increased so did the numbers of pods with exit holes.

Results: (a) Plant measurements

CABBAGE SEED POD WEEVIL Lethbridge, AB (Irrigation)					
Treatment	**Emergence Counts (plants/m^2)**	**Harvest Counts (plants/m^2)**	**# Primary Branches**	**# Secondary Branches**	**# Tertiary Branches**
Early Seeding Date					
1lb/ac sprayed	17	17	7	9	1
1lb/ac unsprayed	17	17	6	9	1
3lb/ac sprayed	39	39	5	5	0
3lb/ac unsprayed	44	44	4	4	0
5lb/ac sprayed	104	104	4	1	0
5lb/ac unsprayed	85	83	4	1	0
Normal Seeding Date					
1lb/ac sprayed	27	27	7	9	1
1lb/ac unsprayed	22	22	6	8	1
3lb/ac sprayed	59	59	5	3	0
3lb/ac unsprayed	55	53	4	3	0
5lb/ac sprayed	147	147	4	1	0
5lb/ac unsprayed	150	148	4	1	0
LSD			0.5	1.5	0.2
CV%			7.9	26.7	121.5

Results: (b) Pod Distribution

CABBAGE SEED POD WEEVIL Lethbridge, AB (Irrigation)		
Treatment	**Pods/Plant**	**Pods/ft^2**
Early Seeding Date		
1lb/ac sprayed	172	292
1lb/ac unsprayed	161	274
3lb/ac sprayed	93	362
3lb/ac unsprayed	87	383
5lb/ac sprayed	58	603
5lb/ac unsprayed	58	493
Normal Seeding Date		
1lb/ac sprayed	153	413
1lb/ac unsprayed	144	316
3lb/ac sprayed	85	513
3lb/ac unsprayed	87	479
5lb/ac sprayed	53	779
5lb/ac unsprayed	54	810
LSD	19.0	
CV%	15.5	

Results: (c) Exit Hole data*

Seeding Date	Treatment	Seeding Rate	Mean Number of Exit Holes per Pod
Early	Sprayed	1	0.00 ± 0.00 ***a***
		3	0.01 ± 0.00 ***a***
		5	0.00 ± 0.00 ***b***
	Unsprayed	1	0.02 ± 0.01 ***a***
		3	0.04 ± 0.01 ***b***
		5	0.21 ± 0.02 ***b***
Normal	Sprayed	1	0.01 ± 0.00 ***a***
		3	0.00 ± 0.00 ***a***
		5	0.00 ± 0.00 ***a***
	Unsprayed	1	0.03 ± 0.01 ***a***
		3	0.05 ± 0.01 ***a***
		5	0.05 ± 0.01 ***a***

*Data supplied by Dr. Lloyd Dosdall.
Mean numbers of cabbage seedpod weevil exit holes per pod (± S.E.) for plants of ***B. napus*** seeded at rates of 1, 3, and 5 pounds per acre on early (+ May 2001) and normal (+ May 2001) seeding dates and either treated with foliar insecticide (Matador CS® at 10 g a.i. per ha) or untreated. Letters in the columns within each seeding date and insecticide treatment regime indicate significance of differences among the seeding rates: means having the same letter indicate no significant differences using analysis of variance and Tukey's studentized range test.

Results: (d) Pan Trap / Emergence Trap data*

Seeding Date	Seeding Rate	Weevil Adults	Weevil Larvae
Early	1	21.64 ± 1.74 ***a***	0.12 ± 0.06 ***b***
	3	22.30 ± 2.17 ***a***	1.03 ± 0.37 ***ab***
	5	28.49 ± 2.41 ***a***	1.72 ± 0.47 ***a***
Normal	1	17.00 ± 1.47 ***a***	0.08 ± 0.05 ***a***
	3	24.57 ± 1.67 ***a***	0.22 ± 0.07 ***a***
	5	27.25 ± 2.24 ***a***	0.23 ± 0.09 ***a***

*Data supplied by Dr. Lloyd Dosdall.
Mean numbers of cabbage seedpod weevil adults and larvae (± S.E.) collected per pan trap sampler set among plants of ***B. napus*** seeded at rates of 1, 3, and 5 pounds per acre on early (+ May 2001) and normal (+ May 2001) seeding dates. Letters in the columns within each seeding date indicate significance of differences among the seeding rates: means having the same letter indicate no significant differences using analysis of variance and Tukey's studentized range test.

Results: (e) Yield and quality data

CABBAGE SEED POD WEEVIL Lethbridge, AB (Irrigation)							
Treatment	**Yield (%)**	**Yield (bu/ac)**	**Contribution Margin ($/ac)**	**Oil (%)**	**1000 Kernel Weight (g)**	**Growing Degree Days**	**Days To Maturity**
Early Seeding Date							
1lb/ac sprayed	73	22.1	4.48	42.3	4.4	1136	108
1lb/ac unsprayed	76	23.2	22.65	42.2	4.2	1136	108
3lb/ac sprayed	83	25.3	19.46	42.7	4.3	1065	102
3lb/ac unsprayed	83	25.1	28.11	42.9	4.2	1065	102
5lb/ac sprayed	91	27.5	25.73	42.6	4.3	1009	97
5lb/ac unsprayed	85	25.7	23.92	42.6	4.1	1009	97
Normal Seeding Date							
1lb/ac sprayed	70	21.1	(1.88)	42.3	3.8	1079	99
1lb/ac unsprayed	68	20.7	5.77	41.4	4.1	1079	99
3lb/ac sprayed	103	31.2	58.50	43.3	3.8	1023	95
3lb/ac unsprayed	97	29.6	58.48	43.2	3.6	1023	95
5lb/ac sprayed (check)	100	30.3	53.21	43.4	4.0	1009	94
5lb/ac unsprayed	97	29.5	49.52	42.2	4.4	1009	94
LSD CV%		3.99 12.7		0.82 1.6	0.70 14.5		

Note: Bracket represents a negative contribution margin.

Discussion: Yields differences of 3.99 bu/ac or more are significant. As plant densities increased, the benefits of an insecticide application also increased. Comparing the early 3 lb/ac treatments (sprayed vs. unsprayed), pod exit hole numbers were significantly different. The number of pods per plant were similar, as well as the plants per square foot.

Pan trap and emergence trap data collected show significant differences in weevil populations as seeding rate increased. The highest populations found were in the 5 lb/ac early seeded treatment. A potential reason for higher weevil numbers with increased plant populations relates to pod density. The higher pod densities supply a larger target area for the weevils to feed and lay eggs on. There were more pods per square foot as seeding rate increased (see ***Table b***). The 5 lb/ac normal seeding date had 810 pods/ft^2 as compared to 513 pods/ft^2 in the 3 lb/ac normal treatment.

This is the first year for this study and it will be continued to monitor and assess the merits of seeding rates and dates as a cultural control for the weevil.