Bertha Armyworm: *Mamestra configurata*
Monitoring Protocol

The purpose of this monitoring program is to determine the regional risk of an outbreak in advance before the appearance of the damaging (larval) stage. This gives farmers, agronomists, pesticide suppliers, and others involved in pest management some advanced warning of a potential outbreak, and enables them to place proper emphasis on monitoring for the larvae. It also provides time for agriculture retailers to have the appropriate insecticides in place.

At no time should a decision to use insecticides to control bertha armyworm be made based only on information from the traps for adults of this insect. Such decisions need to be made after later sampling for the damaging (larval) stages of bertha armyworm and determining if the levels of larvae present in the field are above the economic threshold. Weather can affect the success of mating and laying eggs, and many mortality factors could reduce the numbers of eggs and larvae before they develop to the damaging stage.

Host Plants:

Bertha armyworm is a general feeder on broadleafed plants, and has been especially harmful to canola and flax. They also feed on a range of secondary hosts including peas and potato.

Identification, Life Cycle and Damage:

Adult: The adult moths (Figure 1) begin emerging from the overwintering pupae in **early to mid-June and continue until early August**. The moth has a wing span of about 4 cm., and is active only at night. The forewing is predominantly gray, and flecked with patches of black, brown, olive and white scales. There is a prominent, white, kidney-shaped marking near the middle of the forewing, towards the wing margin. White and olive-colored fringe on the forewing is also a characteristic of the species.

Figure 1: Adults- 1-5 days

Figure 2: Eggs- 7 days

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Eggs: Females lay eggs about the size of a pinhead, usually on the underside of the leaves and these are deposited in single layered clusters of 50 to 500 (Figure 2). When first laid, they are white but become darker as they develop.

Larva: Newly emerged larvae are 0.3 cm long, pale green with pale yellowish stripe along each side. The larva has six instar stages and passes through color phases of green and pale brown before becoming large black caterpillars (Figure 3). Mature larvae are 4-5 cm long with a light brown head and a broad pale orange stripe along each side. However, some larvae remain green or pale brown throughout their larval life. Large larvae may drop off the plants and curl up when disturbed, a defensive behavior typical of cutworms and armyworms. Young larvae chew irregular holes in leaves, but normally cause little damage. The fifth and sixth instars cause the most damage by defoliation and seed pod consumption. Crop losses due to pod feeding will be most severe if there are few leaves. Larvae eat the outer green layer of the stems and pods exposing the white tissue. At maturity, in late summer or early fall, larvae burrow into the ground and form pupae.

Pupa:
Bertha armyworms survive the winter as pupae in the ground at depths of 5 to 16 cm. Pupa is reddish brown and about 1.8 in size (Figure 4).

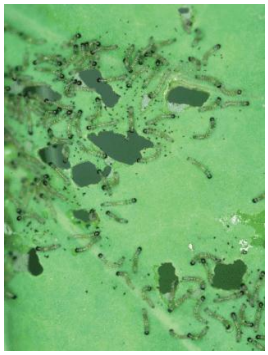

Figure 3: Larvae- 6 weeks

Figure 4: Pupa- overwintering stage

Monitoring

Pheromone Traps for Adult Monitoring- Unitrap:
Adult bertha armyworm moths are monitored using pheromone-baited traps that attract male moths. The number of adults collected by these traps provides an indication of the risk of larval damage. We use the all-green model of the unitrap.

Timing:
First week in June – last week in July. The traps should be checked and the number of moths should be counted once a week.

Site Selection:
Select a canola field in your area. Use two traps per field. The trap should not be placed next to a shelterbelt, steep ditch or within ½ kilometer of a strong light source (such as a farm yard light). **The traps should be located 2 m from the field edge and a minimum of 50 m apart.**

Assembly and Trap Set Up:

1. Place vapona insecticidal strip inside the bucket of the trap, so that the moths are killed when they fly inside (Figure 5). This is an insecticide and should not be handled with bare hands.
2. For new-model traps, there are four holes drilled in the base of the bucket of the trap. Two holes can be used for attaching the trap to the stand, to prevent the trap swinging in the wind.
3. Place the lure into the lure basket, and close using the cap (Figure 6). Do not handle the rubber septum with your hands. Oil from your skin can reduce the effectiveness of the lure. Lures should be stored in sealed containers at temperatures below 0°C until you are ready to use them. Store only lures for one type of insect per container. Wear disposable gloves when handling lures and use a new pair of gloves between handling lures of different types. This will avoid cross-contamination of the pheromones and possible interferences with their attractiveness.
4. Insert the closed pheromone basket into the top of the trap by snapping it into place (Figure 7).
5. **Mount the traps at about three feet off the ground on a sturdy stake**. The trap can either be hung using a wire hangar attached to top that is wired to an “L” shaped metal post (Figure 8) or it can be wired on to a stand (Figure 9).

Figure 5: Pheromone trap components.

Figure 6: Orange pheromone septum lure and lure basket that dispenses the pheromone.

Figure 7: Inserting pheromone lure basket into top of trap.

Figure 8: Hanging trap from top using wire hangar.

Figure 9: Mounting trap on to a stand.

Table 1: Cumulative pheromone trap counts in relation to risk map categories.

Cumulative moth catch	Risk Level	Interpretation
0 to 300	Low	Infestations are unlikely to be widespread, but fields should be inspected for signs of insects or damage.
300 to 900	Uncertain	Infestations may not be widespread, but fields that were particularly attractive to egg-laying females could be infested. Check your fields.
900 to 1200	Moderate	Infestations likely, canola fields should be sampled regularly for larvae and for evidence of damage.
1200+	High	Infestations very likely, canola fields should be sampled frequently for larvae and for evidence of damage.

Larval monitoring:

Generally, **higher moth numbers during mid June-July indicate greater risk of larval damage in July and August**. Larval sampling should commence **once the adult moths are noted**. Sample at least three locations, a minimum of 50 m apart. At each location, mark an area of 1 m^2 and beat the plants growing within that area to dislodge the larvae. Count them.

Data from monitoring adults with pheromone lures indicates regions where more intensive larval monitoring is needed (as indicated in the Table). By about mid-July, the monitoring data should indicate whether there is a risk of larval infestation. Data from larval monitoring is expected to influence pest control decisions.

Economic thresholds

Table 2. Economic thresholds for Bertha armyworm in canola (courtesy Manitoba Agriculture, Food and Rural Initiatives).

	Expected Seed Value - $ / bushel*										
Spraying cost – $ / acre	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
	Number of Larvae / metre² *										
7	20	17	15	13	12	11	10	9	9	8	8
8	23	20	17	15	14	13	11	11	10	9	9
9	26	22	19	17	16	14	13	12	11	10	10
10	29	25	22	19	17	16	14	13	12	11	11
11	32	27	24	21	19	17	16	15	14	13	12
12	34	30	26	23	21	19	17	16	15	14	13
13	37	32	28	25	22	20	19	17	16	15	14
14	40	35	31	27	24	22	20	19	17	16	15
15	43	37	32	29	26	23	22	20	19	17	16

***** Economic thresholds for bertha armyworm are based on an assumed yield loss of 0.058 bu/acre for each larva/metre^2 (Bracken and Bucher. 1977. Journal of Economic Entomology. 70: 701-705).

Under drought conditions, Bertha armyworm larvae will concentrate their feeding on pods by early leaf drop so dividing the above threshold values by a value of 1.48 may provide more appropriate economic thresholds.