Rutgers Cooperative Extension
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Prepared with support from Northeast Region SARE Program Project ENE95-7

BROCCOLI/CAULIFLOWER IPM FIELD GUIDE

Pre-planting Decisions:

1. Use hot water seed treatment and resistant varieties for disease control. Select Fusarium resistant varieties to avoid "Yellows". **(292)****
2. Select dome shaped varieties with tight heads and very small beads for resistance to bacterial soft rot. **(292)**
3. Select fields with good drainage and no history of Fusarium yellows. **(292)**
4. Practice 3 year rotation from cole crops for black rot, Alternaria leaf spot, white rust, downy mildew and sugar beet cyst nematode control; 4 year rotation from cole crops for blackleg control; and 7 years rotation from cole crops for clubroot control. **(26, 292, 601)**
5. Adjust soil pH with hydrated lime to as close to 7 as possible for clubroot control. Improve drainage by making ditches & planting on raised beds. **(292, 421)**
6. Apply lime and fertilizer according to soil test recommendations. **(1584)**
7. Use the information obtained from the previous season's weed scouting to select appropriate control strategies for those weeds. Match preplant incorporated and preemergence herbicides to soil type and percent organic matter in each field. **(292)**

Plant Emergence or Transplanting to Pre-heading (to 9 true leaves)

Scouting procedure: Examine both sides of all leaves of 5 plants in 6 random locations, except where noted otherwise.

Disease	What to Look For	Sampling Method	Sampling Frequency	Threshold	Notes
Black Rot **(29)**	Symptoms appear as v or wedge shaped area, yellow turning brown on the leaf margins, often affecting one side of plant. **(29)**	Look for affected plants while scouting the field for other pests.	weekly	presence	Avoid entry into fields with black rot when leaves are wet. Fixed copper sprays plus Maneb tank mixes at first indication of disease help to limit spread. **(292)**
Pest	**Damaging Stage**	**Sampling Method**	**Sampling Frequency**	**Threshold**	**Notes**
Flea Beetles **(138, 601, 711)**	adults	Pay particular attention to field margins. Count the beetles on plants several feet away, as beetles will jump as you approach. Do not allow your shadow to fall on plants being scouted.	2x/week	50% of plants infested and "shothole injury" present **(526)** OR 1 beetle/plant throughout the field OR 3-5 beetles/plant on 10% of stand **(601)** OR 1 flea beetle/plant up to the 6 leaf stage **(711)**	Spot treat if infestation is localized. Flea beetles transmit Alternaria leaf spot, more important as leaves age & become more susceptible. **(526, 601)** A trap crop of Indian mustard, *Brassica juncea* var. *crispifolia*, every 60 rows successfully controls flea beetles in broccoli & cauliflower in Ontario. **(711)**

Plant Emergence or Transplanting to Pre-heading (to 9 true leaves), continued

Pest	Damaging Stage	Sampling Method	Sampling Frequency	Threshold	Notes
Cabbage Aphids Green Peach Aphids (GPA) Turnip Aphids **(138, 601, 711)**	all	Cabbage aphids have a waxy, gray, cigarette ash appearance. Check field edges especially those upwind from other cruciferous crops/weeds. Look for "hot spots". If aphids are detected, randomly select & examine leaves of 10 plants at 10 sites in field. GPA found primarily on older leaves; CA tends to colonize the youngest, highest and innermost leaves. **(526)**	weekly	2% of plants with ≥ 5 aphids/plant **(526)**	Treat only infested areas of a field, if population is localized. Overuse of pyrethroids kill predators/parasites that help keep aphid populations under control. (292)
Diamondback Moth (DBM), Imported Cabbageworm (ICW), Cabbage Looper (CL) **(31, 32, 33, 601, 711)**	Larva	Scout as outlined above. ICW frequently found lying along side of midrib of leaf. As soon as a larva of any species is found, count plant as "infested". Noting which species is present aids in selecting an appropriate control. Compute % infested by dividing the number of plants infested by the total number of plants sampled.	weekly	20 - 30% of plants infested with any species of caterpillar **(292, 601, 711)**	**Treatment:** Immediately plow down harvested cole crop fields to eliminate the buildup of DBM in crop residues. Larvae must be smaller than third instar for control with Bt insecticides.

Head Formation to Harvest Always check the base of the heads and beneath, if possible, for Lepidopterous larvae.

Pest	Damaging Stage	Sampling Method	Sampling Frequency	Threshold	Notes
Flea Beetles **(138, 601, 711)**	adult	Pay particular attention to field margins. Count the beetles on plants several feet away, as beetles will jump as you approach. Do not allow your shadow to fall on plants being scouted.	weekly	1 beetle/plant or 3-5 beetles/plant on 10% of the field **(601)**	Flea beetles transmit Alternaria leaf spot, important as leaves age & become more susceptible. Flea beetle feeding injury predisposes broccoli heads to soft rot infection. Spot treat if infestation is concentrated on field edges. **(526, 601, 915)**
Diamondback Moth (DBM) Imported Cabbageworm (ICW) Cabbage Looper (CL) **(33, 32, 31)**	Larva	Scout as outlined above. ICW frequently found lying along side of midrib of leaf. As soon as a larva of any species is found, count plant as "infested". Noting which species is present aids in selecting an appropriate control. Compute % infested by dividing the number of plants infested by the total number of plants sampled.	weekly	5 - 10% of plants infested with any species **(601, 711)**	**Treatment:** Immediately plow down harvested cole crop fields to eliminate the buildup of DBM in crop residues.

Head Formation to Harvest, continued

Pest	Damaging Stage	Sampling Method	Sampling Frequency	Threshold	Notes
Aphids including Cabbage Aphids **(138, 711)**	all	In warm, dry seasons scout 5 plants in 6 random locations, checking the southwest borders of fields where aphids often enter and land due to prevailing winds. **(601)**	weekly	After heads begin to form: > 10% of plants infested. **(601)** 2% of plants with ≥ 5 aphids **(526)**	Scout the youngest, highest and innermost leaves. After heads begin to form, look for aphids between florets or curds. Overuse of pyrethroids kill predators/ parasites that help keep populations under control. (**601,** 292)

Scout for diseases while sampling for Lepidopterous pests.

Disease	Sampling What to look for:	Sampling Frequency	Threshold	Notes
Black Rot **(29)**	Symptoms appear as v or wedge shaped area, yellow turning brown on the leaf margins of older leaves progressing upward, often affecting one side of plant. **(29)**	weekly	Presence	Avoid entry into fields with black rot when leaves are wet. Fixed copper with Maneb tank mixes at first indication of disease help to limit spread. **(292)**
Downy Mildew **(601)**	Look for purple specks, which expand into yellow & brown irregular patches. Under moist conditions, short white spore structures can be seen on the undersides of leaf spots. Purple or black spots/blotches appear on the inner curd or floral stems of cauliflower and broccoli. **(601)**	weekly	Presence of disease	Infection of florets may predispose broccoli to head rots caused by soft rot bacteria. **(601)**
Alternaria Leaf Spot **(601)**	Look for tiny yellow specks on the oldest leaves turning brown or black as they grow, developing alternating light & dark concentric rings that give a target-like appearance. Cauliflower curds have sunken, velvety, dark brown spots and broccoli has a brown discoloration that begins at the margins of individual flowers & flower clusters. Look for disease while scouting Lepidopterous pests. This disease usually shows up late in the season. Leaves become more susceptible as they age. **(601)**	weekly	Presence	Disease transmitted by flea beetles. Disease development favored by heavy, late summer dews or rains, which keep the leaves wet for more than nine hours. **(601)**
Head Rot of Broccoli **(915)**	Look for symptoms of water soaking after periods of rain when heads have remained wet for several days and temperatures have remained high (82^{o}F = optimum). Sunken areas of decay develop rapidly when conditions are favorable. Frost damage, flea beetle and tarnished plant bug feeding injury predispose heads to head rot. Some varieties have more tolerance than others. **(292, 915)**	weekly		Select varieties with dome shaped heads with few cavities that would hold water following rainfall.

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***Bolded numbers in parenthesis indicate sources of additional information found in the IPM database by this special reference number.**