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Agri-Food Canada

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Pesticide Use and Pest Management Practices of Canadian Carrot Growers

Findings of the 2005 Crop Protection Survey
conducted by **Statistics Canada**, Agriculture Division
on behalf of **AAFC** – Pest Management Centre,
Pesticide Risk Reduction Program

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Canada

Executive Summary

Canadian farmers use a variety of methods and tools to protect their crops from the effects of weeds, diseases, and insect pests. Pesticides are commonly used in conventional agricultural systems, along with other integrated pest management practices such as: crop rotation, cultivation, forecasting, and the use of biological agents. Although pesticide use is regulated in Canada, very little data are collected regarding how they are actually used. The Crop Protection Survey was a voluntary survey designed to collect baseline data, for the first time, on the quantities and types of pesticide and pest management practices used nationally in 2005. This was a pilot project to determine the feasibility of collecting such information. The survey was conducted from January to March 2006 by Statistics Canada, with funding from AAFC. This paper describes some of the major findings related to pest management in Canadian carrot production in 2005.

In 2005, nearly 90% of the carrot farms in Canada applied pesticides to control insects, diseases and weeds. A total of 69,092 kg of pesticides were applied on 6,055 hectares of carrot-producing farm land in Canada, in 2005. Almost two-thirds (65.1%) of the pesticides applied by weight were fungicides (mainly chlorothalonil and mancozeb). These were applied over 85.2% of the surveyed area. Herbicides were applied over a larger area (91.5%), but represented a smaller percentage (20.9%) of the total kilograms of pesticides applied.

Chlorothalonil – used for the control of carrot leaf blights – was the most commonly used fungicide on carrots in Canada in 2005 (76.1% of the producing area applied this fungicide). Linuron – used for the control of weeds – was the most commonly used herbicide on carrots in Canada in 2005 (89.4% of the producing area applied this pesticide). Phosmet – an organophosphate insecticide, used for the control of the carrot weevil – was the most commonly used insecticide on carrots in Canada in 2005 (42.8% of the producing area applied this pesticide).

The vast majority of Canadian carrot growers used pesticides responsibly; they consistently practiced proper application procedures, such as maintaining low sprayer travel speeds and low boom height. Growers also timed insecticide sprays to correspond with insect development stages for their crop areas and used the tools available to help make spray decisions. These practices reduce the impact of pest control products on the non-target organisms and the environment.

Growers perceived an increase in weeds over 23.4% of the producing area. They also felt that weeds had grown resistant to herbicides. Interestingly, despite this, the intensity of pesticide use was lower for weeds than for diseases or insect pests (only 1.2% of the treatments for weeds were applied over the label rate were used for weeds).

In addition to the use of pesticides, most Canadian carrot growers used a variety of cultural practices to control insects, diseases, and weeds – taking an integrated approach to pest management. The cultural practices used in integrated pest management systems varied by region.

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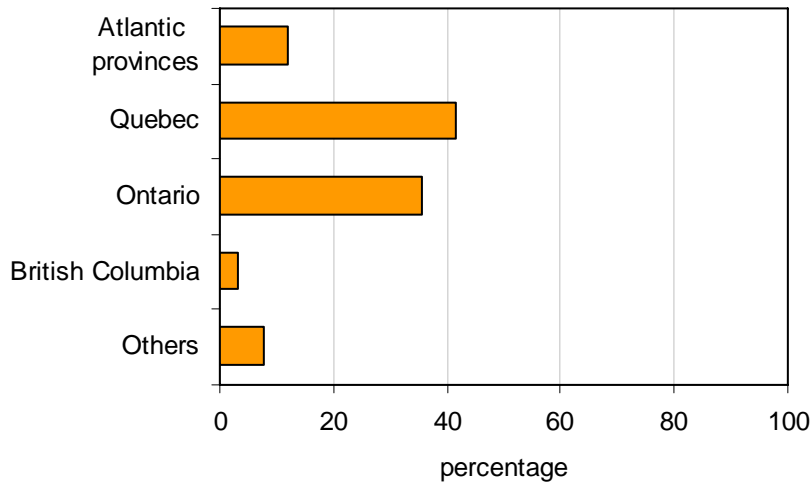
1 Introduction

Agriculture and Agri-Food Canada, in collaboration with PMRA, is working with agricultural stakeholders to reduce pesticide risks by assisting the development and adoption of lower risk pesticides and pest management practices. The Crop Protection Survey was designed and tested to collect data from apple, carrot, and grape growers in Canada as a pilot project to determine the feasibility of collecting information on how the Canadian grower makes pest management decisions. The survey was designed to ascertain if, when, and how crop pests are managed.

According to the Statistics Canada Fruit and Vegetable Survey, 2005, the producing area for carrots in Canada totalled 8,140 hectares in 2005. The production areas are broken down by region (each representing its percentage of the national production area) in [Figure 1](#). The Crop Protection Survey (CPS) for carrots in Canada – the subject of this report – used information from the Fruit and Vegetable Survey to establish some elements of the methodology.

The CPS was conducted from January to March 2006 by Statistics Canada, with funding from Agriculture and Agri-Food Canada. The survey collected information from a representative sample of carrot growers with regard to their crop protection practices for the 2005 growing season. Survey participants reported their pesticide use and integrated pest management practices from a single carrot field on their farms.

Figure 1 Canadian carrot producing area by region, 2005



Source: Statistics Canada, Fruit and Vegetable Survey 2005

2 Methodology

The Crop Protection Survey was conducted by Statistics Canada (STC) for Agriculture and Agri-Food Canada (AAFC), Environment Canada (EC), and Health Canada (HC). A total of 126 carrot producers participated in this voluntary survey, carried out between January and March 2006, and reported information about their pest management practices during the 2005 growing season. Producers, with the help of a trained interviewer, were asked to answer the survey questions with regard to a single field of their operations. A copy of the [questionnaire](#) is available through the Statistics Canada website.

Due to operational constraints, only farms in the Atlantic Provinces, Québec, Ontario, and British Columbia were included in the survey. The survey targeted active Canadian farms with sales of at least \$10,000, according to the 2001 Census of Agriculture. Institutional farms (prisons, colleges, research stations), farms located on reserves, and small farms – contributing to the bottom 5% of carrot producing area for each region – were not included in the survey.

Overall response rate was close to 90%.

A detailed discussion of methodologies associated with the Crop Protection Survey is available in the document “[Pesticide Use and Pest Management Practices of Canadian Apple Growers](#)” SC catalogue no. 21-601-MIE, available on the Statistics Canada website.

3 Results

This section presents significant findings related to the perceptions and decisions of carrot growers regarding pesticide use and other pest management practices in 2005. Detailed statistical tables can be found in [Appendix A – Statistical tables](#). Please note that data was suppressed to conform to privacy requirements when a limited number of responses were available in a given region.

3.1 General Pest Management Practices

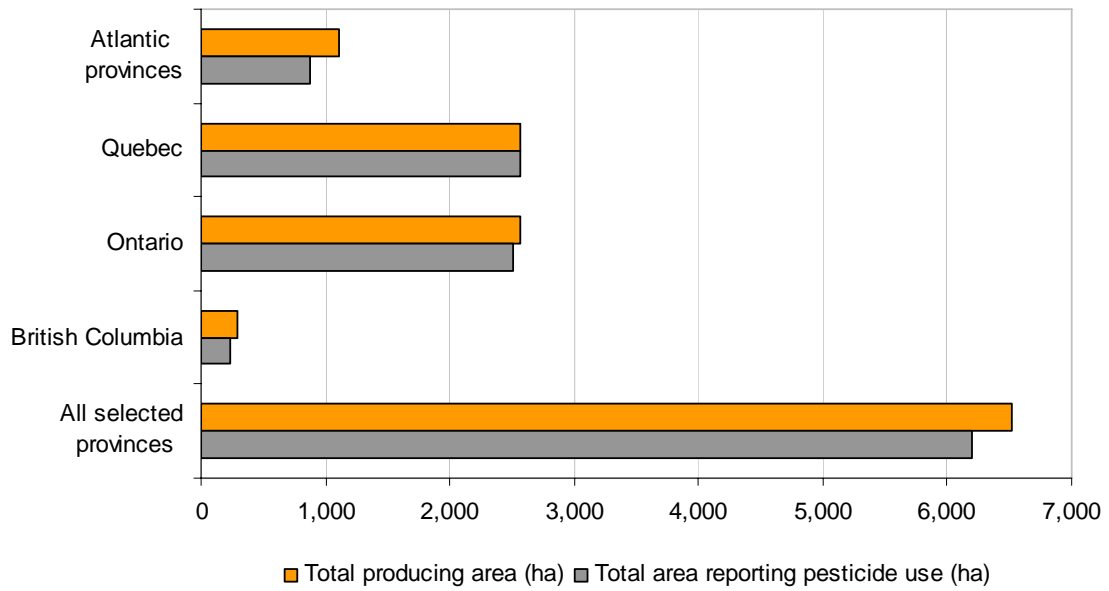
This section presents data relating to all pest types: insects, diseases, and weeds. Details on individual pest types follow in section [3.4 Pest management practices – by pest type](#).

3.1.1 General Pesticide Use

Pesticides are management tools used by growers to control insects, diseases, and weeds on their farms. Pesticides were applied at least once to 92.8% of the carrot growing area in 2005 (see [Table A. 24](#)). This might give an understanding of the importance of this method for crop protection for growers in Canada. British Columbia's pesticide use covered the largest percentage area (93.4%), while Quebec had the smallest (75.9%). Of the 6525 hectares of carrots surveyed, a total of 69,092 kg of pesticide were applied on 6,055 hectares. No pesticides were applied to 470 of the carrot-growing hectares, representing 7.2% of the area covered in the survey ([Table A. 1](#)).

A limitation of these data is that organic farmers (who use non-chemical pest control methods) were not specifically identified in the sample selection, prior to data collection. It is likely that organic growers were under-represented in this pilot survey.

Figure 2 Producing area and total kg of applied pesticide for carrot growers reporting pesticide use, selected provinces¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia

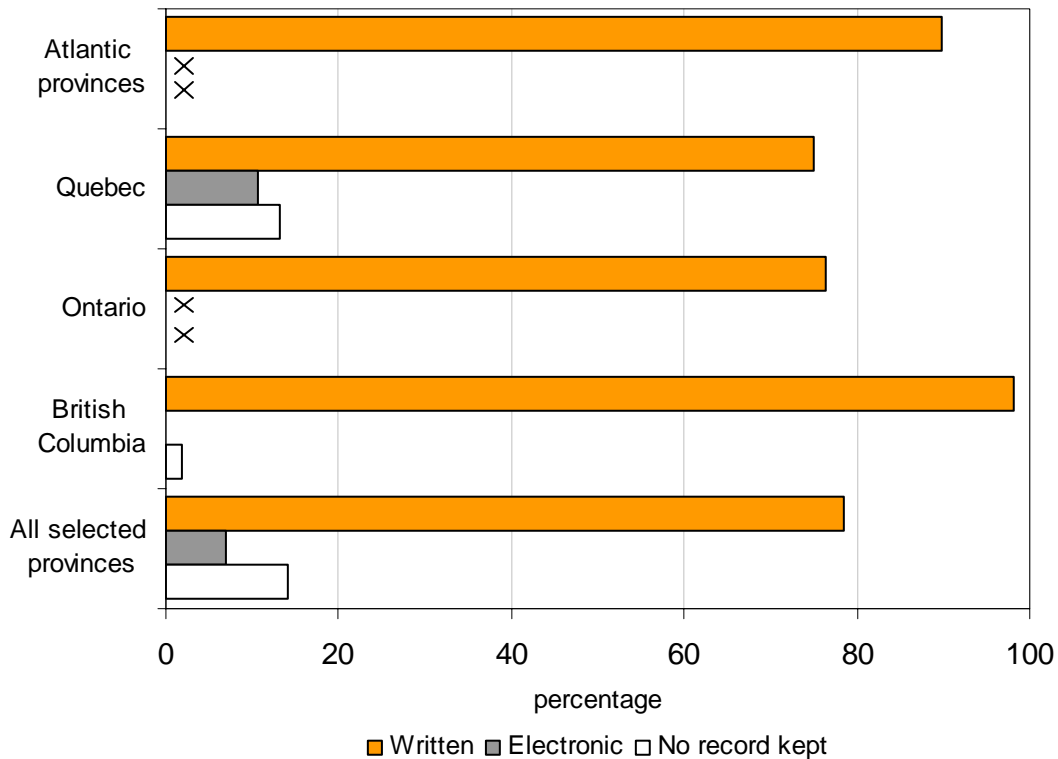
Source: Statistics Canada, 2005 Crop Protection Survey

¹ Based on total number of carrot hectares reporting application of pesticides (6,055 ha)

3.1.2 Spray Record Keeping

Written records of pesticide applications were kept for almost 80% of the pesticide-using producing area (Figure 3). Most farms kept pesticide records in written form, while a few kept electronic records. Most of the producing area for carrots recorded: the date of application (85.2%), identification of the field (86.8%), the total area treated (77.3%), the product applied (88.2%), and the application rate (85.9%) (Table A. 4). It was relatively uncommon for the temperature or wind speed at the time of application to be recorded.

Figure 3 Format used to record pesticide use, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

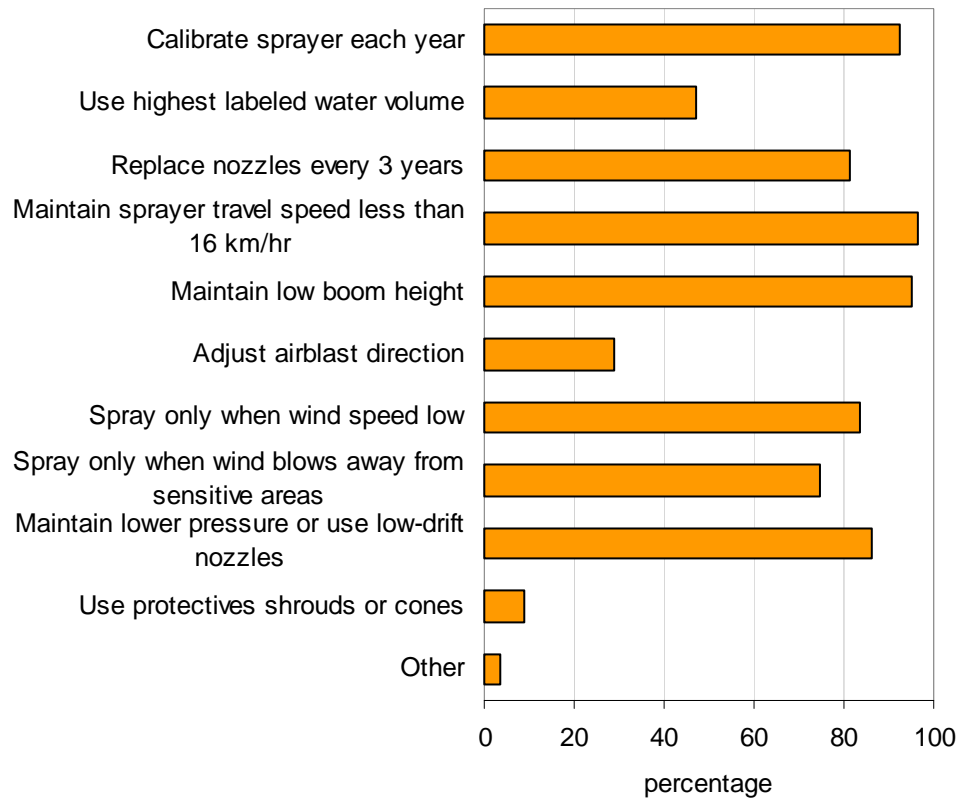
x suppressed to meet the confidentiality requirements of the Statistics Act.

¹ Based on total number of carrot hectares reporting application of pesticides (6,192 ha)

3.1.3 Pesticide spray practices

Pesticide spraying practices influence how much of the product reaches the targeted pests. Growers can maximize efficiency, while reducing risks to human health and to the environment, by exercising a number of different practices. Some of these practices include: applying the correct dosage of the pesticide through calibrated equipment; timing applications to correspond to specific pest developmental stages; using different products in combination; and changing and rotating the family of products used over time. Growers were asked which of 10 such practices they used in 2005. As shown in [Figure 4](#), a number of beneficial practices were commonly implemented on Canadian farms.

Figure 4 Spraying practices, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

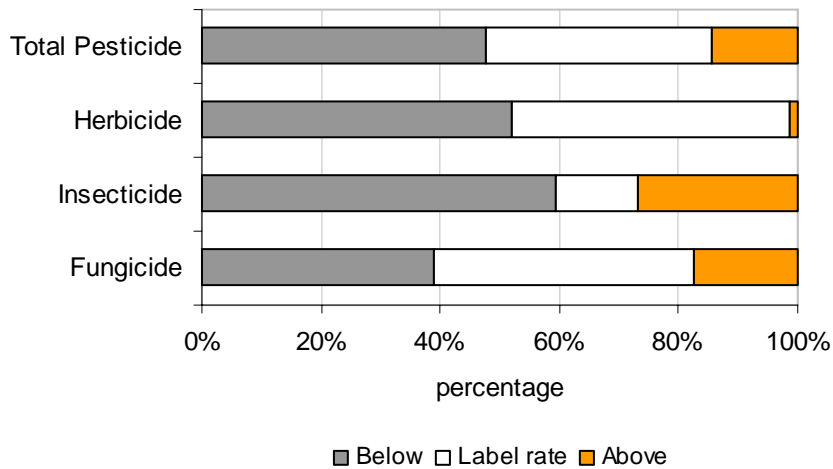
1 Based on total number of carrot hectares reporting application of pesticides (6,192 ha)

3.1.4 Pesticide-use intensity

Figure 5 (below) shows the pesticide application rates on the treated carrot area. Pesticides were applied below the label rate on almost half of the producing area, at the label rate on 38% of the producing area, and above the labelled rate on 15% of the producing area. Insecticides were rarely applied at the label rate: 60% were below and 27% were above the label rate for producing area. Herbicides and fungicides were applied at the label rate on 47% and 43% of the carrot producing area, respectively.

The Canadian carrot farms that applied pesticides did so an average of 2.2 times during the 2005 growing season (Table A. 1). Fungicides, on average, were applied most frequently, at 3.0 times, while insecticides were applied 1.8 times, and herbicides 1.7 times.

Figure 5 Pesticide application rates, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

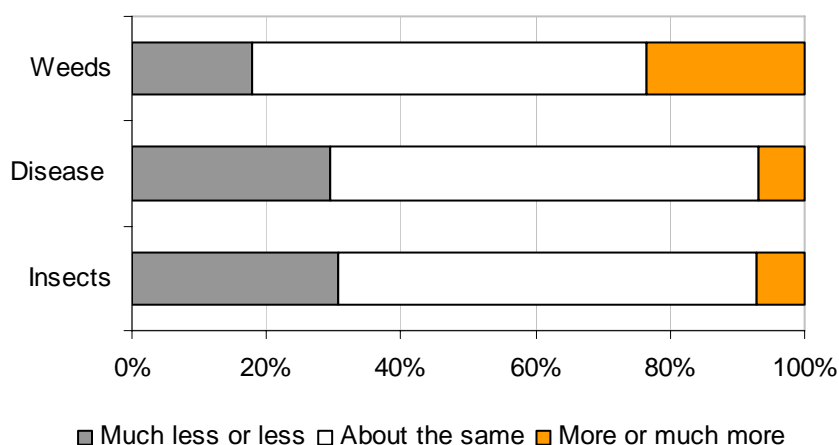
Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total number of carrot hectares reporting application of pesticides (6,055 ha)

3.2 Pest Incidence

Pest changes from year to year are affected by a number of factors. Growers were asked in 2005 to share whether they felt pests were more, less, or about equally prevalent compared to the previous five years. Growers perceived that weeds had shown the greatest increase of the three pest types, with 23.4% of the producing area reporting “more” or “much more” weed pressure. Conversely, diseases and insects reportedly had a lower incidence on 29.4% and 30.8% of the total area, respectively ([Figure 6](#)).

Figure 6 Pest incidence compared to the previous five years, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total number of carrot hectares reporting for incidence of insects (6,395 ha), disease (6,412 ha), and weeds (6,516 ha)

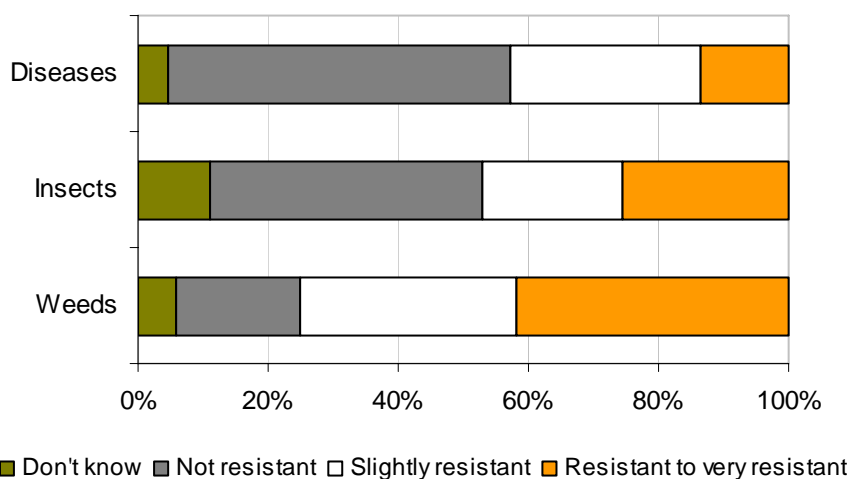
Actions planned for following year to control increased incidence

Growers who reported an increase in weed problems were asked what techniques, both pesticide-dependent and preventative, they would use the following season. Nearly half (48.1%) of the growers in the area surveyed would alter crop rotation; some (16.5%) would increase the rates of herbicide applications; and some (20.1%) would change planting or tillage practices ([Table A. 23](#)). For those with a significant disease problem, carrot growers representing 76.1% of the producing area indicated they would use crop rotation, whereas of growers with a significant insect problem, those that reported they would use crop rotation represented 87.1% of the affected producing area ([Table A. 16](#) and [Table A. 11](#)).

3.3 Pest resistance to pesticides

Most growers noticed resistance issues on their farms for all pest types, but resistant weed populations were most commonly reported (41.8% of area, [Figure 7](#)).

Figure 7 Resistance of pest to pesticide treatment, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

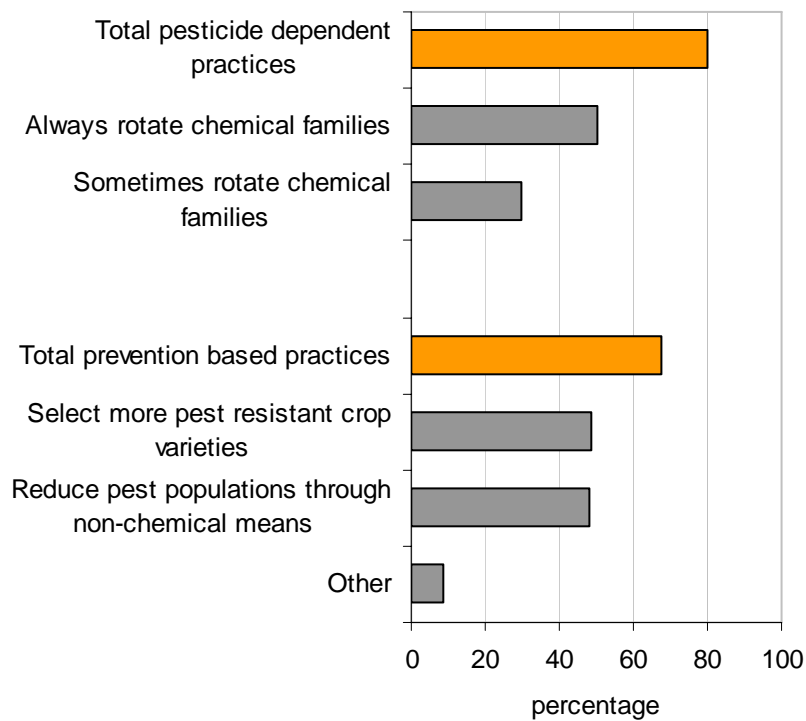
Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total number of carrot hectares reporting for incidence of insects (6,478 ha), disease (6,525 ha), and weeds (6,478 ha)

To reduce the emergence of resistant weeds, pathogens, and insects, growers made use of several different practices. In this survey, growers were asked to identify which pesticide-dependent and basic IPM preventative practices, they used on their farms in 2005.

Growers representing the majority of the carrot producing area (79.9%) used pesticide-dependent practices. On 50.4% of that area, growers “always” rotated chemical families to reduce resistance, and on 29.5% of the area growers “sometimes” rotated chemical families. Prevention-based practices were used on 67.8% of the area. Selecting a more resistant crop variety was practiced on 48.7% of the area, while reducing pest populations through non-chemical means was practiced on 47.9% ([Figure 8](#)).

Figure 8 Practices used to prevent pest resistance to chemical products, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total number of carrot hectares surveyed (6,525 ha)

3.4 Pest management practices – by pest type

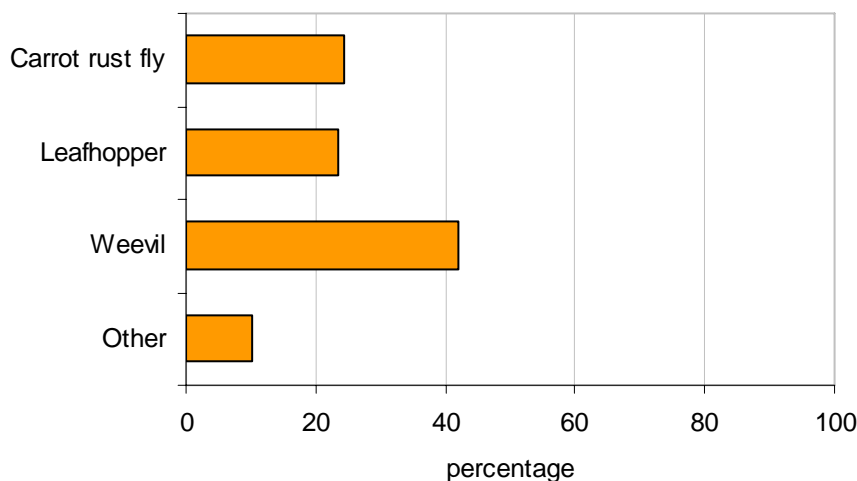
The Canadian and international produce market has high standards and growers must meet consumers' demands for quality products in order to remain competitive. As a result, using a variety of means, growers target pests that cause physical damage to carrots and that limit yield. In this section the control options used by growers are detailed by pest type (insects, diseases, weeds).

The most common tools available to growers are conventional pesticides. These include insecticides for insect control, fungicides to control diseases, and herbicides to control weeds. In this section, approaches involving the use of pesticides are referred to as pesticide dependent practices. Other methods used by growers to control crop pests will be referred to as prevention-based practices. These include frequently used practices (such as selecting pest-resistant crop varieties and disease-free stock) as well as less common practices (such as altering fertilizer or irrigation water levels and releasing or attracting beneficial organisms). Prevention-based management practices have to be well-planned, and results may not be apparent for a couple of years.

3.4.1 Insect Pests

Carrot growers reported that the carrot weevil, carrot rust fly, and leafhopper were the most prevalent insect pests for the selected provinces (Figure 9). Regional differences were apparent; different regions reported higher incidences of different insects. Atlantic provincial growers reported leafhopper as the primary pest over 78.4% of the producing area, whereas 79.2% of the producing area in Quebec reported weevils as their primary insect pest. Ontario had a higher incidence of carrot rust fly than other species, and growers in BC reported other prevalent pests (Table A. 13). New insect pests were reported by only a small portion of the national producing area (2.8%, Table A. 12)

Figure 9 Most prevalent insect, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

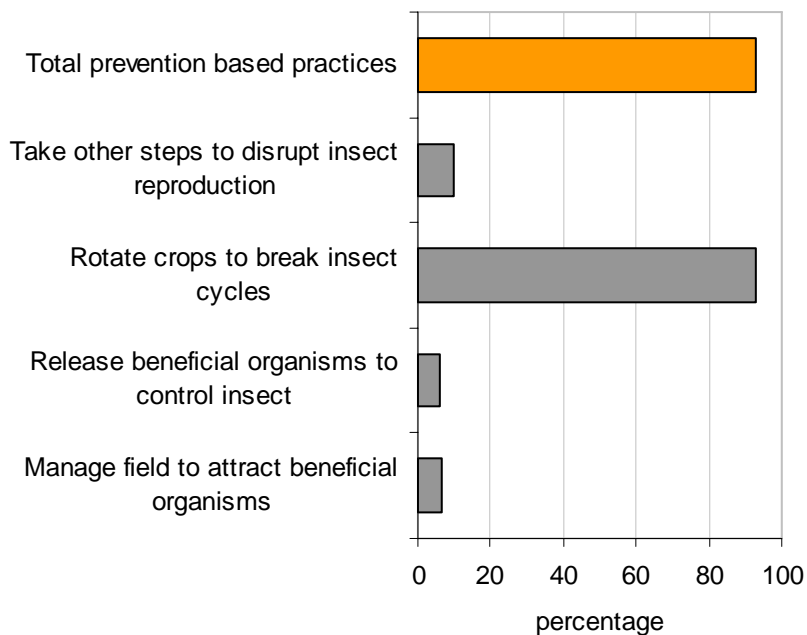
¹ Based on total number of carrot hectares reporting a most prevalent insect (4,810 ha)

Insect control approaches

Growers were asked to indicate which practices they used to control their most prevalent insects. Of the six practices presented to growers in the survey, four were prevention-based practices and two were pesticide-dependent.

Prevention-based practices, often employed as part of IPM strategies, were used on 93.% of the growing area; however, the majority of growers used only one of these practices – crop rotation (Figure 10). Other methods, such as practices that release or attract beneficial organisms, were used minimally.

Figure 10 Prevention-based practices to control the most prevalent insect, selected provinces, carrot producing area¹, 2005



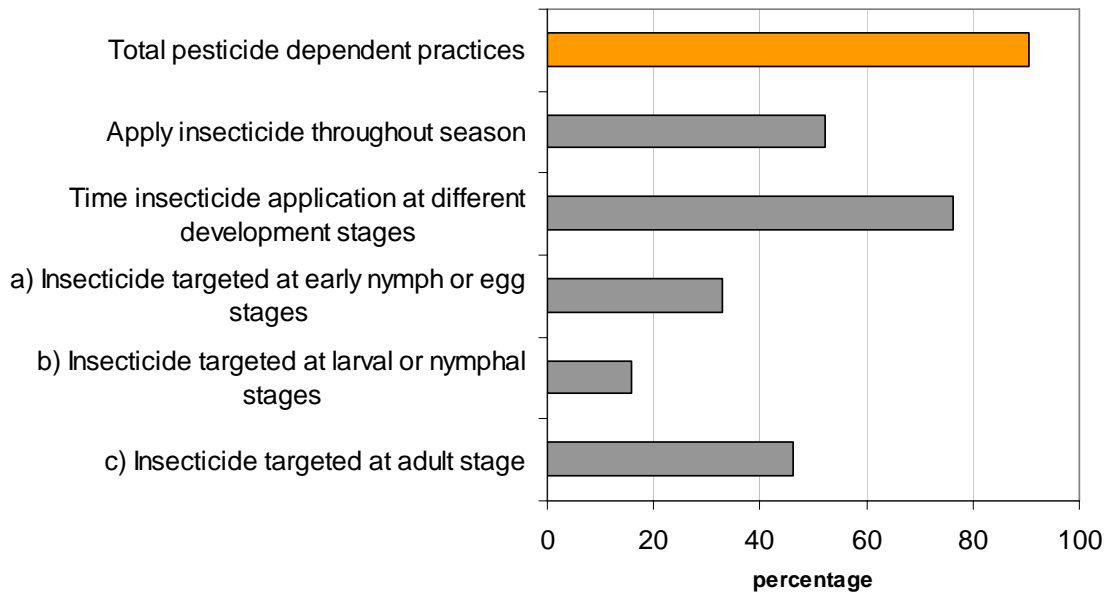
Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total number of carrot hectares reporting a most prevalent insect (4,810 ha)

Pesticide-dependent practices were used by growers on 90.6% of the producing area, targeting specific life stages of pests on 76.2% of the producing area. Insecticides were applied throughout the season on 52.1% of the area (Figure 11).

Figure 11 Pesticide-dependent practices to control the most prevalent insect, selected provinces, carrot producing area¹, 2005



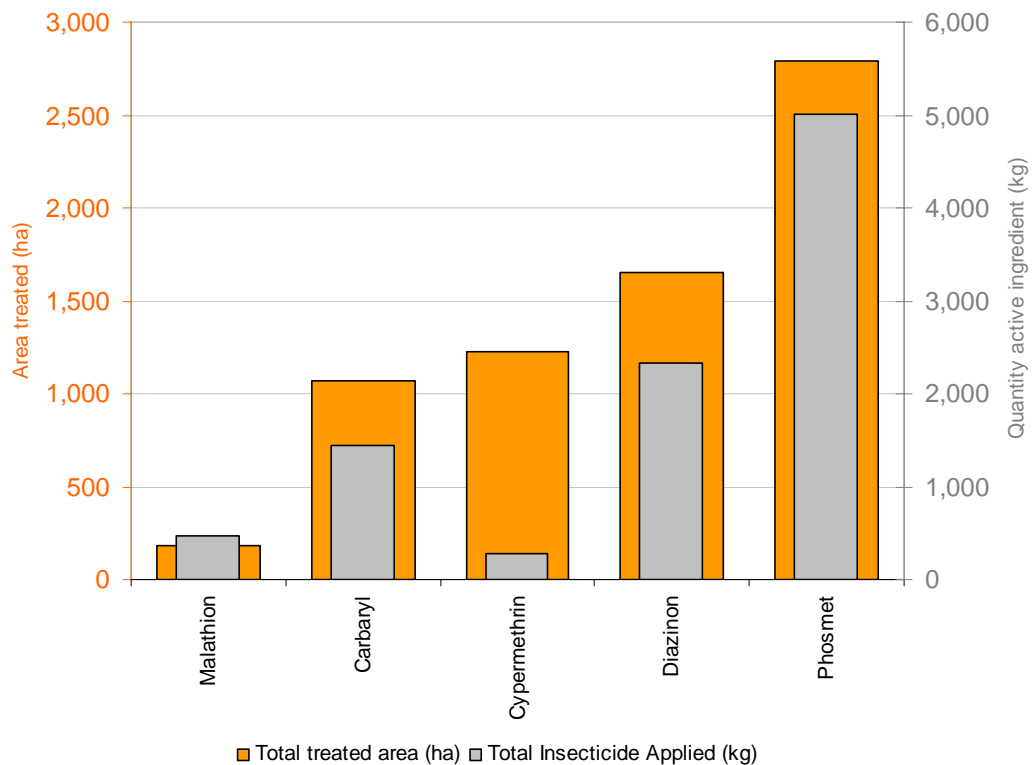
Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total number of carrot hectares reporting a most prevalent insect (4,810 ha)

Growers made use of various insecticides to control different insects in 2005, as shown in Figure 12 . Phosmet (labelled for carrot weevil) was used over the largest area and its active ingredient was the most heavily applied. Cypermethrin (for carrot rust fly) was applied on 18.7% of the producing area, but the actual quantity of applied product (in kg) was very low. Malathion (labelled for imported cabbage worm, cabbage looper, pepper weevil, aphid, spider mite, leaf hopper, cucumber beetle, and flea beetle) was used over a smaller area then other insecticides, but had the largest number of kilograms applied, for the area. Malathion, diazinon, and phosmet are all organophosphates and, though currently registered for these uses, are under re-evaluation by the Pest Management Regulatory Agency (PMRA). Some domestic and agricultural uses for these products have been phased out. Carbaryl, a carbamate insecticide, is also undergoing re-evaluation review by the federal pesticide regulator.

Figure 12 Insecticides most commonly used to control insects, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island , Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total number of carrot hectares reporting use of insecticides (4.596 ha)

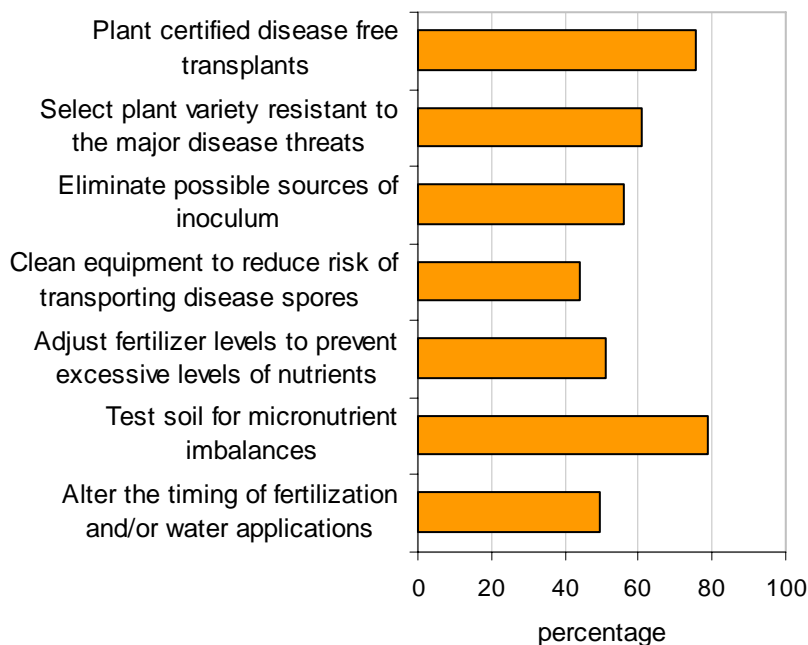
3.4.2 Diseases

Growers representing the majority of the producing area (93.1%) (Table A. 15) observed no significant increase in disease pathogens in 2005. While only 57.6% of the growing area reported a “most prevalent” pest (Table A. 18), 85.2% of the area reported treatment with a fungicide (Table A. 1). Leaf blights (*Cercospora* and *Alternaria*) represented 58.8% of reported diseases (Table A. 18).

Disease Control Approaches

Growers with cropland subject to disease pressure, made use of a variety of prevention-based practices to control problems. Growers managing the greater part of the production area made an effort to test the soil for micronutrients (78.8%), plant certified disease-free seed (75.4%), and select resistant carrot varieties (60.9%, Figure 13).

Figure 13 Practices to control the most prevalent disease, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

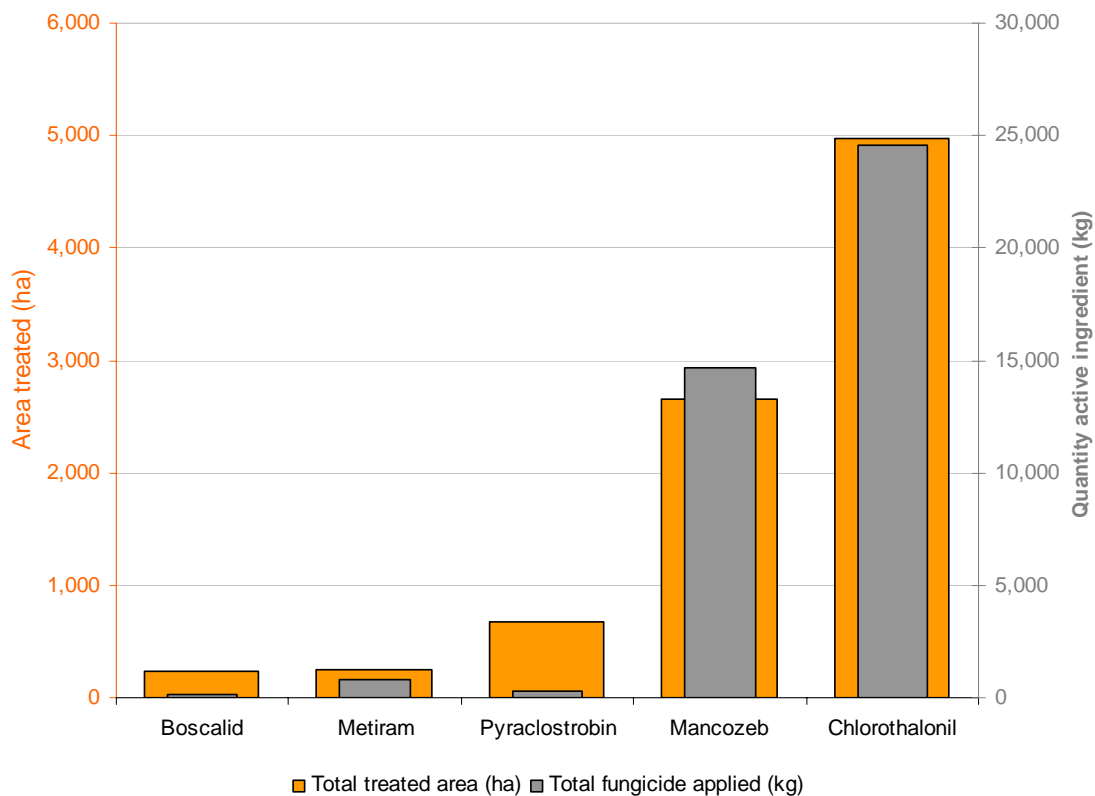
Source: Statistics Canada, 2005 Crop Protection Survey

1. Based on total area for farms reporting a significant disease problem (3,762 ha)

Growers used a variety of methods to decide when to apply fungicides. Scouting reports and thresholds (80.2%) were used on the greater part of the carrot growing area where significant diseases were reported. Climatic conditions (63.6%) and regional forecasting (46.6%) were also important factors taken into consideration for application decisions (Table A. 19).

Fungicides were applied on 85.2 % of the growing area (Table A. 1). As shown in Figure 14, Chlorothalonil was applied over the largest percentage of the carrot producing area (76.1%). Mancozeb was another commonly used fungicide, applied on 40.6% of the carrot growing area in Canada, with an average of 3.2 applications per year. Metiram, pyraclostrobin, and boscalid were also used, but much less commonly than chlorothalonil and mancozeb. Both chlorothalonil and mancozeb are considered to have a low risk of resistance by FRAC (Fungicide Resistance Action Committee). This, together with the appropriate rotation in the used chemical families, may explain the low level of resistance observed by growers.

Figure 14 Fungicides most commonly used to control diseases, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total area reporting application of fungicide (5,561 ha)

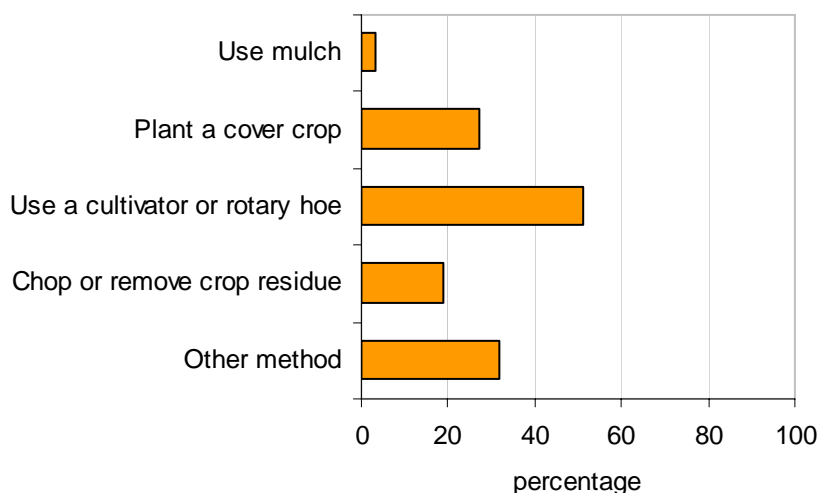
3.4.3 Weeds

Growers reported an increase in weeds on 23.4% of the producing area compared with the last five years (Table A. 22), and also noted a developing resistance to herbicides in the weed populations on 42% of the production area in 2005 (Table A. 9).

Approaches to weed management

Growers were asked which, of 5 prevention-based practices for weed control they used on their farms in 2005. The use of a cultivator or rotary hoe was a popular choice for weed control, with 51.0% of the production area using this technique (Figure 15). The use of cover crops was exercised on 27.4% of the producing area, and chopping or removing residues was practiced on 19.1% for weed management. Other weed management practices recorded include: flame weeding, hand weeding, and mowing to mechanically destroy weeds.

Figure 15 Methods used to manage weeds, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

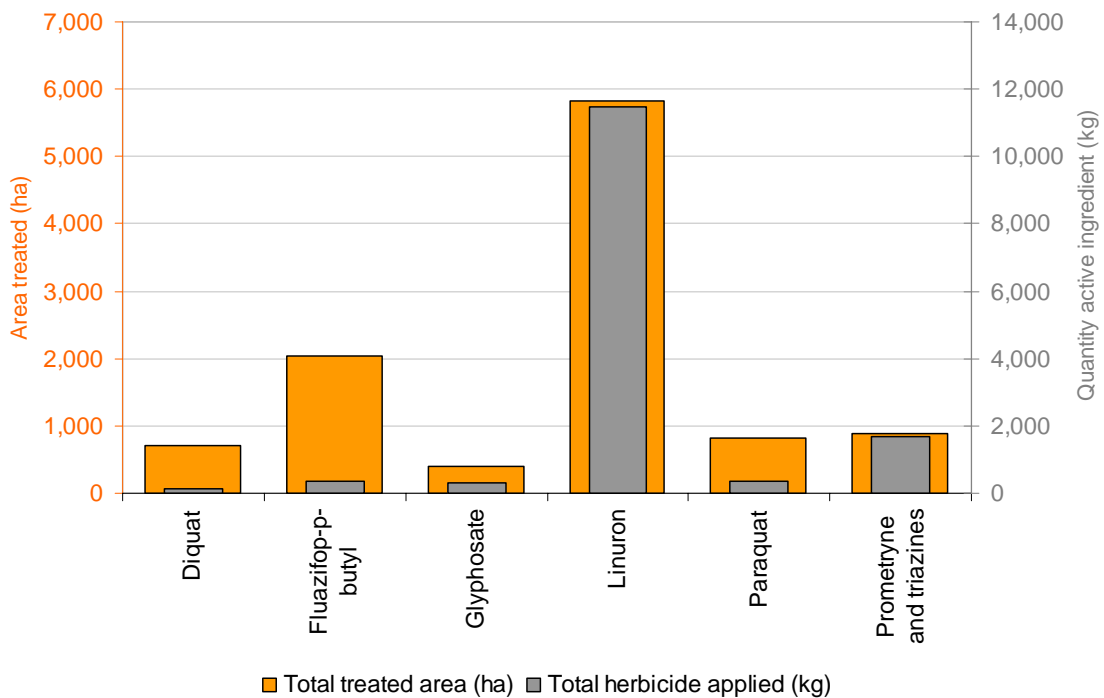
Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total area surveyed area (6,525 ha)

Herbicides

Linuron was the herbicide used most in carrot production in 2005. It was applied to 89.4% of the carrot production area (Figure 16). This percentage is greater than that of the other herbicides combined. Fluazifop-p-butyl was used on 31.1% of the growing area, and all of the applications made were below its labelled rate (Table A. 2). Paraquat, diquat, and glyphosate were used on a small portion of the total growing area. More than half of the applications of herbicides were, on average, below label rates. Despite observations of resistance from the weed population, herbicides were applied above their label rates only rarely.

Figure 16 Herbicides most commonly used to control weeds, selected provinces, carrot producing area¹, 2005



Note: Includes Prince Edward Island, Nova Scotia, New Brunswick, Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total area reporting application of herbicides (5,969 ha)

4 Conclusion

Canadian carrot growers cope with threats to their crops from insects, diseases, and weeds. Growers often make use of an integrated approach to control these pests. The Crop Protection Survey aimed to ascertain how and when such tools were put into practice and revealed the following results.

The Crop Protection Survey found that most of the areas surveyed applied pesticides. Growers participating in the survey kept detailed written records of their spray practices. Their records indicate that Canadian growers in the surveyed area reduce risks by exercising proper spray practices.

With regard to pests, most growers indicated that pest incidences were not much higher than they had been in the previous five years. Growers felt that weeds were becoming resistant to herbicides. Weed management would benefit from a greater number of effective and economically viable products, as this would increase chemical rotation and reduce resistance development within the weed population. According to the survey's results, Linuron was used over a larger area than all other herbicides combined, and its active ingredient was most heavily applied.

Growers, representing approximately 50% of the carrot producing area, indicated that they did not always rotate chemical families. Their disinclination to practice rotation may suggest: a lack of effective, economical, and registered products; a need for greater extension to promote registered alternatives that could be part of rotation; or a lack of concern, given the low percentage area where resistant pathogens and insect pests were observed.

As for prevention-based practices, crop rotation was the most common, and almost exclusively used, practice for the control of insect and disease populations. Crop rotation was less often used for weed management than for other pests. Overall, greater diversity in prevention-based practices may be useful for growers to implement within their carrot production operations.

This survey might have benefited from a larger sample size. The presence of suppressed data makes regional comparisons difficult; when regional differences are available and clearly demonstrated – as they were for “most prevalent insect” – they prove to be quite helpful. Since pests differ regionally, so must management strategies. Accordingly, it would be useful to report on what is currently being used regionally from a chemical and a cultural perspective in order to identify gaps and trends in current practices. These may become apparent through future surveys.

This survey featured detailed questions asking growers how they made decisions about controlling diseases. Similar questions dealing with the management of insect pests and weeds would have provided useful information.

Surveys like this play an important role in determining how the Canadian grower is adapting to changes relating to Canadian pest management issues. Whether new integrated techniques are being successfully implemented will help determine future research needs and potentially improve extension practices.

Appendix A – Statistical tables

Table A. 1 Pesticide use in carrot production, selected provinces¹, 2005

Pesticide types and active ingredients	Farms reporting	Treated area		Average application	Average rate of application	Quantity applied
	number	hectare	percentage ²	number	kilograms per hectare	kilograms
Total herbicides, insecticides and fungicides	1,184	6,055	92.8	2.2	1.1	69,092
Herbicides	1,170	5,969	91.5	1.7	0.7	14,429
Bromoxynil (ester)	32	108	1.7	1.0	0.3	31
Diclofob-methyl	x	x	x	x	x	x
Diquat	124	703	10.8	1.5	0.1	127
Fluazifop-p-butyl	414	2,028	31.1	1.0	0.2	352
Glyphosate	114	410	6.3	1.1	0.7	299
Linuron	1,141	5,832	89.4	2.2	0.9	11,457
Paraquat	158	823	12.6	1.4	0.3	346
Prometryne and triazines	219	877	13.4	1.1	1.8	1,666
Quizalofop p-ethyl	x	x	x	x	x	x
Sethoxydim	32	208	3.2	1.0	0.3	55
Trifluralin	24	69	1.1	1.0	0.9	63
Insecticides	920	4,596	70.4	1.8	0.7	9,680
Carbaryl	128	1,070	16.4	1.6	0.9	1,446
Carbofuran	x	x	x	x	x	x
Chlorpyrifos	x	x	x	x	x	x
Cypermethrin	308	1,223	18.7	2.0	0.1	282
Diazinon	272	1,651	25.3	2.7	0.5	2,330
Lambda-cyhalothrin	105	456	7.0	1.0	0.0	5
Malathion	28	181	2.8	3.3	0.8	468
Naled	x	x	x	x	x	x
Permethrin	33	33	0.5	2.3	0.1	8
Phosmet	512	2,794	42.8	1.5	1.2	5,011
Fungicides	973	5,561	85.2	3.0	1.6	44,983
1,3-dichloropropene	14	80	1.2	1.0	43.9	3,525
Azoxystrobin	10	40	0.6	1.0	0.4	16
Boscalid	27	238	3.7	1.9	0.2	110
Chloropicrin	x	x	x	x	x	x
Chlorothalonil	851	4,968	76.1	3.3	1.5	24,577
Iprodione	15	113	1.7	1.8	0.4	75
Mancozeb	456	2,649	40.6	3.2	1.7	14,688
Maneb	x	x	x	x	x	x
Metalaxyl	x	x	x	x	x	x
Metiram	25	243	3.7	2.3	1.5	829
Pyraclostrobin	64	669	10.2	2.0	0.2	259
Zineb	19	95	1.5	1.0	2.1	202

1. Includes Atlantic provinces, Québec, Ontario and British Columbia.

2. Percentage of total carrot area.

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 2 Pesticide use intensity in carrot production, selected provinces¹, 2005

Pesticide types and active ingredients	Farms reporting number	Quantity applied kilograms	Application rate		
			below	labelled percentage ¹	above
Total herbicides, insecticides and fungicides	1,184	69,092	48	38	15
Herbicides	1,170	14,429	52	47	1
Bromoxynil (ester)	32	31	0	0	100
Diclofob-methyl	x	x	100	0	0
Diquat	124	127	59	41	0
Fluazifop-p-butyl	414	352	100	0	0
Glyphosate	114	299	56	41	2
Linuron	1,141	11,457	44	56	1
Paraquat	158	346	53	47	0
Prometryne and triazines	219	1,666	58	42	0
Quizalofop p-ethyl	x	x	0	100	0
Sethoxydim	32	55	100	0	0
Trifluralin	24	63	72	28	0
Insecticides	920	9,680	60	14	27
Carbaryl	128	1,446	13	87	0
Carbofuran	x	x	0	100	0
Chlorpyrifos	x	x	0	100	0
Cypermethrin	308	282	76	0	24
Diazinon	272	2,330	61	0	39
Lambda-cyhalothrin	105	5	4	43	53
Malathion	28	468	89	11	0
Naled	x	x	0	100	0
Permethrin	33	8	10	85	4
Phosmet	512	5,011	72	0	28
Fungicides	973	44,983	39	43	18
1,3-dichloropropene	14	3,525	100	0	0
Azoxystrobin	10	16	0	100	0
Boscalid	27	110	83	0	17
Chloropicrin	x	x	100	0	0
Chlorothalonil	851	24,577	24	72	4
Iprodione	15	75	0	0	100
Mancozeb	456	14,688	59	0	41
Maneb	x	x	0	0	100
Metalaxyl	x	x	100	0	0
Metiram	25	829	72	0	28
Pyraclostrobin	64	259	71	29	0
Zineb	19	202	0	77	23

1. Includes Atlantic provinces, Québec, Ontario and British Columbia.

2. Percentage of cumulative treated area.

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 3 Format used to keep records of pesticides applied, selected provinces, carrot producing area, 2005

Format used for record-keeping system	Area				
	Atlantic			British	All
	provinces	Quebec	Ontario	Columbia	selected provinces
	hectares				
Written	791	1,919	1,922	230	4,862
Electronic	x	275	x	0	425
No record kept	x	336	x	5	873
Total area for reporting farms	882	2,561	2,515	235	6,192
	percentage				
Written	89.8	74.9	76.4	98.1	78.5
Electronic	x	10.7	x	0.0	6.9
No record kept	x	13.1	x	1.9	14.1

x suppressed to meet the confidentiality requirements of the *Statistics Act*.
Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 4 Information kept in record-keeping system, selected provinces, carrot producing area, 2005

Information kept in record-keeping system	Area				All selected provinces
	Atlantic	Quebec	Ontario	British	
	provinces			Columbia	
	hectares				
Date of application	849	2,031	2,168	230	5,278
Identification of field	836	2,201	2,112	225	5,375
Total area treated	730	1,991	1,840	225	4,786
Product applied	842	2,219	2,168	233	5,461
Rate of application	x	2,219	2,053	x	5,317
Wind speed	496	457	x	x	1,127
Temperature at application	x	465	488	x	1,283
Targeted weed, insect or disease	550	522	1,155	0	2,227
Other information	x	x	461	0	826
Total area for reporting farms	882	2,561	2,515	235	6,192
	percentage				
Date of application	96.3	79.3	86.2	98.1	85.2
Identification of field	94.9	85.9	84.0	96.1	86.8
Total area treated	82.8	77.7	73.2	96.1	77.3
Product applied	95.5	86.6	86.2	99.2	88.2
Rate of application	x	86.6	81.6	x	85.9
Wind speed	56.2	17.8	x	x	18.2
Temperature at application	x	18.2	19.4	x	20.7
Targeted weed, insect or disease	62.4	20.4	45.9	0.0	36.0
Other information	x	x	18.3	0.0	13.3

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 5 Spraying practices used by carrot growers, selected provinces, 2005

Spraying practices	Area				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
	hectares				
Calibrate sprayer each year	x	2,487	2,311	x	6,044
Use highest labeled water volume	x	1,683	826	x	3,088
Replace nozzles every 3 years	x	2,080	2,151	x	5,310
Maintain sprayer travel speed less than 16 km/hr	1,101	2,434	2,515	230	6,280
Maintain low boom height	x	2,384	2,495	x	6,205
Adjust airblast direction	x	1,226	494	0	1,882
Spray only when wind speed low	605	2,367	2,254	230	5,456
Spray only when wind blows away from sensitive areas	x	1,897	2,088	x	4,883
Maintain lower pressure or use low-drift nozzles	1,070	2,024	2,330	207	5,632
Use protectives shrouds or cones around sprayer boom	x	x	377	0	567
Other	0	202	x	x	225
Total area	1,114	2,561	2,565	285	6,525
	percentage				
Calibrate sprayer each year	x	97.1	90.1	x	92.6
Use highest labeled water volume	x	65.7	32.2	x	47.3
Replace nozzles every 3 years	x	81.2	83.9	x	81.4
Maintain sprayer travel speed less than 16 km/hr	98.9	95.0	98.0	80.6	96.2
Maintain low boom height	x	93.1	97.3	x	95.1
Adjust airblast direction	x	47.9	19.3	0.0	28.8
Spray only when wind speed low	54.3	92.4	87.9	80.6	83.6
Spray only when wind blows away from sensitive areas	x	74.1	81.4	x	74.8
Maintain lower pressure or use low-drift nozzles	96.1	79.0	90.8	72.5	86.3
Use protectives shrouds or cones	x	x	14.7	0.0	8.7
Other	0.0	7.9	x	x	3.5

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 6 Practices used to prevent weeds, insects and disease resistance to chemical products by carrot growers, selected provinces, 2005

Practices used to prevent resistance to chemical products	Area				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
	hectares				
Pesticide dependent practices	x	1,973	2,462	x	5,213
Always rotate chemical families	x	1,582	1,290	x	3,290
Sometimes rotate chemical families	x	391	1,173	x	1,923
Prevention based practices	699	1,778	1,668	279	4,423
Select more pest resistant crop varieties	x	1,323	x	x	3,181
Reduce pest populations through non-chemical means	635	1,146	1,089	253	3,123
Other	x	440	x	x	565
Total area for reporting farms	1,114	2,561	2,565	285	6,525
	percentage				
Pesticide dependent practices	x	77.0	96.0	x	79.9
Always rotate chemical families	x	61.8	50.3	x	50.4
Sometimes rotate chemical families	x	15.3	45.7	x	29.5
Prevention based practices	62.8	69.4	65.0	97.7	67.8
Select more pest resistant crop varieties	x	51.6	x	x	48.7
Reduce pest populations through non-chemical means	57.0	44.7	42.4	88.8	47.9
Other	x	17.2	x	x	8.7

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 7 Carrot growers' perception that insects are becoming resistant to insecticides, selected provinces, 2005

	Area				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
Resistance to insecticides perception					
	hectares				
Resistant to very resistant	x	327	1,100	x	1,654
Slightly resistant	x	728	478	x	1,393
Not resistant	541	x	x	x	2,707
Don't know	184	x	x	255	724
Total area for reporting farms	1,114	2,514	2,565	285	6,478
	percentage				
Resistant to very resistant	x	13.0	42.9	x	25.5
Slightly resistant	x	29.0	18.6	x	21.5
Not resistant	48.6	x	x	x	41.8
Don't know	16.5	x	x	89.5	11.2

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 8 Carrot growers' perception that diseases are becoming resistant to fungicides, selected provinces, 2005

	Area				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
Resistance to fungicides perception					
	hectares				
Resistant to very resistant	x	295	366	x	886
Slightly resistant	368	782	745	0	1,895
Not resistant	x	x	x	x	3,452
Don't know	15	x	x	55	292
Total area for reporting farms	1,114	2,561	2,565	285	6,525
	percentage				
Resistant to very resistant	x	11.5	14.3	x	13.6
Slightly resistant	33.1	30.5	29.0	0.0	29.0
Not resistant	x	x	x	x	52.9
Don't know	1.4	x	x	19.2	4.5

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 9 Carrot growers' perception that weeds are becoming resistant to herbicides, selected provinces, 2005

	Area				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
Resistance to herbicides perception					
	hectares				
Resistant to very resistant	x	1,241	1,424	x	2,720
Slightly resistant	538	638	x	x	2,146
Not resistant	366	635	230	7	1,238
Don't know	x	0	x	53	374
Total area for reporting farms	1,114	2,514	2,565	285	6,478
	percentage				
Resistant to very resistant	x	49.4	55.5	x	42.0
Slightly resistant	48.3	25.4	x	x	33.1
Not resistant	32.9	25.2	9.0	2.5	19.1
Don't know	x	0.0	x	18.4	5.8

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 10 Incidences of insects compared to the last five years, carrot growers, selected provinces, 2005

	Area				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
Incidence of insects					
	hectares				
Much less or less	x	x	527	x	1,968
About the same	604	1,256	1,849	260	3,968
More or much more	x	x	132	x	459
Total area for reporting farms	1,088	2,514	2,508	285	6,395
	percentage				
Much less or less	x	x	21.0	x	30.8
About the same	55.5	49.9	73.7	91.0	62.0
More or much more	x	x	5.3	x	7.2

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 11 Actions planned to reduce insect problems by carrot growers, selected provinces¹, 2005

Actions planned for the next growing season	Area ¹				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
	hectares				
Prevention based practices	x	x	132	x	400
Rotate crops to disrupt insect cycles	x	x	132	x	400
Plant a more resistant crop variety	0	x	0	0	x
Take actions to disrupt insect reproduction or development	x	x	82	0	242
Pesticide dependent practices	x	x	x	0	218
Switch to a different insecticide	x	x	x	0	218
Apply an additional insecticide	0	x	0	0	x
Increase rate of insecticide applications	0	0	0	0	0
Other	0	0	x	0	x
Total area for farms reporting increased insect problems	x	x	132	x	459
	percentage				
Prevention based practices	x	x	100.0	x	87.1
Rotate crops to disrupt insect cycles	x	x	100.0	x	87.1
Plant a more resistant crop variety	0.0	x	0.0	0.0	x
Take actions to disrupt insect reproduction or development	x	x	62.1	0.0	52.7
Pesticide dependent practices	x	x	x	0.0	47.4
Switch to a different insecticide	x	x	x	0.0	47.4
Apply an additional insecticide	0.0	x	0.0	0.0	x
Increase rate of insecticide applications	0.0	0.0	0.0	0.0	0.0
Other	0.0	0.0	x	0.0	x

1. For farms that reported having "more" or "much more" insect problems compared to the last five years.

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 12 Carrot growers reporting they had to deal with new insects, selected provinces, 2005

	Area				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
Dealing with new insects					
	Hectares				
Yes	x	x	x	0	185
No	x	x	x	285	6,341
Total area for reporting farms	1,114	2,561	2,565	285	6,525
	percentage				
Yes	x	x	x	0.0	2.8
No	x	x	x	100.0	97.2

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 13 Most prevalent insect reported by carrot growers, selected provinces, 2005

	Area				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
Most prevalent insect					
	hectares				
Carrot rust fly	x	197	856	x	1,177
Leafhopper	578	x	499	x	1,124
Weevil	x	1,412	558	x	2,017
Other	x	x	336	27	492
Total area for reporting farms	737	1,782	2,248	42	4,810
	percentage				
Carrot rust fly	x	11.0	38.1	x	24.5
Leafhopper	78.4	x	22.2	x	23.4
Weevil	x	79.2	24.8	x	41.9
Other	x	x	15.0	63.3	10.2

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 14 Practices to control the most prevalent insect used by carrot growers, selected provinces¹, 2005

Practices to control the most prevalent insect	Area ¹				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
	hectares				
Pesticide dependent practices	x	1,708	2,008	x	4,360
Apply insecticide throughout season	293	466	1,749	0	2,508
Time insecticide application at different development stages	x	1,698	1,323	x	3,665
Insecticide targeted at early nymph or egg stages	x	423	913	x	1,588
Insecticide targeted at larval or nymphal stages	x	309	403	x	768
Insecticide targeted at adult stage	230	946	1,050	0	2,226
Prevention based practices	726	1,580	2,126	42	4,474
Take other steps to disrupt insect reproduction	x	x	123	10	480
Take other action to disrupt insect morphological development	0	0	x	0	x
Rotate crops to break insect cycles	726	1,580	2,126	39	4,472
Release beneficial organisms to control insect	x	x	x	x	297
Manage field to attract beneficial organisms	x	x	x	x	330
Total area for farms reporting a significant insect problem	737	1,782	2,248	42	4,810
	percentage				
Pesticide dependent practices	x	95.9	89.3	x	90.6
Apply insecticide throughout season	39.7	26.2	77.8	0.0	52.1
Time insecticide application at different development stages	x	95.3	58.9	x	76.2
Insecticide targeted at early nymph or egg stages	x	23.7	40.6	x	33.0
Insecticide targeted at larval or nymphal stages	x	17.4	17.9	x	16.0
Insecticide targeted at adult stage	31.2	53.1	46.7	0.0	46.3
Prevention based practices	98.5	88.7	94.6	100.0	93.0
Take other steps to disrupt insect reproduction	x	x	5.5	23.8	10.0
Take other action to disrupt insect morphological development	0.0	0.0	x	0.0	x
Rotate crops to break insect cycles	98.5	88.7	94.6	93.5	93.0
Release beneficial organisms to control insect	x	x	x	x	6.2
Manage field to attract beneficial organisms	x	x	x	x	6.9

1. For farms that reported having a significant insect problem.

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 15 Incidences of diseases compared to the last five years, carrot growers, selected provinces, 2005

Incidence of diseases	Area				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
	hectares				
Much less or less	x	506	x	x	1,888
About the same	917	1,753	1,159	256	4,086
More or much more	x	255	x	x	439
Total area for reporting farms	1,114	2,514	2,508	276	6,412
	percentage				
Much less or less	x	20.1	x	x	29.4
About the same	82.3	69.7	46.2	92.7	63.7
More or much more	x	10.1	x	x	6.8

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 16 Actions plan to reduce disease problems by carrot growers, selected provinces¹, 2005

	Area ¹				All selected provinces
	Atlantic provinces	Quebec	Ontario	Columbia	
Actions planned for the next growing season					
	hectares				
Prevention based practices	x	207	x	0	391
Plant a more resistant crop variety	0	x	x	0	x
Rotate crops to disrupt disease cycles	x	207	x	0	334
Alter soil fertility or water management	0	x	x	0	x
Pesticide dependent practices	0	0	x	0	x
Increase rate of fungicide applications	0	0	x	0	x
Switch to a different fungicide	0	0	x	0	x
Apply an additional fungicide	0	0	x	0	x
Other	0	x	0	0	x
Total area for farms reporting increased disease problems	33	255	151	0	439
	percentage				
Prevention based practices	x	81.3	x	0.0	89.1
Plant a more resistant crop variety	0.0	x	x	0.0	x
Rotate crops to disrupt disease cycles	x	81.3	x	0.0	76.1
Alter soil fertility or water management	0.0	x	x	0.0	x
Pesticide dependent practices	0.0	0.0	x	0.0	x
Increase rate of fungicide applications	0.0	0.0	x	0.0	x
Switch to a different fungicide	0.0	0.0	x	0.0	x
Apply an additional fungicide	0.0	0.0	x	0.0	x
Other	0.0	x	0.0	0.0	x

1. For farms that reported having "more" or "much more" disease problems compared to the last five years. x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 17 Carrot growers reporting they had to deal with new diseases, selected provinces, 2005

	Area				
	Atlantic provinces	Quebec	Ontario	British Columbia	All selected provinces
Dealing with new diseases					
	hectares				
Yes	x	x	0	0	x
No	x	x	2,565	285	x
Total area for reporting farms	1,114	2,561	2,565	285	6,525
	percentage				
Yes	x	x	0.0	0.0	x
No	x	x	100.0	100.0	x

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 18 Most prevalent disease reported by carrot growers, selected provinces, 2005

	Area				
	Atlantic provinces	Quebec	Ontario	British Columbia	All selected provinces
Most prevalent disease					
	hectares				
Blight	x	555	1,053	x	2,212
Other	x	832	605	x	1,550
Total area for reporting farms	715	1,387	1,658	2	3,762
	percentage				
Blight	x	40.0	63.5	x	58.8
Other	x	60.0	36.5	x	41.2

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 19 Tools or methods to make decisions on when to apply fungicides used by carrot growers, selected provinces¹, 2005

Decision tools or methods used	Area ¹				All selected provinces
	Atlantic	Quebec	Ontario	British Columbia	
	provinces	Quebec	Ontario	Columbia	
	hectares				
Calendar spraying	x	284	943	x	1,281
Scouting reports and thresholds	661	1,085	1,273	0	3,018
Regional forecasting / warning services	x	415	1,029	x	1,753
Climatic conditions	512	838	1,044	0	2,395
Advice from other operators	x	x	868	0	1,001
Advice from a chemical sales salesperson	x	431	353	x	808
Other	0	219	x	x	275
Total area for farms reporting a significant disease problem	x	1,387	1,658	x	3,762
	percentage				
Calendar spraying	x	20.5	56.9	x	34.1
Scouting reports and thresholds	92.4	78.2	76.7	0.0	80.2
Regional forecasting / warning services	x	29.9	62.0	x	46.6
Climatic conditions	71.7	60.4	62.9	0.0	63.6
Advice from other operators	x	x	52.3	0.0	26.6
Advice from a chemical sales salesperson	x	31.0	21.3	x	21.5
Other	0.0	15.8	x	x	7.3

1. For farms that reported having a significant disease problem.

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 20 Practices to control the most prevalent disease used by carrot growers, selected provinces¹, 2005

Practices to control the most prevalent disease	Area ¹				All selected provinces
	Atlantic provinces	Quebec	Ontario	Columbia	
	hectares				
Plant certified disease free transplants	512	861	1,462	0	2,835
Select plant variety resistant to the major disease threats	x	775	1,158	x	2,292
Eliminate possible sources of inoculum	359	632	1,118	0	2,109
Clean equipment to reduce risk of transporting disease spores	x	300	1,128	x	1,652
Adjust fertilizer levels to prevent excessive levels of nutrients	359	680	886	0	1,925
Test your soil for micronutrient imbalances	382	1,011	1,572	0	2,964
Alter the timing of fertilization and/or water applications	x	603	1,102	x	1,859
Total area for farms reporting a significant disease problem	x	1,387	1,658	x	3,762
	percentage				
Plant certified disease free transplants	71.6	62.1	88.2	0.0	75.4
Select plant variety resistant to the major disease threats	x	55.9	69.8	x	60.9
Eliminate possible sources of inoculum	50.2	45.6	67.4	0.0	56.1
Clean equipment to reduce risk of transporting disease spores	x	21.6	68.0	x	43.9
Adjust fertilizer levels to prevent excessive levels of nutrients	50.2	49.0	53.4	0.0	51.2
Test your soil for micronutrient imbalances	53.4	72.8	94.8	0.0	78.8
Alter the timing of fertilization and/or water applications	x	43.4	66.5	x	49.4

1. For farms that reported having a significant disease problem.

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 21 Practices for weed management used by carrot growers, selected provinces, 2005

Weed management practices	Area				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
	hectares				
Use mulch	x	x	0	0	221
Plant a cover crop	x	679	639	x	1,787
Use a cultivator or rotary hoe	224	1,304	1,749	50	3,327
Chop or remove crop residue	x	584	579	x	1,243
Other method	x	1,174	875	x	2,082
Total area for reporting farms	1,114	2,561	2,565	285	6,525
	percentage				
Use mulch	x	x	0.0	0.0	3.4
Plant a cover crop	x	26.5	24.9	x	27.4
Use a cultivator or rotary hoe	20.1	50.9	68.2	17.6	51.0
Chop or remove crop residue	x	22.8	22.6	x	19.1
Other method	x	45.8	34.1	x	31.9

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 22 Incidences of weeds compared to the last five years, carrot growers, selected provinces, 2005

Incidence of weeds	Area				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
	hectares				
Much less or less	x	633	88	x	1,157
About the same	896	1,698	1,191	52	3,836
More or much more	x	230	1,287	x	1,524
Total area for reporting farms	1,114	2,561	2,565	276	6,516
	percentage				
Much less or less	x	24.7	3.4	x	17.8
About the same	80.4	66.3	46.4	18.7	58.9
More or much more	x	9.0	50.2	x	23.4

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 23 Actions planned to reduce weed problems by carrot growers, selected provinces¹, 2005

Actions planned for the next growing season	Area ¹				All selected provinces
	Atlantic provinces	Quebec	Ontario	British Columbia	
	hectares				
Switch to different herbicide	0	x	x	0	x
Apply an additional herbicide	x	0	0	x	x
Increase rate of herbicide applications	0	0	252	0	252
Change planting or tillage practices	0	x	153	x	306
Alter crop rotation	0	x	684	x	733
Other	x	x	265	x	608
Total area for farms reporting increased weed problems	x	230	1,287	x	1,524
	percentage				
Switch to different herbicide	0.0	x	x	0.0	x
Apply an additional herbicide	x	0.0	0.0	x	x
Increase rate of herbicide applications	0.0	0.0	19.6	0.0	16.5
Change planting or tillage practices	0.0	x	11.9	x	20.1
Alter crop rotation	0.0	x	53.1	x	48.1
Other	x	x	20.6	x	39.9

1. For farms that reported having "more" or "much more" weed problems compared to the last five years.

x suppressed to meet the confidentiality requirements of the *Statistics Act*.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 24 2005 Crop Protection Survey coverage, carrot growers, selected provinces¹

Data sources	Atlantic	Quebec	Ontario	British	All selected
	provinces			Columbia	
	Farms reporting number				
2006 Census of agriculture	292	396	648	437	2,303
2005 Fruit and Vegetable Survey
2005 Crop Protection Survey	35	84	63	31	213
Farms reporting using pesticides	34	82	61	13	190
Farms with valid pesticide use data	34	82	61	13	190
	Area hectares				
2006 Census of agriculture	1,408	3,274	4,044	290	9,857
2005 Fruit and Vegetable Survey	988	3,375	2,893	251	8,140
2005 Crop Protection Survey	1,114	2,561	2,565	285	6,525
Farms reporting using pesticides	882	2,561	2,515	235	6,192
Farms with valid pesticide use data	882	2,561	2,515	235	6,192
Selected field	389	426	756	72	1,643
	Survey coverage percentage ¹				
Number of reporting farms	12.1	21.1	9.8	7.1	9.3
Carrot area	112.7	75.9	88.7	113.7	80.2
Farms reporting using pesticides	89.2	75.9	86.9	93.4	76.1
Farms with valid pesticide use data	89.2	75.9	86.9	93.4	76.1
Selected field	39.4	12.6	26.1	28.6	20.2

. Not available for any reference period.

1. Compared with the 2005 Fruit and Vegetable Survey for the areas and the 2006 Census of Agriculture for the number of farms.

Source: Statistics Canada, 2005 Crop Protection Survey.