

Pesticide Use and Pest Management Practices of Canadian Grape Growers 2005

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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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, 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 in 2005. This was a pilot project to determine the feasibility of collecting such information. The survey was conducted by Statistics Canada, with funding from AAFC, from January to March 2006. This paper describes some of the major findings related to pest management in Canadian grape production in 2005.

These data represent 536 grape farms, located in Quebec, Ontario, and British Columbia. Although they only represent 31.4% of grape-producing farms in Canada, due to the size of these operations 91.3 % of the grape-producing area is accounted for through this survey. The area represented by each region varied considerably. The surveyed area in Quebec amounted to 186 hectares, while BC totalled 2,263 ha, and Ontario spanned 5,570 ha. Regional differences were evident in all of the survey question categories; however, specific causes for these differences (e.g. climate) are not discussed in this report.

Pesticides are management tools used by growers to control insects, diseases, and weeds on their farms. About 239,000 kg of crop pest control active ingredients were applied to 93.7% of the producing area, although this varied by both the product and the region. Fungicides were applied over the largest area for each province, representing 91.3% of the producing area. They were also the largest source of active ingredient (216,007 kg) applied in 2005. Insecticides were applied over a large percentage area in Ontario (74.9%), but covered a smaller percentage area in British Columbia (30.7%) and Quebec (19.9%). Herbicides were applied over a smaller percentage area in Ontario (50.5%), but used in greater quantity (kg) of active ingredient than insecticides (Figure 2). Both Quebec and British Columbia applied herbicides over a larger area and their herbicide application accounted for more active ingredient than insecticides.

Sulphur, used in the management of powdery mildew was applied to the largest area and represented more kg of active ingredient than all other pesticide applications combined. Mancozeb and captan were also used consistently, largely for downy mildew management. The most common herbicide applied was glyphosate.

Insecticide use varied considerably by province. It was also shown that each region had a distinctive insect pest of greatest concern. In Ontario the most commonly used insecticide by area was permethrin, followed by acetamiprid. The most applied active ingredient, by kg, was carbaryl followed by azinphos-methyl. Azinphos methyl, an organophosphate is being phased out of use in Canada by 2012.

The vast majority of Canadian grape growers used pesticides responsibly: they consistently practiced proper application procedures, with great care to details such as maintaining low sprayer travel speeds; timing insecticide sprays to correspond to insect development stages for their crop areas; and using available tools to help make spray decisions. These practices reduce the impact of agricultural pest management on the environment. In addition to the use of pesticides, some Canadian grape growers used a variety of cultural practices to control insects, diseases, and weeds, resulting in an integrated approach to pest management.

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1 Introduction

Agriculture and Agri-Food Canada (AAFC), in collaboration with the Pest Management Regulatory Agency of Health Canada (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 regarding how the Canadian grower makes pest management decisions. The survey was designed to ascertain if, when, and how crop pests are managed.

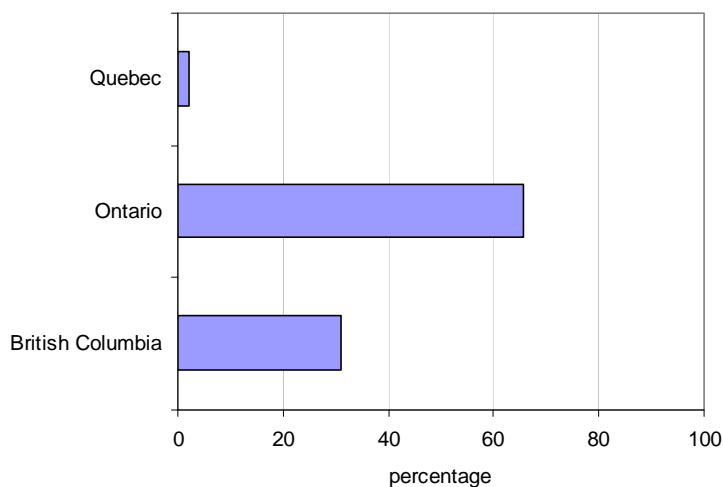
According to the Statistics Canada Fruit and Vegetable Survey, 2005, the producing area for grapes in Canada totalled 8,788 hectares in 2005. The production areas are broken down by region and are presented as a percentage of the national production area in Figure 1. The Crop Protection Survey (CPS) for grapes in Canada – the subject of this report – used information from the Fruit and Vegetable Survey to establish elements of the methodology.

According to the BC Ministry of Agriculture and Land's publication, "An Overview of the British Columbia Wine Industry," over 97% of the grapes grown in 2002 were used for wine production. In Ontario more than 90% of the grape growing acreage was destined for processing, rather than the fresh market, in 2005. This survey, however, does not distinguish between grapes grown for the fresh market and those for wine or other processing.

The CPS was conducted by Statistics Canada, with funding from Agriculture and Agri-Food Canada, from January to March 2006. The survey collected information from a representative sample of grape 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 vineyard on their farms.

Data was collected from larger farms to maximize the surveyed area. Although the number of farms surveyed (536) represents a small proportion of the total number of grape-producing farms in Canada, the area represented by this sample accounts for 91.3% of the crop grown in Canada.

Figure 1 Canadian grape 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 536 grape producers were represented by 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 vineyard of their operations. The survey [questionnaire](#) is available through the Statistics Canada website.

Due to operational constraints, only farms in Québec, Ontario, and British Columbia were included in the survey. The survey targeted active farms in Canada, 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 – which make up 5% of grape 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 at <http://www.statcan.gc.ca/pub/21-601-m/21-601-m2008089-eng.htm>

3 Results

This section presents significant findings related to the perceptions and decisions of grape 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 where only a limited number of responses are available in a given region, data is suppressed to conform with confidentiality requirements.

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”.

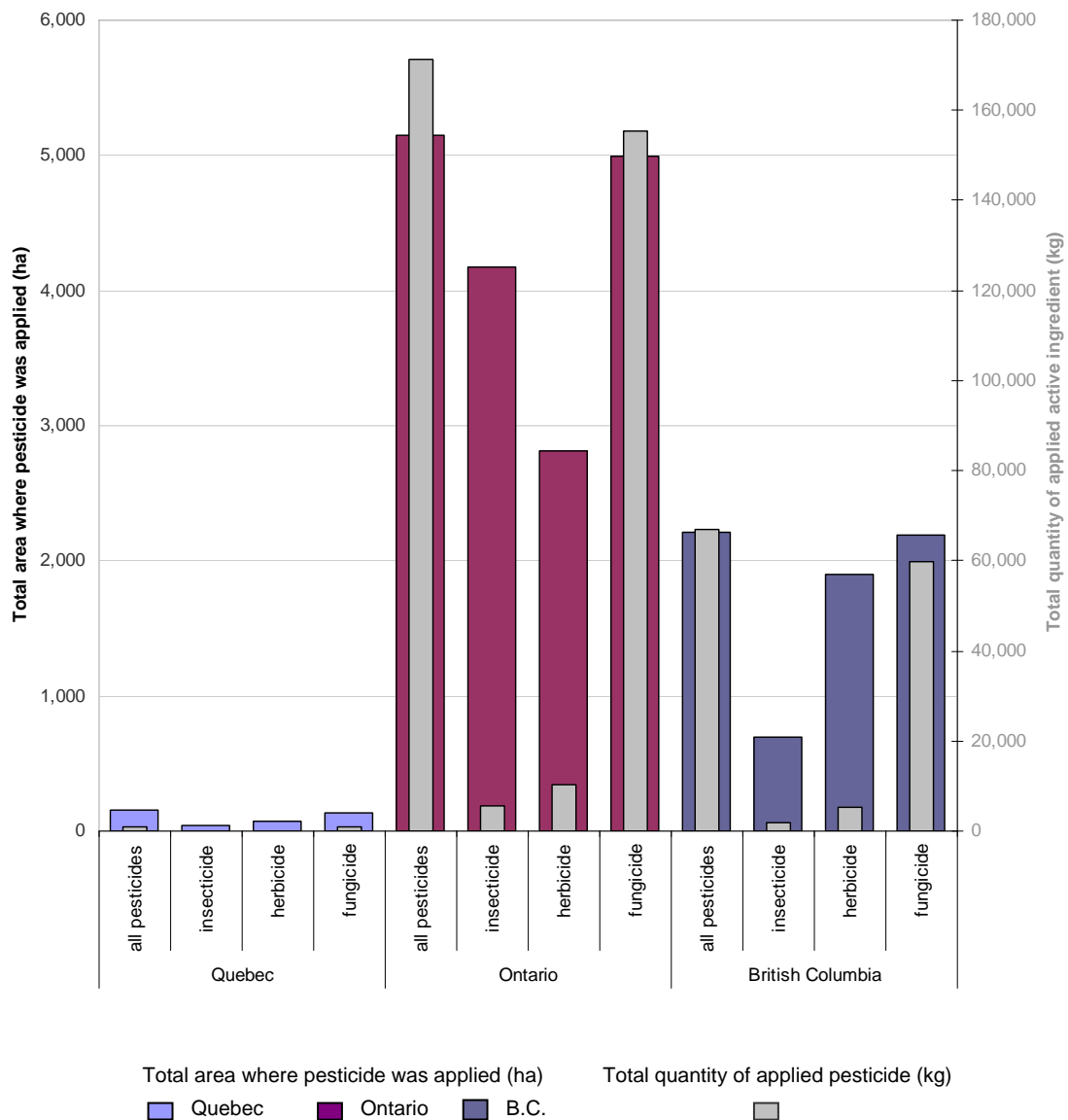
A limitation of these data is that organic farmers using strictly non-chemical pest control methods were not specifically identified in the sample selection, prior to data collection. It is likely that organic growers were under-represented in this pilot survey.

3.1.1 General pesticide use

Pesticides are management tools used by growers to control insects, diseases, and weeds on their farms. A total of 239,290 kg of active ingredient was applied to 93.7% of the grape growing area in 2005 (Table A. 2). Fungicides were applied over the largest area for each province, representing 91.3% of the producing area. Fungicides were also the largest source of active ingredient (216,007 kg) applied in 2005.

Insecticides were applied over a large percentage area in Ontario (74.9%, Table A. 4), but spanned a smaller percentage area in British Columbia (30.7%, Table A. 5) and Quebec (19.9%, Table A. 3). Herbicides were applied over a smaller percentage area in Ontario (50.5% Table A. 4), but used a greater quantity (kg) of active ingredient than insecticides (Figure 2). Quebec and British Columbia applied herbicides over a larger area than insecticides, and their herbicide application accounted for more active ingredient than insecticides.

Figure 2 Total area treated with pesticides and total kilograms of active ingredient applied for grape growers, selected provinces¹, 2005



Note: Includes Quebec, Ontario, and British Columbia

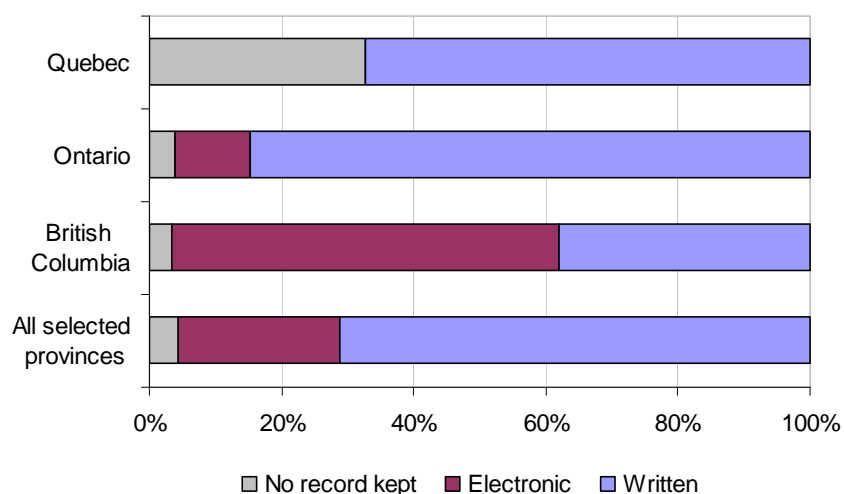
Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total number of grape hectares reporting a most prevalent insect (8019 ha)

3.1.2 Spray record keeping

A majority (95.3%) of the producing area that applied pesticides kept detailed pesticide records (Figure 3). Most of the producing area represented by the survey kept records in written form. Of the three provinces, BC had the most farms adopt electronic record keeping (58.6%). Most grape farms recorded: the date of application, the identification of the vineyard, the product applied, and the application rate. Few farms recorded the wind speed or temperature at the time of application (Table A. 12). Other information recorded by operators included: the effectiveness of the application, growth stage of the crop, tractor speed, number of nozzles, quantity of product used, re-entry date, visual inspection notes, spray damage, operator, tractor identification, and quantity of water used.

Figure 3 Format used to keep records of pesticides applied, selected provinces, grape producing area¹, 2005



Note: Includes Quebec, Ontario, and British Columbia

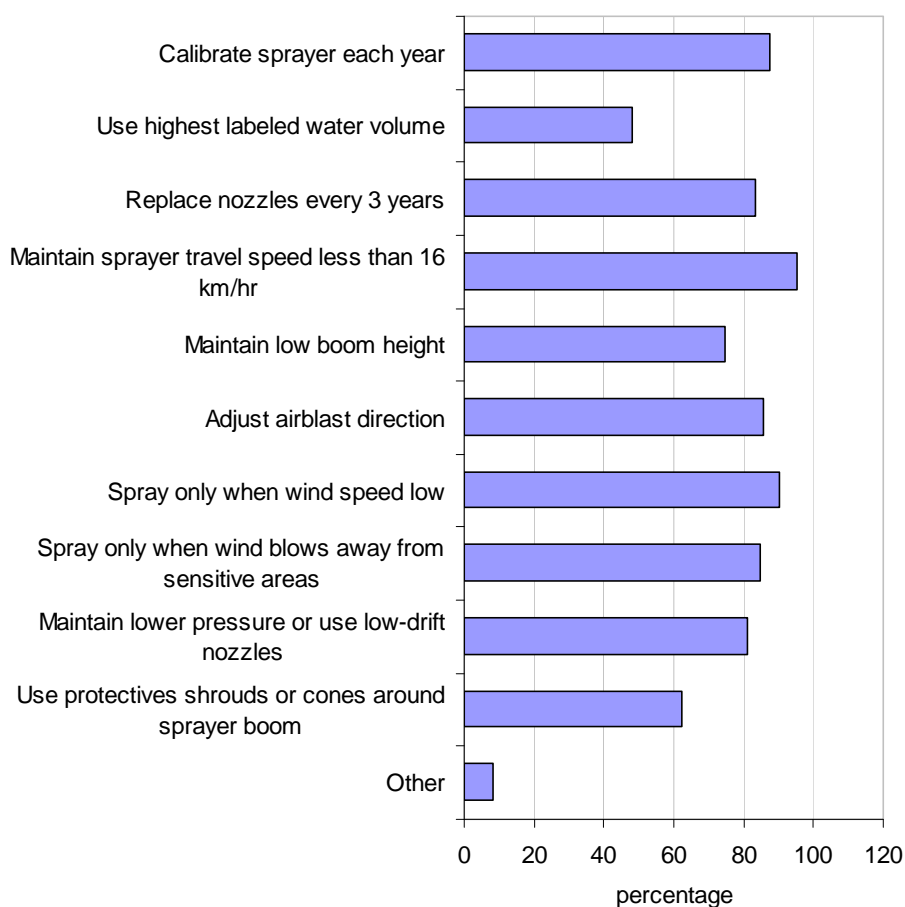
Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total number of grape hectares reporting application of pesticides (7,927 ha)

3.1.3 Pesticide spray practices

Canadian growers made use of appropriate spray practices over the majority of the producing area in 2005. Growers maintained sprayer travel speeds below 16km/hr and sprayed only when wind speeds were low (Table A. 13), reducing the risk of pesticide drift, on over 90% of the producing area. Wind and spray direction, as well as sprayer calibration, were also important considerations for grape growers when they applied pesticides. Other practices employed by growers included the use of spray shields, deflectors, and tunnels; spray recycling; computerized sprayers; and the use of backpack sprayers.

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



Note: Includes Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

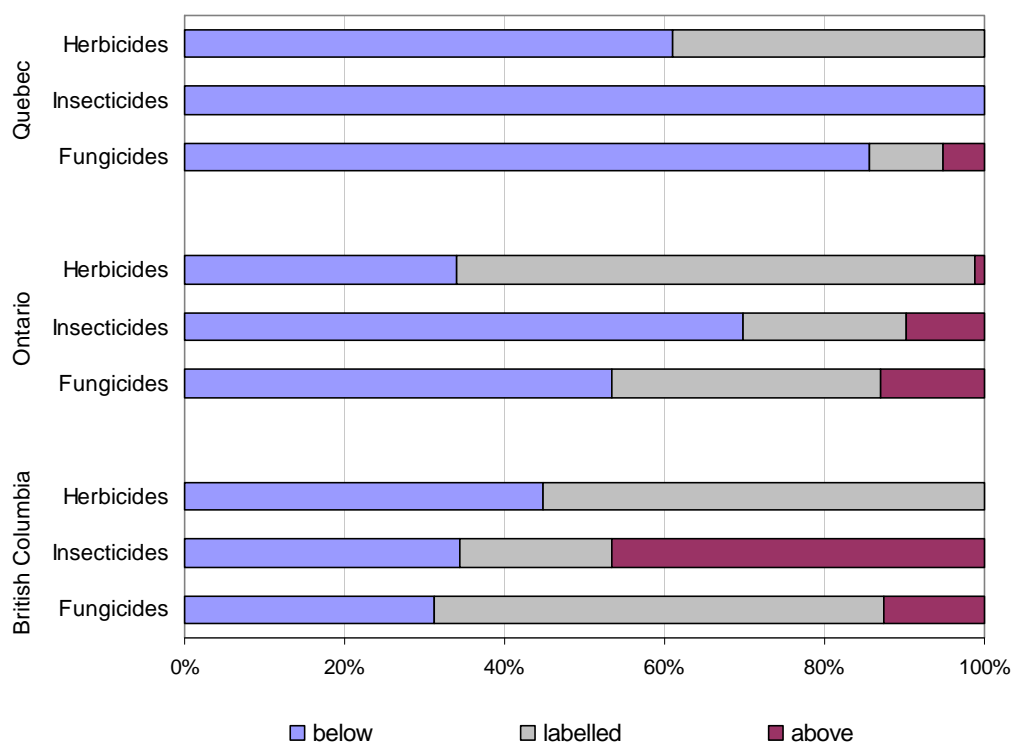
¹ Based on total producing area for reporting farms (8,019 ha)

3.1.4 Pesticide-use intensity

The intensity of pesticide use varied by region and by pest type. Quebec applied products at rates below those labelled on the majority of the producing area where pesticides were used; herbicides were the products most commonly applied at the labelled rate. Ontario applied pesticides either below or at the labelled rates on the majority of the producing area for all pest types. In contrast, British Columbia applied insecticides over the label rate on close to 50% of the area where insecticide use was reported.

Fungicides were the most frequently applied pesticide, averaging 2.5 applications (Table A. 1) over the season, though this varied by product and region. British Columbia, on average applied herbicides (avg. 2.9 times) more often than fungicides (2.6 times, Table A. 5).

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

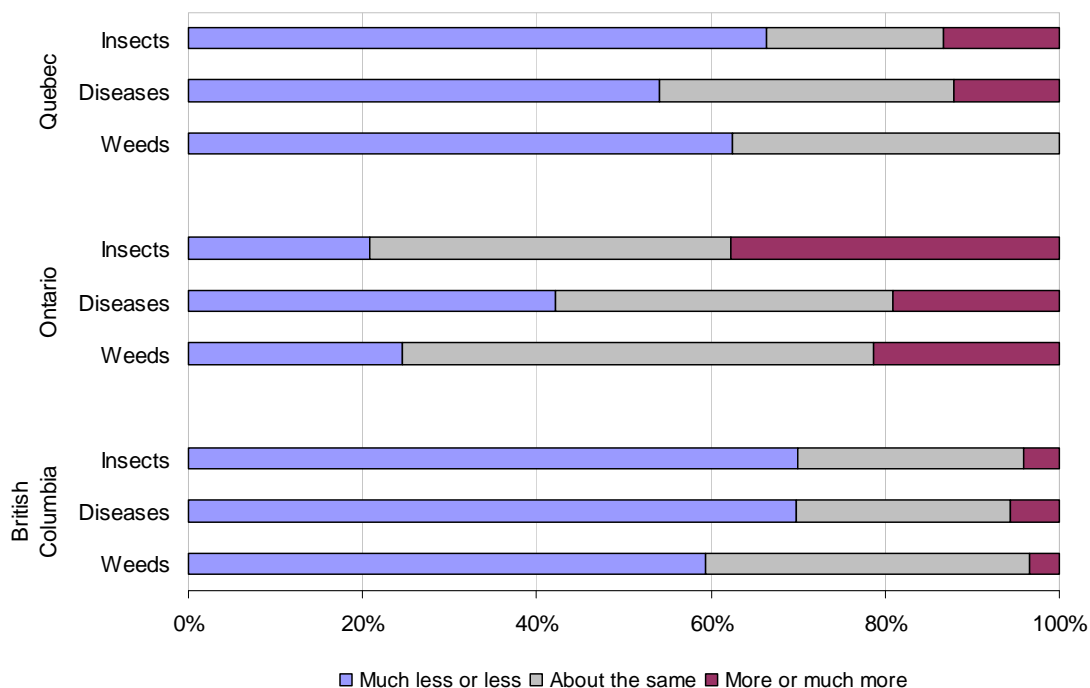


Note: Includes Quebec, Ontario, and British Columbia
Source: Statistics Canada, 2005 Crop Protection Survey
1 Based on percentage of cumulative treated area.

3.2 Pest Incidence

Pest incidence varies due to a variety of factors. Growers were asked to share whether they thought the incidence of weed, disease, and insect pests had increased, decreased, or stayed the same in 2005, compared to the previous 5 years. According to growers' observations, pest incidence varied both regionally and by pest type. BC growers rarely indicated an increase in any pest type; in fact, over most of the producing area, it was reported that pest incidence had decreased. Quebec showed similar trends, but Ontario growers reported an increase in insect pests over 37.7% of the area, and a greater degree of pest incidence (compared to the previous five years) of all pest types compared to the other regions.

Figure 6 Pest incidence compared to the last five years, selected provinces, grape producing area¹, 2005



Note: Includes Quebec, Ontario and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total producing area for reporting farms (insects 7,919 ha, diseases 7,843ha and weeds 7,966 ha).

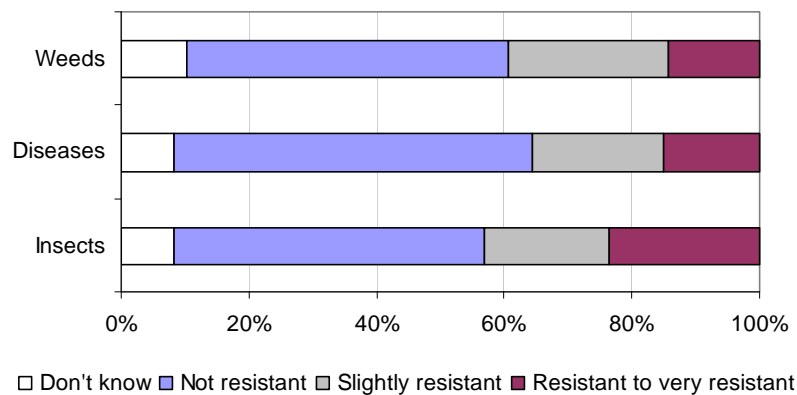
Actions planned for following year to control increased incidence

Growers who stated that they noticed *more* or *much more* pest incidence were asked what actions they would take in the following year to reduce their pest problems. Growers who reported an increase in insect and disease incidence planned to use both pesticide dependent and prevention-based practices to deal with the increased pressure. For prevention based practices they specifically planned to scout for damage (83.7% insects, 65.1% disease) and use forecasting systems (67.3% insects, 56.5% disease) (Table A. 15 and Table A. 20). Those with increased weed problems planned on switching to a new herbicide on 48.7% of the producing area, while 40.8% planned to switch to different weed control practice (Table A. 27).

3.3 Resistance

Resistance to chemical methods of control differed by region, according to grower observation. BC growers observed no resistance from any pest type for approximately 80% of the producing area. In Ontario, approximately 50% of the producing area reported some degree of resistance for all pest types. Growers representing a majority of the growing area in Quebec were uncertain whether there was any resistance to insecticides and herbicides (Table A. 29 and Table A. 30).

Figure 7 Grape growers' perception of resistance of pest to pesticide treatment, selected provinces, grape producing area¹, 2005



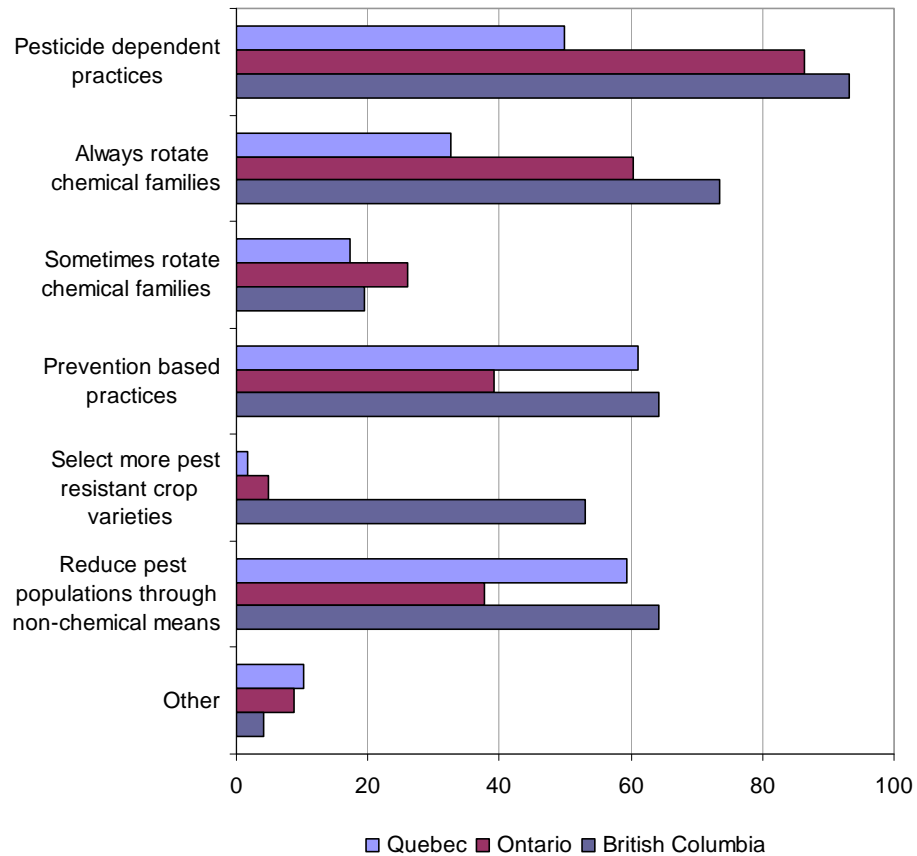
Note: Includes Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total producing area for reporting farms (insects 8,016 ha, diseases 7,929 ha and weeds 8,016 ha).

To manage resistance, growers made use of both prevention and pesticide dependent practices. Prevention based practices were used on the majority of the producing area in BC (64.2%) and Quebec (61.1%) as shown in Figure 8 (Table A. 28). To reduce resistance through pesticide dependent practices, chemical families were routinely rotated on a majority of the producing area in Ontario (60.4%) and British Columbia (73.6%).

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



Note: Includes Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total producing area for reporting farms (7,919 ha).

3.4 Pest management practices – by pest type

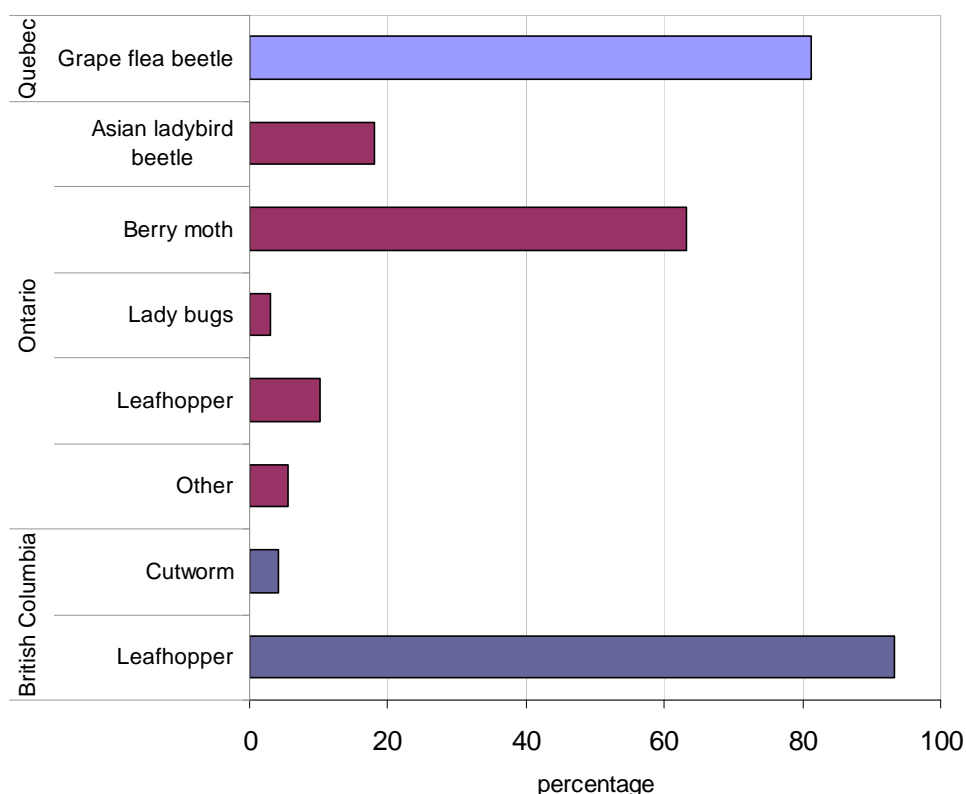
The Canadian market has high standards and growers must meet consumers' demands for quality products in order to remain competitive. As a result, using a variety of means, growers target pests that cause physical damage to plants and that limit yield. In this section the control options used by growers are detailed by pest type (insects, diseases, and 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. These practices will be referred to as pesticide dependent practices in this section. Other tools 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). These management practices have to be well-planned and their results may not be apparent for a couple of years.

3.4.1 Insect Pests

New insects were not a concern for the majority of the grape-producing area in 2005 (78.4%, Table A. 16). The majority of grape growers did, however, report a *most significant insect* for the 2005 growing season, although the species of insects varied greatly by region (Figure 9). In Quebec, the most significant pest, over the largest producing area (81.3%), was the grape flea beetle (Table A. 17). Ontario growers representing 63.1% of the producing area reported the berry moth as the most significant pest, though the Asian ladybird beetle was the most significant in some areas. British Columbia reported the leafhopper as the primary pest over the largest area (93.2%).

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



Note: Includes Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

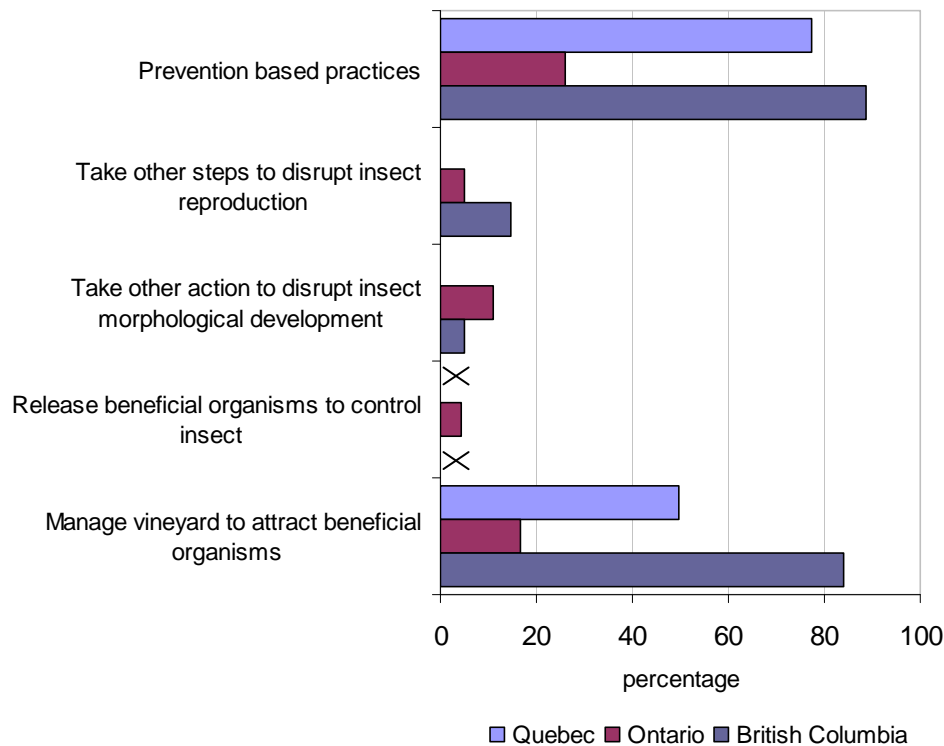
1 Based on total number of grape hectares reporting a most prevalent insect (6,567 ha)

Insect Control approaches

Growers were asked what strategies they used, in 2005, to manage the most prevalent pest on their operations.

Prevention-based practices for the purpose of controlling the most prevalent insect were implemented with varying efforts over the producing area (Table A. 18). Ontario rarely implemented prevention strategies (they were only reported on 25.9% of the producing area); however, growers in Quebec and British Columbia applied prevention-based practices over the majority of the area (77.2% and 88.5% respectively). BC growers, in particular, managed their vineyards to attract beneficial insects (84%) as shown in Figure 10.

Figure 10 Prevention-based practices to control the most prevalent insect, select provinces, grape producing area, 2005



Note: Includes Quebec, Ontario, and British Columbia

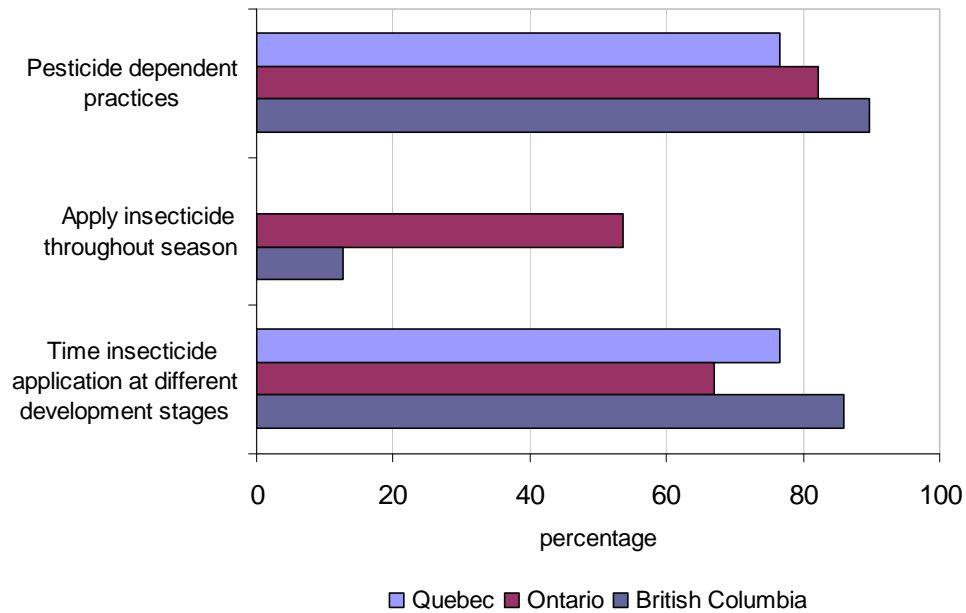
Source: Statistics Canada, 2005 Crop Protection Survey

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

1 Based on total number of grape hectares reporting a most prevalent insect (6,567 ha)

Pesticide dependent methods for insect pest control were practiced on the majority of the producing area in all provinces (84.0% Table A. 18, Figure 11). The majority of growers made efforts to time insecticide applications appropriately to the developmental stages of the insects in question (71.9% of the producing area).

Figure 11 Pesticide dependent practices to control the most prevalent insect, select provinces, grape producing area, 2005



Note: Includes Quebec, Ontario and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total number of grape hectares reporting a most prevalent insect (6,567 ha)

Insecticides

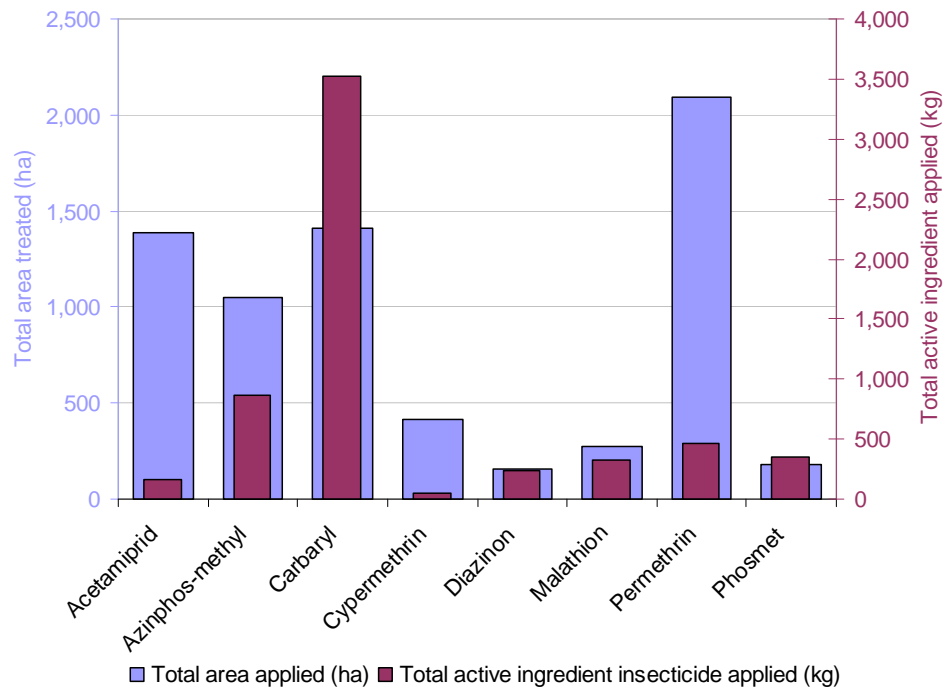
The total active ingredient quantity (kg) for each insecticide, and the area where the product was applied varied by province. Quebec and British Columbia only applied insecticides over 19.9% and 30.7% of their respective producing areas (Table A. 3 and Table A. 5). In contrast, Ontario applied insecticides over the majority (74.9%) of its producing area (Table A. 4). The total quantity (kg) of active ingredient that was applied also varied; however, this was heavily influenced by newer chemistries which require much smaller concentrations of active ingredient per application.

The most widely applied pesticide was permethrin, which was used on 26.1% of the producing area (Table A. 2); although this percentage is mainly represented by Ontario. Permethrin at the time of the writing of this report was labelled for both grape berry moth and leafhopper.

In terms of active ingredient quantity (kg), the most heavily applied insecticide was carbaryl. Because carbaryl's active ingredient is registered for use at a significantly higher rate it was almost always applied at or below the label rate. Carbaryl is registered for both Ontario's and British Columbia's insects of significant concern; these are the grape berry moth and the leafhopper, respectively. Acetempirid, which is labelled for leafhopper and is considered to be a reduced risk product, was applied over an area percentage similar to carbaryl. The label rate for acetempirid is lower than that for carbaryl, however about half of acetempirid applications were above the label rate.

Azinphos-methyl was the second most applied pesticide, by kg of active ingredient, and was applied exclusively in Ontario. This organophosphate will be phased out of use by 2012. Three other organophosphate insecticides – malathion, diazinon, and phosmet – are under review by the Pest Management Regulatory Agency. As this report is being written, carbaryl, which is a carbamate, is also under re-evaluation review by the federal regulator.

Figure 12 Insecticides most commonly used to control insects, selected provinces, grape producing area, 2005



Note: Includes Quebec, Ontario, and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total number of grape hectares reporting use of insecticides 4,903 ha

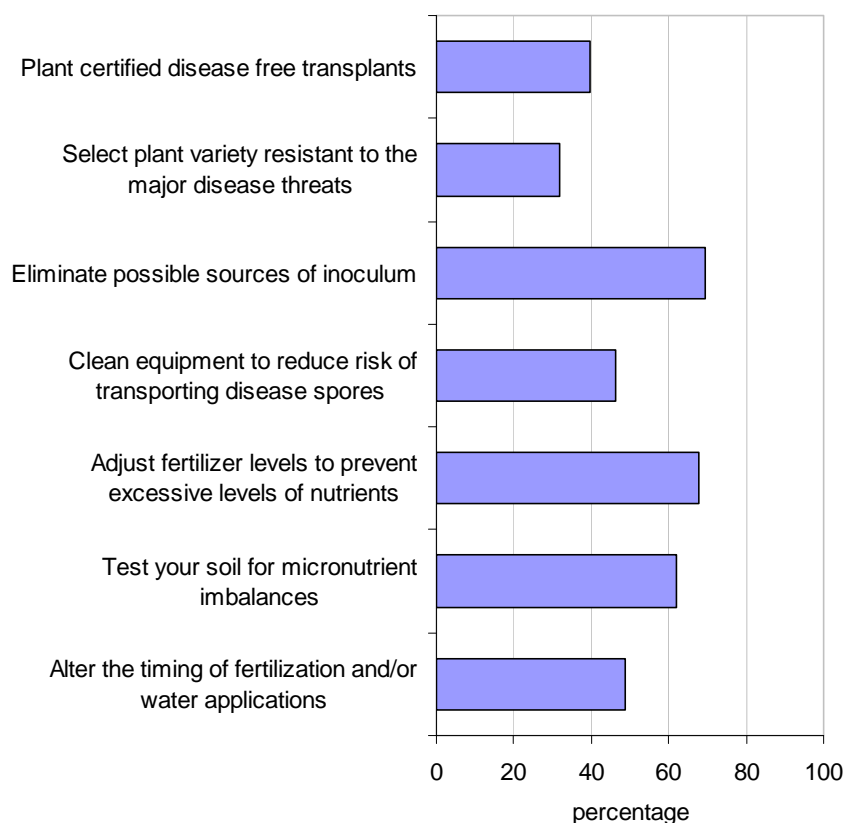
3.4.2 Diseases

Mildews (powdery and downy) were the most prevalent diseases on 82.0% of the total producing area in 2005 (Table A. 22). These were followed by botrytis, which was reported as the most prevalent disease on 8.2% of the producing area. According to their reports, few growers (14.7%) dealt with new diseases (Table A. 21).

Growers used a number of prevention-based practices to control their most prevalent disease. Eliminating possible sources of inoculums was the most commonly implemented practice over the whole surveyed area (69.4%, Figure 13) (Table A. 24). A substantial percentage of the grape-producing area also had fertilizer applied appropriately (67.6%) and soil tested for micronutrient imbalances (62.1%).

British Columbia made the most comprehensive use of these practices, employing them on over 70% of the producing area (Table A. 24). Equipment was kept clean to prevent the spread of disease by the majority of the producing area in British Columbia and Quebec (Table A. 24), but this was practiced on only 31.8% of Ontario's grape-producing area.

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



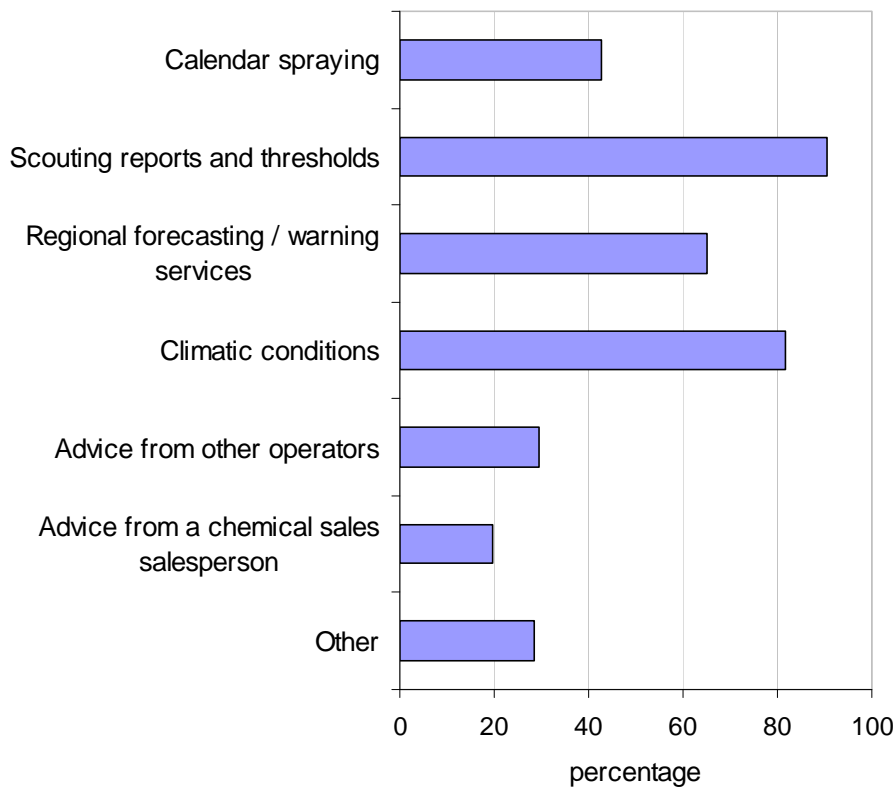
Note: Includes Quebec, Ontario and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total area for farms reporting a significant disease problem (6,187 ha)

Pesticide effectiveness can be maximized by timing applications appropriately to target pathogens at vulnerable life stages, ideally before they cause damage to plants. Growers made use of several tools to determine when they should apply fungicides. Of these tools, scouting thresholds and reports were used on 90.4% of the producing area and climatic conditions helped determine application timing for 81.6% of the area (Table A. 23).

Figure 14 Tools or methods to make decisions on when to apply fungicides used by grape growers, selected provinces, grape producing area¹, 2005



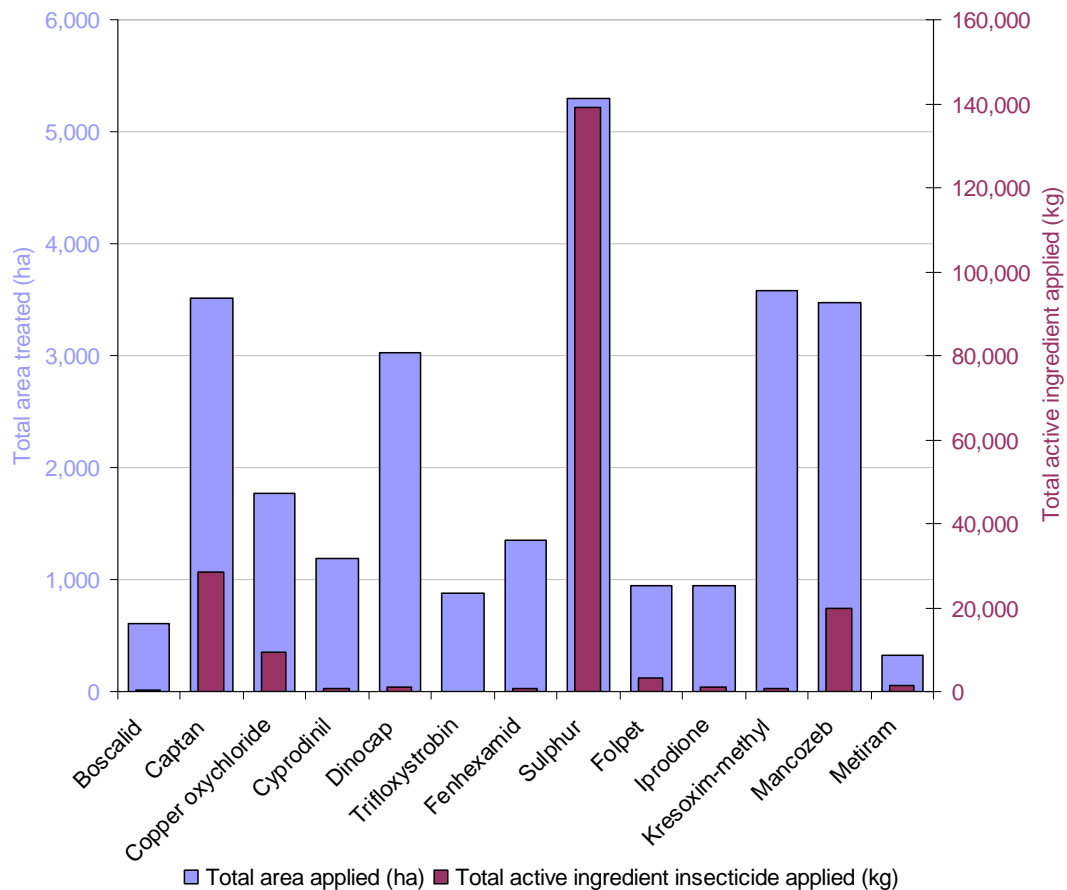
Note: Includes Quebec, Ontario and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total area for farms reporting a significant disease problem (6,187 ha)

In 2005, fungicides were applied over a greater area and at a higher quantity (kg) of active ingredient than any other pesticide. BC applied fungicides over the largest area, (96.8%, Table A. 5), followed by Ontario (89.7%, Table A. 4), then by Quebec (73.3%, Table A. 3). Sulphur was the most extensively used pesticide by area percentage (66.1%, Table A. 2) and by active ingredient quantity (139,064 kg) in 2005. Sulphur permits a very high concentration of active ingredient per application, so the relatively large quantity (kg) of product applied can be expected. Captan, dinocap, kresoxim-methyl, and mancozeb were applied to approximately 40% of the total producing area, but used fewer kg of active ingredient. Fungicides comprised the greatest variety of products used by growers, making up almost the number of herbicide and insecticide products combined.

Figure 15 Fungicides most commonly used to control diseases, selected provinces, grape producing area¹, 2005



Note: Includes Quebec, Ontario and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

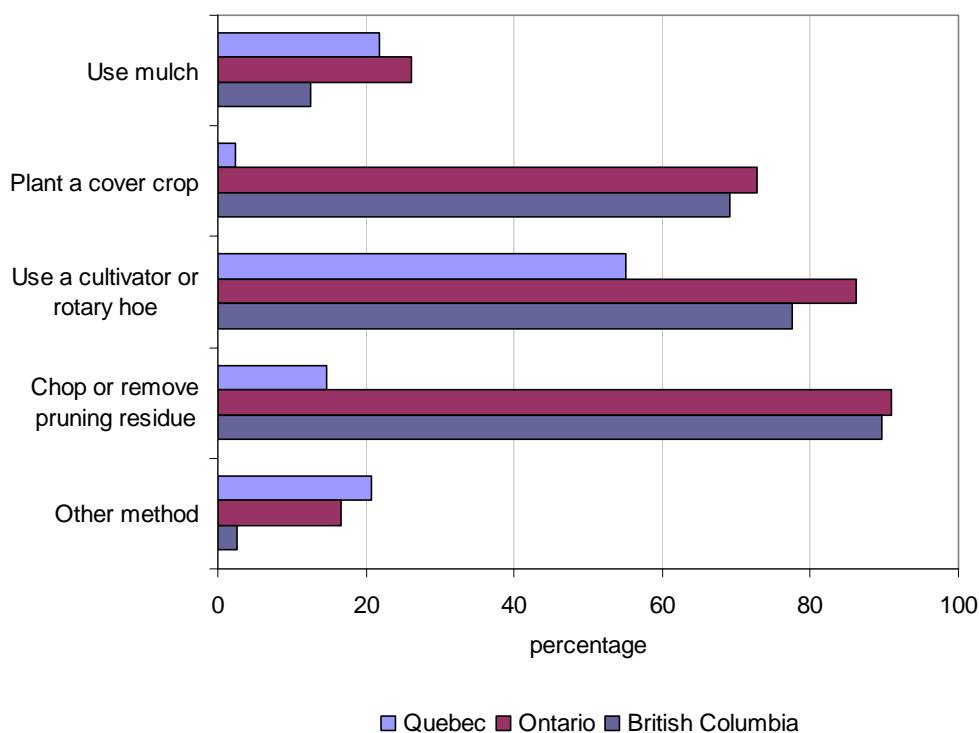
1 Based on total area for farms reporting herbicide use (7323 ha)

3.4.3 Weeds

Weed incidence either decreased or remained the same for the majority of the producing area (more or much more being reported on only 15.8% Table A. 26), and weed resistance to pesticides was rarely observed (14.2% of the producing area, Table A. 29).

Cultural weed control methods were often consistent by region. In the grape producing areas of Ontario and British Columbia, growers used cover crops, cultivators or hoes, and chopped and removed residues. Quebec growers did not consistently use any of the methods; however in 2005 growers from Quebec did not report an increase in weeds over any of the producing area (Table A. 25).

Figure 16 Practices for weed management used by grape growers, selected provinces, 2005



Note: Includes Quebec, Ontario and British Columbia

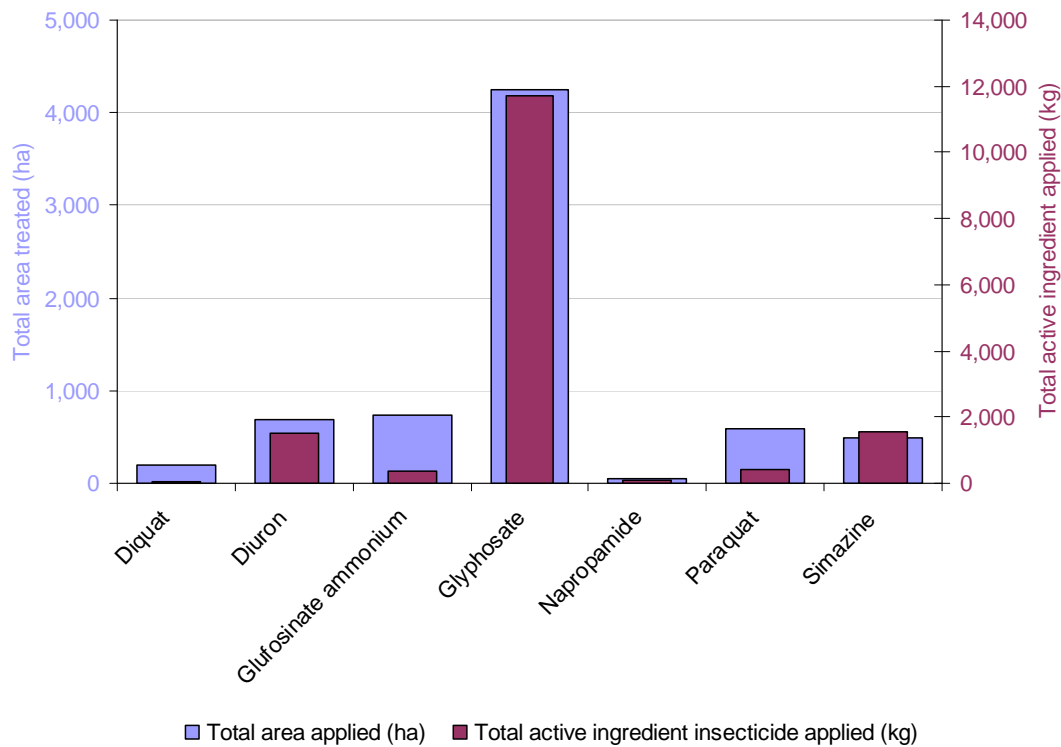
Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total producing area for reporting farms (8019 ha)

Chemical weed control was used for most of the grape producing region in BC (84.0%, Table A. 5) but was less common in Ontario (50.5%, Table A. 4) and even less so in Quebec (39.2% Table A. 3). Glyphosate was applied over the largest area (53.1%) and had the highest number of kg of applied product (11,691 kg) (Table A. 2).

Paraquat was the most commonly applied herbicide in Quebec, used on 24% of the total area, and in Ontario the most common was glyphosate, used on 42% of the producing area.

Figure 17 Herbicides most commonly used to control diseases, selected provinces, grape producing area¹, 2005



Note: Includes Quebec, Ontario and British Columbia

Source: Statistics Canada, 2005 Crop Protection Survey

1 Based on total area for farms reporting herbicide use (4, 787 ha)

Conclusion

Canadian grape 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 produced the following results.

The Crop Protection Survey found that most of the areas surveyed applied pesticides. Canadian growers participating in the survey kept detailed written records of their spray practices and their records indicated that they reduced risks by exercising proper spray practices. Generally, new pests were not a concern.

Fungicides were used on about 90% of the national grape producing area. These were the most commonly used of the three pesticide types, which indicates that pathogens are a major concern for grape growers. The risk of disease agents developing resistance to chemical control might be mitigated by the variety of products from different modes of action that growers used. By rotating chemistries, pathogen resistance is delayed.

Insecticides were applied at different intensities in different regions. In Ontario they were applied on about 75% of the producing area, but in British Columbia and Quebec insecticides were applied to approximately 20% and 30% of the grape producing area, respectively. This is likely related to the fact that Ontario growers reported the highest insect incidence in 2005 compared with the previous five years; 37.7% of its producing area reported *more or much more* insects, compared to only 13.3% in Quebec and 4.2% in British Columbia. Azinphos-methyl was applied to 18.9% of the Ontario producing area in 2005, but because this product is being phased out of use by 2012, investigation and extension of alternatives has become necessary for this chemical.

Nationally, herbicides were the least commonly applied pesticides, in terms of percentage area. There were marked regional differences; BC applied herbicides over a larger percentage area than Ontario, although Ontario growers reported a greater increase in weed problems in 2005 than either of the other provinces. As for prevention-based methods, British Columbia and Quebec used these on similar percentage areas.

This survey indicated that pest pressure varies by region. Pest management practices differed a great deal between regions, suggesting management practices may be linked to pest pressure. Data gathered in this survey cannot confirm whether differences in pest pressure are a result of management practices or whether pest pressure encourages certain styles of pest management; this could point to an important area of future study.

Surveys like this play an important role in illustrating how the Canadian grower is adapting to changes related to Canadian pest management issues. Discovering 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 Summary of pesticide use in grape production, selected provinces¹, 2005

Pesticide types	Farms reporting	Treated area		Average application	Average rate of application kilograms per hectare	Quantity applied
	number	hectare	percentage ²	number		kilograms
Total herbicides, insecticides and fungicides	492	7,515	93.7	2.3	2.31	239,290
Herbicides	327	4,787	59.7	1.9	1.18	15,668
Insecticides	349	4,903	61.1	1.6	0.612	7,615
Fungicides	470	7,323	91.3	2.5	2.77	216,007

1. Includes Québec, Ontario and British Columbia.

2. Percentage of total grape producing area.

Source: Statistics Canada, 2005 Crop Protection Survey.

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

Pesticide types and active ingredients	Farms reporting	Treated area		Average application	Average rate of application kilograms per hectare	Quantity applied
	number	hectare	percentage ²	number	hectare	kilograms
Total herbicides, insecticides and fungicides	492	7,515	93.7	2.3	2.31	239,290
Herbicides	327	4,787	59.7	1.9	1.18	15,668
Dichlobenil	x	x	x	x	x	x
Diquat	25	193	2.4	1.2	0.203	45.1
Diuron	49	682	8.5	1.0	2.14	1,511
Glufosinate ammonium	39	729	9.1	1.2	0.419	367
Glyphosate	260	4,255	53.1	2.4	1.15	11,691
Napropamide	11	46	0.6	1.0	1.82	82.8
Paraquat	77	584	7.3	1.2	0.569	395
Pendimethalin	x	x	x	x	x	x
Simazine	42	498	6.2	1.1	2.93	1,562
Insecticides	349	4,903	61.1	1.6	0.612	7,615
Acetamiprid	74	1,386	17.3	1.8	0.065	163
Azinphos-methyl	82	1,054	13.1	1.6	0.528	865
Carbaryl	103	1,411	17.6	1.4	1.73	3,528
Cypermethrin	26	413	5.2	1.7	0.065	46.0
Diazinon	19	157	2.0	1.2	1.26	236
Dicofol	x	x	x	x	x	x
Endosulfan	10	102	1.3	1.0	1.44	146
Malathion	28	277	3.5	1.3	0.899	330
Permethrin	125	2,091	26.1	1.9	0.118	459
Phosmet	19	184	2.3	1.2	1.55	353
Pyridaben	8	318	4.0	1.0	0.224	71.0
Spirodiclofen	x	x	x	x	x	x
Fungicides	470	7,323	91.3	2.5	2.77	216,007
Boscalid	43	608	7.6	1.3	0.236	193
Captan	228	3,507	43.7	4.3	1.89	28,356
Copper oxychloride	27	1,766	22.0	1.3	3.99	9,425
Cyprodinil	72	1,188	14.8	1.1	0.539	692
Dinocap	225	3,021	37.7	1.6	0.220	1,067
Dodine	x	x	x	x	x	x
Fenhexamid	61	1,355	16.9	1.0	0.407	570
Ferbam	x	x	x	x	x	x
Folpet	80	951	11.9	2.6	1.32	3,226
Iprodione	56	943	11.8	1.4	0.739	969
Kresoxim-methyl	156	3,578	44.6	1.3	0.129	618
Lime sulphur	25	214	2.7	1.5	22.62	7,440
Mancozeb	249	3,474	43.3	1.8	3.16	19,665
Metalaxyl-m	12	73	0.9	1.6	0.098	11.6
Metiram	25	323	4.0	1.8	2.29	1,370
Myclobutanil	261	3,021	37.7	1.5	0.098	453
Sulphur	287	5,299	66.1	5.4	4.82	139,064
Tribasic copper sulphate	43	826	10.3	2.0	1.62	2,643
Trifloxystrobin	75	876	10.9	1.3	0.069	79.8

1. Includes Québec, Ontario and British Columbia.

2. Percentage of total grape producing area.

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

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 3 Pesticide use in grape production, Quebec, 2005

Pesticide types and active ingredients	Farms reporting	Treated area		Average application	Average rate of application	Quantity applied
	number	hectare	percentage ¹	number	kilograms per hectare	kilograms
Total herbicides, insecticides and fungicides	30	158	84.9	1.6	1.01	1,060
Herbicides	16	73	39.2	1.2	1.07	139
Dichlobenil	x	x	x	x	x	x
Diquat	x	x	x	x	x	x
Glyphosate	x	x	x	x	x	x
Napropamide	x	x	x	x	x	x
Paraquat	8	44	23.4	1.0	0.470	20.5
Simazine	x	x	x	x	x	x
Insecticides	8	37	19.9	1.3	0.088	4.29
Cypermethrin	x	x	x	x	x	x
Endosulfan	x	x	x	x	x	x
Permethrin	x	x	x	x	x	x
Fungicides	27	136	73.3	1.6	1.05	916
Boscalid	x	x	x	x	x	x
Captan	13	69	37.2	1.8	1.40	175
Dinocap	10	41	22.1	1.1	0.199	9
Fenhexamid	x	x	x	x	x	x
Ferbam	x	x	x	x	x	x
Folpet	12	58	31.5	1.7	1.01	103
Kresoxim-methyl	x	x	x	x	x	x
Lime sulphur	x	x	x	x	x	x
Mancozeb	17	105	56.3	1.9	1.81	365
Metalaxyl-m	12	73	39.3	1.6	0.098	11.6
Metiram	8	42	22.8	1.7	1.32	94.7
Myclobutanil	14	51	27.5	1.4	0.082	5.92
Sulphur	x	x	x	x	x	x
Trifloxystrobin	x	x	x	x	x	x

1. Percentage of total grape producing area.

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

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 4 Pesticide use in grape production, Ontario, 2005

Pesticide types and active ingredients	Farms reporting	Treated area		Average application	Average rate of application	Quantity applied
	number	hectare	percentage ¹	number	kilograms per hectare	kilograms
Total herbicides, insecticides and fungicides	328	5,151	92.5	2.2	2.28	171,413
Herbicides	191	2,813	50.5	1.5	1.48	10,355
Diquat	21	179	3.2	1.2	0.210	43.6
Diuron	49	682	12.2	1.0	2.14	1,511
Glufosinate ammonium	30	613	11.0	1.2	0.382	288
Glyphosate	142	2,372	42.6	1.8	1.56	6,709
Paraquat	50	415	7.4	1.2	0.539	276
Simazine	40	484	8.7	1.0	3.03	1,527
Insecticides	252	4,170	74.9	1.6	0.538	5,645
Acetamiprid	52	1,172	21.1	1.4	0.068	111
Azinphos-methyl	82	1,054	18.9	1.6	0.528	865
Carbaryl	65	1,005	18.0	1.5	1.88	2,842
Cypermethrin	x	x	x	x	x	x
Diazinon	19	157	2.8	1.2	1.26	236
Endosulfan	x	x	x	x	x	x
Malathion	19	252	4.5	1.3	0.835	280
Permethrin	103	2,012	36.1	1.9	0.118	449
Phosmet	19	184	3.3	1.2	1.55	353
Pyridaben	8	318	5.7	1.0	0.224	71.0
Spirodiclofen	x	x	x	x	x	x
Fungicides	314	4,997	89.7	2.5	2.69	155,413
Boscalid	30	442	7.9	1.2	0.221	118
Captan	203	3,356	60.2	4.4	1.9	28,040
Copper oxychloride	x	x	x	x	x	x
Cyprodinil	44	813	14.6	1.1	0.574	503
Dinocap	215	2,980	53.5	1.6	0.220	1,058
Fenhexamid	x	x	x	x	x	x
Ferbam	x	x	x	x	x	x
Folpet	68	893	16.0	2.6	1.33	3,123
Iprodione	43	837	15.0	1.4	0.749	891
Kresoxim-methyl	126	2,151	38.6	1.3	0.150	425
Lime sulphur	x	x	x	x	x	x
Mancozeb	232	3,369	60.5	1.8	3.21	19,300
Metiram	17	281	5.0	1.9	2.42	1,275
Myclobutanil	162	2,300	41.3	1.5	0.098	345
Sulphur	163	3,136	56.3	5.0	5.98	94,428
Tribasic copper sulphate	43	826	14.8	2.0	1.62	2,643
Trifloxystrobin	39	656	11.8	1.4	0.068	60.8

1. Percentage of total grape producing area.

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

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 5 Pesticide use in grape production, British Columbia, 2005

Pesticide types and active ingredients	Farms reporting	Treated area		Average application	Average rate of application	Quantity applied
	number	hectare	percentage ¹	number	kilograms per hectare	kilograms
Total herbicides, insecticides and fungicides	134	2,207	97.5	2.6	2.44	66,817
Herbicides	120	1,901	84.0	2.9	0.841	5,175
Diquat	x	x	x	x	x	x
Glufosinate ammonium	8	116	5.1	1.1	0.635	79.5
Glyphosate	x	x	x	x	x	x
Napropamide	x	x	x	x	x	x
Paraquat	19	126	5.6	1.1	0.713	97.9
Pendimethalin	x	x	x	x	x	x
Insecticides	89	696	30.7	2.1	1.04	1,965
Acetamiprid	22	214	9.5	4.0	0.060	51.4
Carbaryl	38	405	17.9	1.3	1.28	686
Cypermethrin	x	x	x	x	x	x
Dicofol	x	x	x	x	x	x
Malathion	9	25	1.1	1.3	1.59	49.7
Permethrin	x	x	x	x	x	x
Fungicides	129	2,190	96.8	2.6	3.09	59,677
Boscalid	x	x	x	x	x	x
Captan	11	83	3.6	1.1	1.54	141
Copper oxychloride	x	x	x	x	x	x
Cyprodinil	28	376	16.6	1.1	0.465	190
Dodine	x	x	x	x	x	x
Fenhexamid	25	883	39.0	1.0	0.336	303
Iprodione	13	105	4.6	1.2	0.635	78.2
Kresoxim-methyl	x	x	x	x	x	x
Lime sulphur	19	92	4.1	1.0	76.5	7,012
Myclobutanil	86	670	29.6	1.6	0.098	102
Sulphur	x	x	x	x	x	x
Trifloxystrobin	x	x	x	x	x	x

1. Percentage of total grape producing area.

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

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 6 Summary of pesticide use intensity in grape production, provinces and pesticide types, 2005

Region and pesticide types	Farms reporting number	Quantity applied kilograms	below	Application rate labelled percentage²	above
All selected provinces ¹					
Total herbicides, insecticides and fungicides	492	239,290	49	39	12
Herbicides	327	15,668	39	60	1
Insecticides	349	7,615	64	20	15
Fungicides	470	216,007	48	39	13
Quebec					
Total herbicides, insecticides and fungicides	30	1,060	83	12	4
Herbicides	16	139	61	39	0
Insecticides	8	4	100	0	0
Fungicides	27	916	86	9	5
Ontario					
Total herbicides, insecticides and fungicides	328	171,413	54	35	11
Herbicides	191	10,355	34	65	1
Insecticides	252	5,645	70	21	10
Fungicides	314	155,413	53	34	13
British Columbia					
Total herbicides, insecticides and fungicides	134	66,817	34	53	12
Herbicides	120	5,175	45	55	0
Insecticides	89	1,965	34	19	47
Fungicides	129	59,677	31	56	13

1. Includes Québec, Ontario and British Columbia.

2. Percentage of cumulative treated area.

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 7 Pesticide use intensity in grape production, selected provinces¹, 2005

Pesticide types and active ingredients	Farms reporting number	Quantity applied kilograms	below	Application rate labelled percentage²	above
Total herbicides, insecticides and fungicides	492	239,290	49.0	39.4	11.6
Herbicides	327	15,668	39.3	60.1	0.6
Dichlobenil	x	x	100	0	0
Diquat	25	45.1	100	0	0
Diuron	49	1,511	55.6	44.4	0.0
Glufosinate ammonium	39	367	57.7	41.4	0.9
Glyphosate	260	11,691	33.8	65.6	0.5
Napropamide	11	82.8	100	0	0
Paraquat	77	395	32.1	67.9	0.0
Pendimethalin	x	x	0.0	0.0	100.0
Simazine	42	1,562	69.2	26.9	3.9
Insecticides	349	7,615	64.5	20.3	15.3
Acetamiprid	74	163	50.8	0.0	49.2
Azinphos-methyl	82	865	10.0	83.2	6.7
Carbaryl	103	3,528	83.0	14.0	3.0
Cypermethrin	26	46.0	86.7	0.0	13.3
Diazinon	19	236	55.8	0.0	44.2
Dicofol	x	x	0.0	94.6	5.4
Endosulfan	10	146	39.6	0.0	60.4
Malathion	28	330	60.2	0.0	39.8
Permethrin	125	459	91.5	8.2	0.2
Phosmet	19	353	0.0	95.8	4.2
Pyridaben	8	71.0	100	0	0
Spirodiclofen	x	x	0	0	100
Fungicides	470	216,007	48.2	38.9	12.9
Boscalid	43	193	66.7	0.0	33.3
Captan	228	28,356	68.8	21.3	9.9
Copper oxychloride	27	9,425	30.0	8.5	61.5
Cyprodinil	72	692	91.3	0.0	8.7
Dinocap	225	1,067	87.7	0.0	12.3
Dodine	x	x	0	0	100
Fenhexamid	61	570	93.8	0.0	6.2
Ferbam	x	x	0.0	88.4	11.6
Folpet	80	3,226	35.5	0.0	64.5
Iprodione	56	969	92.3	0.0	7.7
Kresoxim-methyl	156	618	29.4	53.1	17.5
Lime sulphur	25	7,440	69.8	0.0	30.2
Mancozeb	249	19,665	76.1	0.7	23.2
Metalaxyl-m	12	11.6	100	0	0
Metiram	25	1,370	36.3	0.0	63.7
Myclobutanil	261	453	90.9	0.0	9.1
Sulphur	287	139,064	16.0	81.3	2.7
Tribasic copper sulphate	43	2,643	86.9	0.0	13.1
Trifloxystrobin	75	79.8	16.7	72.4	10.9

1. Includes 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. 8 Pesticide use intensity in grape production, Quebec, 2005

Pesticide types and active ingredients	Farms reporting	Quantity applied	below	Application rate	above
	number	kilograms		labelled percentage ¹	
Total herbicides, insecticides and fungicides	30	1,060	83.2	12.5	4.3
Herbicides	16	139	61.0	39.0	0.0
Dichlobenil	x	x	100	0	0
Diquat	x	x	100	0	0
Glyphosate	x	x	57.4	42.6	0.0
Napropamide	x	x	100	0	0
Paraquat	8	20.5	1.2	98.8	0.0
Simazine	x	x	100	0	0
Insecticides	8	4.29	100	0	0
Cypermethrin	x	x	100	0	0
Endosulfan	x	x	100	0	0
Permethrin	x	x	100	0	0
Fungicides	27	916	85.6	9.2	5.2
Boscalid	x	x	100	0	0
Captan	13	175	84.4	15.6	0.0
Dinocap	10	9	100	0	0
Fenhexamid	x	x	0	0	100
Ferbam	x	x	0	100	0
Folpet	12	103	74.8	0.0	25.2
Kresoxim-methyl	x	x	100	0	0
Lime sulphur	x	x	0	0	100
Mancozeb	17	365	100	0	0
Metalaxyl-m	12	11.6	100	0	0
Metiram	8	94.7	100	0	0
Myclobutanil	14	5.92	100	0	0
Sulphur	x	x	69.2	30.8	0.0
Trifloxystrobin	x	x	4.0	96.0	0.0

1. 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. 9 Pesticide use intensity in grape production, Ontario, 2005

Pesticide types and active ingredients	Farms reporting number	Quantity applied kilograms	below	Application rate labelled percentage¹	above
Total herbicides, insecticides and fungicides	328	171,413	53.8	34.7	11.5
Herbicides	191	10,355	33.9	64.9	1.1
Diquat	21	43.6	100	0	0
Diuron	49	1,511	55.6	44.4	0.0
Glufosinate ammonium	30	288	67.3	31.7	1.0
Glyphosate	142	6,709	16.6	82.2	1.2
Paraquat	50	276	40.5	59.5	0.0
Simazine	40	1,527	67.5	28.4	4.1
Insecticides	252	5,645	69.7	20.6	9.7
Acetamiprid	52	111	72.7	0.0	27.3
Azinphos-methyl	82	865	10.0	83.2	6.7
Carbaryl	65	2,842	78.1	18.4	3.5
Cypermethrin	x	x	90.4	0.0	9.6
Diazinon	19	236	55.8	0.0	44.2
Endosulfan	x	x	39.6	0.0	60.4
Malathion	19	280	65.9	0.0	34.1
Permethrin	103	449	92.0	8.0	0.0
Phosmet	19	353	0.0	95.8	4.2
Pyridaben	8	71.0	100	0	0
Spirodiclofen	x	x	0	0	100
Fungicides	314	155,413	53.3	33.6	13.1
Boscalid	30	118	81.4	0.0	18.6
Captan	203	28,040	68.7	21.3	10.0
Copper oxychloride	x	x	57.9	16.9	25.2
Cyprodinil	44	503	87.2	0.0	12.8
Dinocap	215	1,058	87.6	0.0	12.4
Fenhexamid	x	x	100	0	0
Ferbam	x	x	0.0	81.6	18.4
Folpet	68	3,123	33.8	0.0	66.2
Iprodione	43	891	91.6	0.0	8.4
Kresoxim-methyl	126	425	6.9	85.9	7.3
Lime sulphur	x	x	100	0	0
Mancozeb	232	19,300	75.3	0.7	24.0
Metiram	17	1,275	27.6	0.0	72.4
Myclobutanil	162	345	92.9	0.0	7.1
Sulphur	163	94,428	13.9	81.1	5.0
Tribasic copper sulphate	43	2,643	86.9	0.0	13.1
Trifloxystrobin	39	60.8	17.7	80.2	2.1

1. 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. 10 Pesticide use intensity in grape production, British Columbia, 2005

Pesticide types and active ingredients	Farms reporting number	Quantity applied kilograms	Application rate		
			below	labelled percentage ¹	above
Total herbicides, insecticides and fungicides	134	66,817	34.5	53.4	12.1
Herbicides	120	5,175	44.9	55.0	0.1
Diquat	x	x	100	0	0
Glufosinate ammonium	8	79.5	0	100	0
Glyphosate	x	x	46.4	53.5	0.1
Napropamide	x	x	100	0	0
Paraquat	19	97.9	10.7	89.3	0.0
Pendimethalin	x	x	0	0	100
Insecticides	89	1,965	34.4	19.0	46.6
Acetamiprid	22	51.4	9.3	0.0	90.7
Carbaryl	38	686	96.7	1.8	1.6
Cypermethrin	x	x	0	0	100
Dicofol	x	x	0.0	94.6	5.4
Malathion	9	49.7	0	0	100
Permethrin	x	x	60.1	27.4	12.5
Fungicides	129	59,677	31.2	56.2	12.6
Boscalid	x	x	36.6	0.0	63.4
Captan	11	141	66.3	19.5	14.3
Copper oxychloride	x	x	1.5	0.0	98.5
Cyprodinil	28	190	100	0	0
Dodine	x	x	0	0	100
Fenhexamid	25	303	91.7	0.0	8.3
Iprodione	13	78.2	100	0	0
Kresoxim-methyl	x	x	61.5	5.5	33.0
Lime sulphur	19	7,012	0	0	100
Myclobutanil	86	102	83.5	0.0	16.5
Sulphur	x	x	18.4	81.6	0.0
Trifloxystrobin	x	x	15.2	36.5	48.3

1. 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. 11 Format used to keep records of pesticides applied by grape growers, selected provinces, 2005

Format used for record-keeping system	Producing area			
	Quebec	Ontario	British Columbia	All selected provinces
	hectares			
Written	115	4,682	837	5,635
Electronic	0	625	1,294	1,918
No record kept	56	218	77	351
Total producing area for reporting farms	170	5,548	2,208	7,927
	percentage			
Written	67.3	84.4	37.9	71.1
Electronic	0.0	11.3	58.6	24.2
No record kept	32.7	3.9	3.5	4.4

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 12 Information kept in record-keeping system by grape growers, selected provinces, 2005

Information kept in record-keeping system	Producing area			
	Quebec	Ontario	British Columbia	All selected provinces
	hectares			
Date of application	115	5,272	2,149	7,535
Identification of vineyard	101	5,079	2,102	7,281
Total area treated	101	4,839	2,028	6,968
Product applied	115	5,291	2,180	7,586
Rate of application	110	5,100	2,117	7,327
Wind speed	19	841	1,200	2,059
Temperature at application	19	1,422	1,462	2,903
Targeted weed, insect or disease	92	3,587	1,853	5,533
Other information	37	885	1,368	2,290
Total producing area for reporting farms	170	5,548	2,208	7,927
	percentage			
Date of application	67.3	95.0	97.3	95.1
Identification of vineyard	59.1	91.5	95.2	91.9
Total area treated	59.1	87.2	91.9	87.9
Product applied	67.3	95.4	98.7	95.7
Rate of application	64.6	91.9	95.9	92.4
Wind speed	11.0	15.2	54.3	26.0
Temperature at application	11.0	25.6	66.2	36.6
Targeted weed, insect or disease	54.1	64.7	83.9	69.8
Other information	21.7	16.0	61.9	28.9

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 13 Spraying practices used by grape growers, selected provinces, 2005

Spraying practices	Producing area			
	British Columbia			All selected provinces
	Quebec	Ontario	Columbia	
	hectares			
Calibrate sprayer each year	164	4,806	2,033	7,003
Use highest labeled water volume	146	2,181	1,527	3,854
Replace nozzles every 3 years	135	4,664	1,883	6,681
Maintain sprayer travel speed less than 16 km/hr	168	5,386	2,101	7,655
Maintain low boom height	131	3,780	2,091	6,001
Adjust airblast direction	150	4,561	2,167	6,878
Spray only when wind speed low	174	4,854	2,223	7,251
Spray only when wind blows away from sensitive areas	109	4,760	1,914	6,784
Maintain lower pressure or use low-drift nozzles	92	4,454	1,950	6,495
Use protectives shrouds or cones around sprayer boom	55	3,112	1,837	5,004
Other	9	582	67	658
Total producing area	186	5,570	2,263	8,019
	percentage			
Calibrate sprayer each year	88.4	86.3	89.8	87.3
Use highest labeled water volume	78.7	39.2	67.5	48.1
Replace nozzles every 3 years	72.7	83.7	83.2	83.3
Maintain sprayer travel speed less than 16 km/hr	90.5	96.7	92.8	95.5
Maintain low boom height	70.3	67.9	92.4	74.8
Adjust airblast direction	80.9	81.9	95.7	85.8
Spray only when wind speed low	93.6	87.1	98.2	90.4
Spray only when wind blows away from sensitive areas	58.7	85.5	84.6	84.6
Maintain lower pressure or use low-drift nozzles	49.4	80.0	86.2	81.0
Use protectives shrouds or cones around sprayer boom	29.5	55.9	81.2	62.4
Other	5.0	10.5	2.9	8.2

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 14 Incidences of insects compared to the last five years, grape growers, selected provinces, 2005

Incidence of insects	Producing area			
	Quebec	Ontario	British Columbia	All selected provinces
	hectares			
Much less or less	114	1,143	1,583	2,840
About the same	35	2,276	586	2,897
More or much more	23	2,065	94	2,182
Total producing area for reporting farms	172	5,484	2,263	7,919
	percentage			
Much less or less	66.4	20.8	69.9	35.9
About the same	20.3	41.5	25.9	36.6
More or much more	13.3	37.7	4.2	27.6

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 15 Actions planned to reduce insect problems by grape growers, selected provinces, 2005

Actions planned for the next growing season	Producing area ¹			
	Quebec	Ontario	British Columbia	All selected provinces
	hectares			
Prevention-based practices	23	1,766	71	1,860
Scout for insect or damage presence	23	1,732	71	1,826
Use forecasting systems	x	1,422	x	1,468
Take actions to disrupt insect reproduction or development	x	1,182	x	1,227
Pesticide dependent practices	x	1,461	x	1,472
Switch to a different insecticide	x	1,089	x	1,099
Apply an additional insecticide	0	896	0	896
Increase rate of insecticide applications	0	428	0	428
Other	0	111	64	176
Total area for farms reporting increased insect problems	23	2,065	94	2,182
	percentage			
Prevention-based practices	100.0	85.5	75.3	85.2
Scout for insect or damage presence	100.0	83.9	75.3	83.7
Use forecasting systems	x	68.9	x	67.3
Take actions to disrupt insect reproduction or development	x	57.3	x	56.2
Pesticide dependent practices	x	70.8	x	67.5
Switch to a different insecticide	x	52.7	x	50.4
Apply an additional insecticide	0.0	43.4	0.0	41.1
Increase rate of insecticide applications	0.0	20.7	0.0	19.6
Other	0.0	5.4	67.9	8.0

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. 16 Grape growers reporting they had to deal with new insects, selected provinces, 2005

Dealing with new insects	Producing area			
	Quebec	Ontario	Columbia	British All selected provinces
	hectares			
Yes	12	526	1,196	1,734
No	174	5,044	1,068	6,285
Total producing area for reporting farms	186	5,570	2,263	8,019
	percentage			
Yes	6.5	9.4	52.8	21.6
No	93.5	90.6	47.2	78.4

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 17 Most prevalent insect reported by grape growers, selected provinces, 2005

Most prevalent insect	Producing area			
	Quebec	Ontario	Columbia	British All selected provinces
	hectares			
Asian lady bugs	0	873	0	873
Berry moth	0	3,038	0	3,038
Cutworm	0	0	70	70
Grappe flea beetle	53	0	0	53
Lady bugs	x	144	x	149
Leafhopper	0	493	1,573	2,067
Other	x	264	x	316
Total producing area for reporting farms	66	4,813	1,688	6,567
	percentage			
Asian lady bugs	0.0	18.1	0.0	13.3
Berry moth	0.0	63.1	0.0	46.3
Cutworm	0.0	0.0	4.2	1.1
Grappe flea beetle	81.3	0.0	0.0	0.8
Lady bugs	x	3.0	x	2.3
Leafhopper	0.0	10.2	93.2	31.5
Other	x	5.5	x	4.8

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

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 18 Practices to control the most prevalent insect used by grape growers, selected provinces, 2005

Practices to control the most prevalent insect	Producing area ¹			
	British Columbia			All selected provinces
	Quebec	Ontario	Columbia	
	hectares			
Pesticide dependent practices	50	3,953	1,513	5,516
Apply insecticide throughout season	0	2,587	214	2,801
Time insecticide application at different development stages	50	3,224	1,451	4,725
Insecticide targeted at early nymph or egg stages	x	1,431	x	1,519
Insecticide targeted at larval or nymphal stages	0	1,625	1,210	2,835
Insecticide targeted at adult stage	25	1,125	71	1,221
Prevention-based practices	51	1,246	1,495	2,791
Take other steps to disrupt insect reproduction	0	240	250	490
Take other action to disrupt insect morphological development	0	536	82	619
Release beneficial organisms to control insect	x	215	x	255
Manage vineyard to attract beneficial organisms	33	805	1,419	2,256
Total area for farms reporting a significant insect problem	66	4,813	1,688	6,567
	percentage			
Pesticide dependent practices	76.6	82.1	89.6	84.0
Apply insecticide throughout season	0.0	53.7	12.7	42.6
Time insecticide application at different development stages	76.6	67.0	85.9	71.9
Insecticide targeted at early nymph or egg stages	x	29.7	x	23.1
Insecticide targeted at larval or nymphal stages	0.0	33.8	71.7	43.2
Insecticide targeted at adult stage	38.1	23.4	4.2	18.6
Prevention-based practices	77.2	25.9	88.5	42.5
Take other steps to disrupt insect reproduction	0.0	5.0	14.8	7.5
Take other action to disrupt insect morphological development	0.0	11.1	4.9	9.4
Release beneficial organisms to control insect	x	4.5	x	3.9
Manage vineyard to attract beneficial organisms	49.8	16.7	84.0	34.4

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. 19 Incidences of diseases compared to the last five years, grape growers, selected provinces, 2005

Incidence of diseases	Producing area			
	Quebec	Ontario	British Columbia	All selected provinces
	hectares			
Much less or less	99	2,276	1,581	3,956
About the same	62	2,089	555	2,706
More or much more	22	1,032	128	1,182
Total producing area for reporting farms	183	5,397	2,263	7,843
	percentage			
Much less or less	54.1	42.2	69.9	50.4
About the same	33.9	38.7	24.5	34.5
More or much more	12.0	19.1	5.6	15.1

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 20 Actions plan to reduce disease problems by grape growers, selected provinces, 2005

Actions planned for the next growing season	Producing area ¹			
	Quebec	Ontario	British Columbia	All selected provinces
	hectares			
Prevention-based practices	x	697	x	774
Scout for disease damages	x	697	x	769
Use forecasting systems	x	591	x	668
Alter soil fertility or water management	x	x	46	137
Pesticide dependent practices	x	615	x	701
Increase rate of fungicide applications	0	90	35	125
Switch to a different fungicide	x	266	x	320
Apply an additional fungicide	0	414	53	467
Other	x	119	x	160
Total area for farms reporting increased disease problems	22	1,032	128	1,182
	percentage			
Prevention-based practices	x	67.5	x	65.5
Scout for disease damages	x	67.5	x	65.1
Use forecasting systems	x	57.3	x	56.5
Alter soil fertility or water management	x	x	36.2	11.6
Pesticide dependent practices	x	59.6	x	59.3
Increase rate of fungicide applications	0.0	8.7	27.4	10.6
Switch to a different fungicide	x	25.8	x	27.1
Apply an additional fungicide	0.0	40.1	41.4	39.5
Other	x	11.5	x	13.6

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. 21 Grape growers reporting they had to deal with new diseases, selected provinces, 2005

	Producing area			
	British Columbia			All selected provinces
Dealing with new diseases	Quebec	Ontario	Columbia	
	hectares			
Yes	20	0	1,158	1,178
No	163	5,570	1,105	6,838
Total producing area for reporting farms	183	5,570	2,263	8,016
	percentage			
Yes	10.8	0.0	51.2	14.7
No	89.2	100.0	48.8	85.3

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 22 Most prevalent disease reported by grape growers, selected provinces, 2005

	Producing area			
	British Columbia			All selected provinces
Most prevalent disease	Quebec	Ontario	Columbia	
	hectares			
Botrytis	0	464	45	508
Mildew	94	3,305	1,669	5,068
Other	x	542	x	611
Total producing area for reporting farms	142	4,310	1,731	6,184
	percentage			
Botrytis	0.0	10.8	2.6	8.2
Mildew	66.3	76.7	96.4	82.0
Other	x	12.6	x	9.9

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

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 23 Tools or methods to make decisions on when to apply fungicides used by grape growers, selected provinces, 2005

Decision tools or methods used	Producing area ¹			
	British Columbia			All selected provinces
	Quebec	Ontario	Columbia	
	hectares			
Calendar spraying	75	2,243	320	2,639
Scouting reports and thresholds	81	3,921	1,593	5,596
Regional forecasting / warning services	71	2,644	1,303	4,017
Climatic conditions	101	3,326	1,624	5,051
Advice from other operators	x	1,623	x	1,833
Advice from a chemical sales salesperson	x	1,173	x	1,217
Other	x	535	x	1,752
Total area for farms reporting a significant disease problem	146	4,310	1,731	6,187
	percentage			
Calendar spraying	51.7	52.0	18.5	42.6
Scouting reports and thresholds	55.9	91.0	92.0	90.4
Regional forecasting / warning services	48.4	61.3	75.2	64.9
Climatic conditions	69.0	77.2	93.8	81.6
Advice from other operators	x	37.7	x	29.6
Advice from a chemical sales salesperson	x	27.2	x	19.7
Other	x	12.4	x	28.3

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. 24 Practices to control the most prevalent disease used by grape growers, selected provinces, 2005

Practices to control the most prevalent disease	Producing area ¹			All selected provinces
	Quebec	Ontario	British Columbia	
			hectares	
Plant certified disease free transplants	x	x	1,336	2,455
Select plant variety resistant to the major disease threats	x	x	1,311	1,964
Eliminate possible sources of inoculum	95	2,814	1,388	4,296
Clean equipment to reduce risk of transporting disease spores	118	1,372	1,369	2,858
Adjust fertilizer levels to prevent excessive levels of nutrients	x	2,648	x	4,183
Test your soil for micronutrient imbalances	126	2,326	1,389	3,841
Alter the timing of fertilization and/or water applications	x	x	1,525	3,014
Total area for farms reporting a significant disease problem	146	4,310	1,731	6,187
	percentage			
Plant certified disease free transplants	x	x	77.2	39.7
Select plant variety resistant to the major disease threats	x	x	75.7	31.7
Eliminate possible sources of inoculum	65.0	65.3	80.2	69.4
Clean equipment to reduce risk of transporting disease spores	80.7	31.8	79.1	46.2
Adjust fertilizer levels to prevent excessive levels of nutrients	x	61.4	x	67.6
Test your soil for micronutrient imbalances	86.4	54.0	80.2	62.1
Alter the timing of fertilization and/or water applications	x	x	88.1	48.7

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. 25 Practices for weed management used by grape growers, selected provinces, 2005

Weed management practices	Producing area			
	British Columbia			All selected provinces
	Quebec	Ontario	Columbia	
	hectares			
Use mulch	40	1,450	283	1,773
Plant a cover crop	5	4,053	1,564	5,622
Use a cultivator or rotary hoe	102	4,796	1,754	6,652
Chop or remove pruning residue	27	5,067	2,031	7,125
Other method	39	929	59	1,026
Total producing area for reporting farms	186	5,570	2,263	8,019
	percentage			
Use mulch	21.7	26.0	12.5	22.1
Plant a cover crop	2.5	72.8	69.1	70.1
Use a cultivator or rotary hoe	55.0	86.1	77.5	83.0
Chop or remove pruning residue	14.7	91.0	89.7	88.8
Other method	20.8	16.7	2.6	12.8

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 26 Incidences of weeds compared to the last five years, grape growers, selected provinces, 2005

Incidence of weeds	Producing area			
	British Columbia			All selected provinces
	Quebec	Ontario	Columbia	
hectares				
Much less or less	114	1,357	1,343	2,814
About the same	69	2,983	845	3,896
More or much more	0	1,180	75	1,256
Total producing area for reporting farms	183	5,520	2,263	7,966
percentage				
Much less or less	62.5	24.6	59.3	35.3
About the same	37.5	54.0	37.3	48.9
More or much more	0.0	21.4	3.3	15.8

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 27 Actions plan to reduce weed problems by grape growers, selected provinces, 2005

Actions planned for the next growing season	Producing area ¹			
	British Columbia			All selected provinces
	Quebec	Ontario	Columbia	
	hectares			
Switch to different herbicide	0	597	15	612
Apply an additional herbicide	0	414	0	414
Increase rate of herbicide applications	0	280	0	280
Switch to different weed control practice	0	459	53	512
Other	0	422	32	455
Total area for farms reporting increased weed problems	0	1,180	75	1,256
	percentage			
Switch to different herbicide	0.0	50.6	19.9	48.7
Apply an additional herbicide	0.0	35.1	0.0	33.0
Increase rate of herbicide applications	0.0	23.7	0.0	22.3
Switch to different weed control practice	0.0	38.9	70.9	40.8
Other	0.0	35.8	42.6	36.2

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

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 28 Practices used to prevent weeds, insects and disease resistance to chemical products by grape growers, selected provinces, 2005

Practices used to prevent resistance to chemical products	Producing area			
	British Columbia			All selected provinces
	Quebec	Ontario	Columbia	
	hectares			
Pesticide dependent practices	92	4,811	2,107	7,011
Always rotate chemical families	60	3,363	1,665	5,089
Sometimes rotate chemical families	32	1,448	442	1,922
Prevention-based practices	114	2,180	1,452	3,746
Select more pest resistant crop varieties	3	275	1,199	1,477
Reduce pest populations through non-chemical means	110	2,107	1,452	3,670
Other	19	488	96	603
Total producing area for reporting farms	186	5,570	2,263	8,019
	percentage			
Pesticide dependent practices	49.8	86.4	93.1	87.4
Always rotate chemical families	32.5	60.4	73.6	63.5
Sometimes rotate chemical families	17.3	26.0	19.5	24.0
Prevention-based practices	61.1	39.1	64.2	46.7
Select more pest resistant crop varieties	1.7	4.9	53.0	18.4
Reduce pest populations through non-chemical means	59.4	37.8	64.2	45.8
Other	10.3	8.8	4.2	7.5

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 29 Grape growers' perception that weeds are becoming resistant to herbicides, selected provinces, 2005

	Producing area			
	British Columbia			All selected provinces
Resistance to herbicides perception	Quebec	Ontario	Columbia	
	hectares			
Resistant to very resistant	42	1,067	28	1,137
Slightly resistant	18	1,736	258	2,013
Not resistant	13	2,218	1,808	4,039
Don't know	110	549	168	827
Total producing area for reporting farms	183	5,570	2,263	8,016
	percentage			
Resistant to very resistant	22.7	19.2	1.2	14.2
Slightly resistant	10.1	31.2	11.4	25.1
Not resistant	7.2	39.8	79.9	50.4
Don't know	60.0	9.9	7.4	10.3

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 30 Grape growers' perception that insects are becoming resistant to insecticides, selected provinces, 2005

Resistance to insecticides perception	Producing area			
	Quebec	Ontario	British Columbia	All selected provinces
	hectares			
Resistant to very resistant	x	1,808	x	1,894
Slightly resistant	x	1,518	x	1,561
Not resistant	45	1,849	2,004	3,898
Don't know	88	395	180	663
Total producing area for reporting farms	183	5,570	2,263	8,016
	percentage			
Resistant to very resistant	x	32.5	x	23.6
Slightly resistant	x	27.2	x	19.5
Not resistant	24.8	33.2	88.5	48.6
Don't know	48.3	7.1	8.0	8.3

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

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 31 Grape growers' perception that diseases are becoming resistant to fungicides, selected provinces, 2005

Resistance to fungicides perception	Producing area			
	Quebec	Ontario	British Columbia	All selected provinces
	hectares			
Resistant to very resistant	x	1,124	x	1,183
Slightly resistant	53	1,323	260	1,636
Not resistant	61	2,585	1,806	4,452
Don't know	x	451	x	657
Total producing area for reporting farms	183	5,483	2,263	7,929
	percentage			
Resistant to very resistant	x	20.5	x	14.9
Slightly resistant	29.3	24.1	11.5	20.6
Not resistant	33.5	47.1	79.8	56.1
Don't know	x	8.2	x	8.3

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

Source: Statistics Canada, 2005 Crop Protection Survey.

Table A. 32 2005 Crop Protection Survey coverage, grape growers, selected provinces

Data sources	Quebec	Ontario	British Columbia	All selected provinces
Farms reporting number				
2006 Census of agriculture	147	778	686	1,709
2005 Fruit and Vegetable Survey
2005 Crop Protection Survey	39	350	147	536
Farms reporting using pesticides	31	343	134	508
Farms with valid pesticide use data	30	328	134	492
Producing and non-producing area hectares				
2006 Census of agriculture	445	8,335	3,155	12,164
2005 Fruit and Vegetable Survey	227	7,325	2,902	10,564
2005 Crop Protection Survey	186	7,550	2,854	10,590
Producing area hectares				
2006 Census of agriculture
2005 Fruit and Vegetable Survey	186	5,775	2,734	8,788
2005 Crop Protection Survey	186	5,570	2,263	8,019
Farms reporting using pesticides	170	5,548	2,208	7,927
Farms with valid pesticide use data	159	5,204	2,208	7,571
Selected vineyard	98	1,858	455	2,412
Survey coverage percentage ¹				
Number of reporting farms	26.3	45.0	21.5	31.4
Grape producing area	99.9	96.5	82.8	91.3
Farms reporting using pesticides	91.5	96.1	80.8	90.2
Farms with valid pesticide use data	85.6	90.1	80.8	86.2
Selected vineyard	52.9	32.2	16.7	27.4

. 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.