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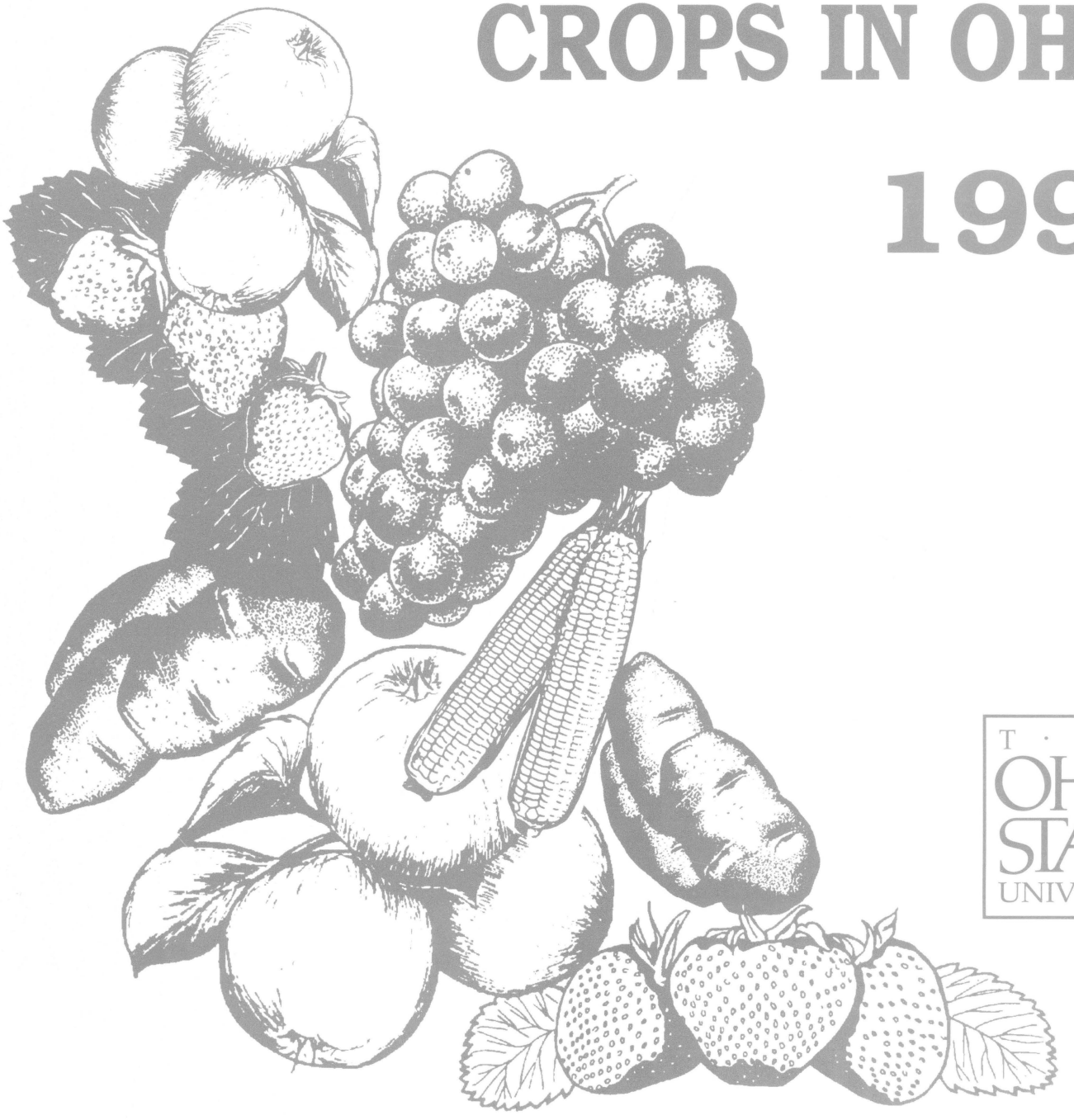
PESTICIDE USE ON FRUIT AND VEGETABLE CROPS IN OHIO 1990



THE OHIO STATE UNIVERSITY

PESTICIDE USE ON FRUIT AND VEGETABLE CROPS IN OHIO-1990

Prepared by

Ohio Pesticide Impact Assessment Program

Dr. Acie C. Waldron
State PIAP Liaison, Coordinator
Ohio Cooperative Extension Service
The Ohio State University

David S. Etzkorn
Technical Assistant
Ohio Cooperative Extension Service
The Ohio State University

Michael H. Wilhelm
Technical Assistant
Ohio Cooperative Extension Service
The Ohio State University

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SUMMARY

Herbicide in Fruit Crops

Approximately 29,362 pounds a.i. of herbicides were applied in 13,031 acre treatments for weed control in tree and small fruits with 53% of that acreage and 46% of the poundage applied in apple orchards. (Acre treatment is the acres of crop treated multiplied by the number of times that acreage was treated with the same pesticide during the year.) Glyphosate (8,261 pounds) and simazine (4,635 pounds) were the herbicides used in the greatest quantity, again with the majority (6,703 and 2,713 pounds) applied in apple orchards. Simazine and diuron were the most used herbicides in grape production, DCPA and napropamide for strawberries, cyanazine for blueberries, and dichlobenil for peaches.

Insecticides on Fruit Crops

Approximately 143,642 pounds a.i. of insecticides were applied in 104,696 acre treatments for insect and mite control in fruit crops in Ohio in 1990. Approximately 81% of that poundage was applied to apple acreage, 5.5% to peaches, 5.3% to grapes, 2.8% to strawberries, 2.0% to melons, and 1.5% to raspberries. Phosmet (38,726 pounds), petroleum oil (21,000), chlorpyrifos (9,725) and azinphos-methyl (9,541 pounds) were the insecticides used in the greatest quantity on apples. Carbaryl was used on grapes (3,842 pounds), apples (2,414), melons (1,502), peaches (1,188), blueberries (458), and lesser quantities on other fruits and totaled 9,814 pounds. Malathion was the major insecticide used on strawberries (1,896 pounds), raspberries (1,838), and pears (620 pounds) with additional uses on apples (2,872) peaches (1,313), grapes (219), blueberries (90), and brambles (53) totalling 8,901 pounds.

Fungicides on Fruit Crops

Approximately 279,410 pounds of fungicide active ingredient were applied in 138,830 acre treatments to fruit crops in Ohio during 1990. Forty-nine percent of that quantity (116,187 pounds) was used in apple production with captan (79,232 pounds) and sulfur (15,351 pounds) constituting the major usage reported. Dodine (6,948 pounds), thiram (5,825) and benomyl (3,181) were the next most common used on apples although combination of the copper formulations constituted 10,611 pounds or 7.8% of total fungicide use. Sulfur was the chemical used in the largest quantities for disease control in grapes, peaches and cherries with 58,244; 23,112; and 3,139 pounds, respectively. In excess of 8,434 pounds of ferbam, 5,624 pounds of mancozeb, 5,106 pounds of maneb, and 3,770 pounds of captan were used on grapes. Captan was used on strawberries to the extent of 5,868 pounds and on peaches at 3,991 pounds. Vinclozolin accounted for the largest quantity used in strawberries at 7,293 pounds for 1,082 acre treatments.

Herbicide in Vegetable Crops

Approximately 109,470 pounds a.i. of herbicides were applied for weed control in vegetable crops in 1990 with 31.7% of that applied for sweet corn, 25.9% for tomato production, 12.7% for cucumbers and 11.5% for potatoes. Approximately 11,860 pounds of metribuzin were used with 90.4% of that applied to tomatoes. Of the 10,669 pounds of trifluralin applied, 63.1% was used for tomatoes. In addition, all of the pebulate (8,841 pounds) was applied to tomato acreage. Alachlor (15,527 pounds) and atrazine (12,479 pounds) were the major herbicides used for sweet corn, metolachlor (6,805 pounds) and linuron (2,876 pounds) for potatoes, bensulide (9,795 pounds) and naptalam (4,086 pounds) for cucumbers and lesser amounts of several herbicides for these and other vegetables.

Insecticide on Vegetable Crops

Of the 169,310 pounds of insecticide a.i. used on vegetable crops in Ohio in 1990, 28.4% was used on potatoes, 19.2% on sweet corn, 9.7% on pumpkins, 8.5% on tomatoes, 6.6% on greens, 5.8% on peppers, 5.7% on cabbage, 5.2% on beans, 4.9% on cucumbers, and 2.4% on radishes with lesser amounts on other crops. Carbaryl was the insecticide used in the largest quantity (39,302 pounds) with 12,596 pounds used on sweet corn, 7,463 pounds on tomatoes, 6,473 pounds on beans, 5,441 pounds on pumpkins, 3,787 pounds on cucumbers, and lesser amounts on other vegetables. Third in total quantity of use was endosulfan (12,326 pounds) with 41.3% (5,089 pounds) used on tomatoes and 24.0% (2,957 pounds) used on potatoes with lesser amounts on other vegetable crops For potatoes the major uses were piperonyl butoxide (11,691 pounds), phorate (9,096 pounds), methamidophos (6,587 pounds), azinphos-methyl (6,112 pounds) and phosmet (2,476 pounds). Malathion's major use was on pumpkins-9,552 pounds. The major uses for parathion, the second insecticide in quantity, were on greens (5,259 pounds), peppers (5,247 pounds), and sweet corn (3,636 pounds) although both malathion and parathion were

used on several crops. The major uses for naled were on greens - 3,891 pounds and cabbage - 1,680 pounds. Approximately 4,330 pounds of esfenvalerate were used on potatoes, 567 pounds on sweet corn and 451 pounds on tomatoes. The second largest usage on sweet corn was attributed to thiodicarb with 4,869 pounds applied. A variety of insecticides were applied to most of the vegetable crops to control insect problems with the exception of carrots, onions, ornamental corn, parsley, peas, and turnips where very little, if any, insecticide use was reported.

Fungicides on Vegetable Crops

Approximately 67.1% of the fungicides applied to vegetable crops in Ohio in 1990 (372,098 pounds a.i.) were applied to tomatoes (249,834 pounds), 18.8% to potatoes (70,118 pounds) and 3.9% (14,667 pounds) to pumpkins. Chlorothalonil accounted for 63.8% of all fungicides applied to all vegetable crops with significant distribution of 210,892 pounds for tomatoes, 10,000 pounds for pumpkins, 5,337 pounds for carrots, 4,727 pounds for squash, 4,168 pounds for cucumbers, 1,022 pounds for sweet corn, 578 pounds for cauliflower, 523 pounds for cabbage and less than 100 pounds for any other individual vegetable crop. Almost 22,136 pounds of anilazine were used exclusively on tomatoes and 15,815 pounds of copper compounds. Almost 6,600 pounds of copper hydroxide were used on peppers and some additional was used on several other vegetables. The most prevalent use of fungicides on potatoes was 40,647 pounds of mancozeb, 22,892 pounds of maneb and 6,340 pounds of metalaxyl. Approximately 91.5% of all the EBDC fungicides used on vegetable crops was applied to potatoes.

Pesticide Application

Fruit and vegetable growers self-applied the vast majority of pesticide chemicals to their crops with ground equipment and in dilute sprays. However, significant custom or commercial application occurred with some pesticides on strawberries and some vegetable crops. The most significant aerial application was noted for insecticides and fungicides on potatoes. The most common distribution of pesticides was by broadcast methods, although banding application was also common in some row crops.

Pest Problems

Prevalent pest problems remained essentially the same as from past years. The pesticides applied for pest control also remained relatively constant reflecting the chemicals and the application technology recommended by the Ohio Cooperative Extension Specialists for effective pest control in Ohio fruit and vegetable crops.

Trends in Pesticide Use

It is difficult to establish trends in pesticide use on fruits and vegetables because of the 7 year time span between 1983 and 1990. The most notable changes are likely due to federal regulations on cancellation or potential cancellation and restricted uses and classifications of several pesticides. The use of chlorothalonil was probably influenced by the circumstances surrounding the EBDC fungicide episode. Reduction in azinphos-methyl use was probably affected by its classification for "restricted use." The increase in sulfur and copper use are also likely a result of the EBDC review and cancellation activities. The major trend, other than that discussed above, was the significant increase in the quantities of fungicides and herbicides applied and the decrease in total quantity of insecticides.

PESTICIDE USE ON FRUIT AND VEGETABLE CROPS IN OHIO-1990

INTRODUCTION

Fruit and vegetable production in Ohio constitutes a minor percentage of the total crop acreage but a significant contribution to the total crop income. In 1990, the Ohio Agricultural Statistics Service (OASS)[1] reported 17,200 acres of fresh market vegetables planted which included 12,300 acres of sweet corn, 350 acres of celery, 500 acres of onions and 3,200 acres of tomatoes. Of that report acreage, 10,700 acres of sweet corn, 300 acres of celery, 500 acres of onions and 2,900 acres of tomatoes were harvested with a production value of $26,562,000. Processing crops consisting of tomatoes, potatoes and cucumbers, planted at 17,500, 8,000 and 4,600 acres respectively, resulted in $44,629,000. Apples, grapes, peaches and strawberries harvested from 9,500, 2,000, 1,000 and 1,100 acres, respectively, resulted in $43,135,000 in sales. The OASS report does not include other fruit and vegetable crops involving approximately 2,600 and 24,074 acres, respectively, as estimated by crop specialists at The Ohio State University (OSU) relative to other crops reported in this survey. Sales from fruits and vegetables in 1990 amounted to approximately 4.2% or greater of the total cash receipts for major agricultural commodities in Ohio.

The production of fruits and vegetables in Ohio is dependent upon adequate pest control measures, many of which involve chemical pesticides. The continued use of effective pesticides requires current knowledge of the extent of use and the subsequent importance of retaining the registration. The current dilemma over the registration and/or reregistration of pesticides for minor crop use, affected by the 1988 Amendment to FIFRA, requiring the Environmental Protection Agency (EPA) to reregister all pesticide products by 1997, and the subsequent requirements of the manufacturers and formulators to supply the necessary data for such registration, which involves substantial cost of and time, is of extreme concern to producers of minor crops as well as the pesticide manufacturers. Loss of registration of many pesticide products, some which has already occurred, could place severe restrictions on the continued profitable production of some of these crops.

Pesticide use surveys were conducted for Ohio fresh market vegetable crops in 1977[2], processing vegetable crops in 1979[3], tree fruit crops in 1978[4] and fruits and vegetable crops in 1983.[5] It was proposed that pesticide use surveys be updated at regular intervals of 4-5 years, which would not only indicate current usage, but also show changes and trends in pesticide use and would be supplemented with yearly input as needed. However, financial conditions and time constraints have caused some alteration in schedule. The current USDA-National Agricultural Statistics Service (NASS) program for conducting pesticide use surveys as well as the Federal Extension Service (FES) and EPA programs for establishing pesticide use data bases may cause further evaluation for the time and type of surveys conducted. Experience in past years has shown the usefulness of pesticide usage data to governmental agencies, agricultural industries, and university and extension service personnel. The complications associated with minor crop registrations initiated by the amendments in FIFRA-88 and the costs, etc., to chemical manufacturing companies to obtain or maintain such minor crop registrations indicates a more urgent need to obtain pesticide use data. Such data is critical in documenting and determining the need for retention of associated pesticide registrations. However, the continuation of the pesticide use survey program as organized in the past depends largely upon the results of the national programs indicated above.

PROCEDURES

A survey questionnaire was developed that could obtain pesticide use information from fruit and vegetable producers regardless of the crop or crops grown. (Appendix 1). The survey was mailed to 1959 producers selected from the growers lists of the Ohio Fruit Growers Association (OFGA) and the Ohio Vegetable and Potato Growers Association (OVPGA) in late December 1990 and early January 1991. Because of the response, an additional 193 surveys were mailed in February of 1991. Also, 687 of the non-respondents from the first mailing were contacted the second time. The second contact was made after the Executive Secretary of the growers associations in the monthly newsletter and at the annual meeting urged recipients to respond. Thus a total of 2,152 growers were contacted on a somewhat random basis, except the population sample was weighted in order to get a greater number of responses from growers and counties with the larger and more intensive fruit and vegetable production. Even with such efforts the response was not overwhelming, but that reported for most crops resulted in a very significant percentage of the crop(s) acreage.

The data from the survey questionnaires were edited by personnel of the OCES-PIAP office and entered on the computer. The data on the computer was reviewed several times and cross-checked with survey returns, was revised as necessary and then printed in several formats for reporting.

RESULTS AND DISCUSSION

General

Approximately 37 percent of the survey questionnaires were returned, but the majority (520 of 785 returned) were not usable because of the addressee being deceased, not producing fruits and vegetables, no longer farming, bad addresses, etc. (Table 1). The 265 returns with usable data represented 12.31 percent of the sample population and 17.6 percent of the fruit and 17.2 percent vegetable production acreage. For individual crops the survey returns represented less than 1.0 to 100 percent of the acreage of 12 fruit crops and 26 vegetable crops with most of the larger acreage crops in the 8-43% range (see Tables 2 and 3). In some cases the crops may be designated in this report in a cluster grouping because of the small acreage or the similarity of product. Production acreages were those reported by the OASS in their annual report and estimates from crop specialists of the OSU agricultural research and extension facilities. In some cases the acreage estimated and acreage reported are relatively insignificant and may be that reported from a single grower or a relatively large number of growers. The significance of the data can be related to both the number that reported for an individual crop and the percentage of that total crop acreage reported regardless of the number of responses. For instance, 2 persons responded with information on carrots yet it constituted 17% of the crop, whereas 36 people responded with data for peaches which accounted for only 10% of the production acreage.

The estimated percentage of Ohio fruit and vegetable acreages treated for weed, insect, disease and other control are listed in Tables 4 and 5. An exact percentage for each crop is difficult to ascertain because of the manner in which the data was interpreted and entered in the computer. Data was entered each time the individual farm report indicated that a different herbicide, insecticide, fungicide or other chemical was used for some of that same farm crop acreage. Thus an acre being treated with more than one pesticide in the category would be counted for each individual pesticide and the total acreage for the crop treated under that category heading may in some cases exceed the planted acreage. This could account for 100% or more of that individual farm crop acreage being treated. However, this phenomena should not be confused with the acre treatments data which is defined in the next paragraph. In some cases 0% of the acreage is reported as treated in the Tables. If less than 0.5% of the total crop acreage was treated the computer dropped the value to zero and if over 0.5% raised the value to one. In some cases the 0% is correct, whereas in others the percent treated may be less than 0.5%. For onions it is noted as <1% where data are known.

Tables 6 and 9 and Figure 1 provide data on the acreage by pesticide category for each fruit and vegetable crop to which pesticides were applied. Tables 7 and 10 and Figure 2 provide similar data for acre treatments. Acre treatments is defined as the acres of crop treated multiplied by the number of times that same acreage as treated with the same pesticide during the year. Thus acre treatments with a specific pesticide can greatly exceed the acres planted, especially if a large percentage of the crop receives multiple applications of the pesticides. Relationships and variations in pesticide use can be observed by scanning the data in the Tables. Interpretation of acres treated is related to the explanation provided in the preceding paragraph and may not be entirely accurate. Consequently, acre treatments may more accurately reflect application data. Herbicides were applied to a total of 13,031 acre treatments, insecticides to 104,696; fungicides to 138,830; and other pesticides to 11,136 for a total summation of 267,693 acre treatments in fruit crops. The greatest use was for apples, grapes, peaches and strawberries with 52% of the acre treatments attributed to disease control and 39.7% to insect control (Table 7). Weed control and other control were at about 5% and 4.2%, respectively. Similar data are presented for vegetable crops in Table 10 with tomatoes and potatoes accounting for the greatest uses followed by sweet corn, cabbage, pumpkins, carrots, cucumbers, and beans with 44.2%, 18.7, 11.1, 4.7, 3.5, 2.3, 2.2 and 2.2%, respectively.

The quantity of pesticides applied to fruit and vegetable crop in 1990 is reported in Tables 8 and 11, and Figure 3, respectively, with tomatoes, apples, potatoes, peaches and grapes receiving the majority of the 1,118,225 pounds of active ingredient. Tomatoes alone accounted for 45.9% of the pesticides applied to vegetable crops and 26% of that applied to all fruit and vegetable crops. Apple acreage received 60% of the pesticides applied to fruit crops and 26% of that applied to all fruit and vegetable crops.

The acres, acre treatments and pounds of pesticide active ingredients applied to fruit crops relative to the category of pest control and specific pesticide are listed in Tables 12, 13 and 14, respectively. Tables 15, 16 and 17 provide the same type of information for vegetable crops.

Herbicide Use on Fruit Crops

The summarization of specific pesticide use for weed control in fruit crops is shown in Tables 12, 13 and 14 for the acres treated, acre treatments and quantities of active ingredient used. As indicated previously, the fruit crops treated in the greatest quantity were apples, grapes strawberries and peaches for acreage and poundage. The major use of

herbicide in apple orchards was 6,703 pounds of glyphosate a.i. used on 1,322 acres in 2,591 acre treatments. Approximately 2,713 pounds of simazine were used on 1,011 acres in 1,050 acre treatments; and 1,250 pounds of paraquat on 1,207 acres and 1,525 acre treatments. Simazine was used in the greatest quantity for grapes with 1,242 pounds applied to 369 acres on a one time basis followed by 976 pounds of diuron applied one time to 586 acres. The largest uses of herbicides for weed control in strawberries were 2,714 pounds of chlorthal-dimethyl (DCPA-Dacthal) and 2,691 pounds of napropamide on 343 and 744 acres, respectively, and 403 and 780 acre treatments. Dichlobenil was used in the greatest quantity for peaches and cyanazine for blueberries. Consequently, 28.1% of the total herbicide use on fruit crops was attributed to glyphosate, 15.8% to simazine, 9.2% each to DCPA and napropamide and 5.7% to diuron. Dichlobenil, paraquat and terbacil accounted for 5.0, 5.0, and 3.8%, respectively.

Insecticide Use on Fruit Crops

Approximately 143,642 pounds a.i. insecticides were applied to fruit crops in Ohio in 1990. Almost 81% of the total quantity was applied to apple acreage, 5.3% to grapes, 5.4% to peaches, 1.8% to melons 2.8% to strawberries, and 1.5% to raspberries (Table 14). Phosmet was the insecticide used in the largest quantity (43,328 pounds) with 89% or 38,726 pounds used on 6,637 acres of apples in 31,899 acre treatments. Over 39% of the carbaryl applied to fruit crops was applied to grapes, 24.6% to apples, 15.3% to melons and 12.1% to peaches. Over 90% of the parathion reported was used on grapes. Approximately 78.1% of the azinphos-methyl was used on apples, all of the barium polysulfide and 91.6% of the chlorpyrifos. (Barium polysulfide (Solabar, Solbar) is reported with the insecticide category because the majority of the growers who responded relative to its use indicated acaricide rather than fungicide. However, it could have been justifiably reported in the fungicide section or as other if the boron nutrient Solubar was the intended interpretation of the grower report.) Chlorpyrifos was used in 3,820 acres and 9,472 acre treatments and azinphos-methyl on 3,360 acres and 12,619 acre treatments. Phosmet was the insecticide used in the greatest quantity on peaches, plums and cherries; malathion on raspberries, strawberries and pears. Evaluation of the data in Tables 12, 13, 14 indicate multiple application of insecticides including some variety of insecticide use associated with the spray schedule. The use of petroleum/dormant oil was also common with the greatest use reported for apple trees.

Fungicide Use on Fruit Crops

By far, the greatest use of pesticides on fruit crops was for disease control. Approximately 54.7% of the pesticide use (279,409 pounds a.i. of the 510,771 pounds total) was attributed to fungicides (Table 14) on 42.0% of the total treated acreage (Table 12) and 51.9% of the acre treatments (Table 13). In excess of 36.0% of the fungicide poundage applied was attributed to sulfur with 15.2% of that quantity applied to apples, 22.9% to peaches, 57.8% to grapes and 3.1% to cherries. Captan was applied to approximately 6,109 acres of apples, 954 acres of strawberries, 567 acres of grapes, and 592 acres of peaches (61.9%, 68.1%, 28.4% and 58% of the planted acreage, respectively) with 40,818, 2,369, 2,163 and 2,545 acre treatments, respectively. Captan use accounted for 34.2% of the total fungicide a.i. applied (95,519 pounds) with 82.9% of that used on apples, 3.9% on grapes, 6.1% on strawberries and 4.2% on peaches.

In descending order following the use of captan and sulfur on apples were dodine - 6,948 pounds, thiram - 5,825, copper hydroxide - 5,227, benomyl - 3,181, copper sulfate pentahydrate - 3,844, metiram - 3,495, systhane - 2,960, ferbam - 2,040, mancozeb - 1,883, copper (metallic) - 1,504, fenarimol - 1,304 and streptomycin - 1,110 pounds. Sulfur was the major fungicide used on cherries, grapes, and peaches and second major on plums accounting for 69.7%, 68.2%, 74.5%, and 47.3%, respectively, of the total fungicide use on those crops. Ferbam was the second largest quantity of individual fungicides used on grapes followed by the EBDC fungicides (maneb, mancozeb). The major reported use for chlorothalonil was on melons, but only 1,276 pounds, with the balance of 249 pounds used on peaches. Vinclozolin (7,293 pounds), captan (5,868 pounds) and thiram (1,119 pounds) accounted for 90.2% of all fungicide use on strawberries.

Other Pesticide Use on Fruit Crops

The major uses on other pesticides applied to fruit crops was for apples and strawberries (Table 14). Calcium chloride accounted for 73.2% of such category use on apples with potassium salts 17.1%. For strawberries, dichloropropene (43.3%), bromothane (28.8%) and chloropicrin (27.7%) constituted the three major uses.

Herbicide Use on Vegetable Crops

The acreage, acre treatments and pounds a.i. of pesticide use on individual vegetable crops are reported in Tables 15, 16, and 17, respectively. Of the 109,470 pounds of herbicides applied 31.7% was applied to sweet corn, 25.9% to tomatoes, 12.7% to cucumbers and 11.5% to potatoes (Table 17). Metribuzin, trifluralin, metolachlor, sethoxydim, linuron, atrazine and alachlor were the seven herbicides used on the greatest acreage constituting 23.5%, 17.9%, 8.2%, 8.1%, 7.1%, 5.2% and 4.7%, respectively, of the total (Table 15). Approximately 87.6% of the acreage treated with metribuzin, 66.6% of the trifluralin and 97.4% of the sethoxydim was attributed to tomatoes. Most of the metolachlor and linuron was applied to potato acreage and the atrazine and alachlor to sweet corn. These same relationships can generally be

observed in the table for acre treatments (Table 16) and pounds (Table 17) of active ingredient applied.

Approximately 28,302 pounds of herbicide were applied for weed control on 46,332 acre treatments of tomatoes. The data provided for acres treated, as indicated earlier, reflects the summation of each acre treated once with one herbicide and again for each individual herbicide applied to the same acreage. Thus, the acres treated may exceed the planted acreage for that crop. In excess of 25.9% of the herbicides used on vegetable crops in Ohio in 1990 was applied to tomatoes. Metribuzin use accounted for almost 10,720 pounds and 37.9% of the herbicide use for tomatoes, trifluralin for 6,727 and 23.8%, and pebulate for 8,841 pounds and 31.2%. Atrazine (12,479 pounds on 4,264 acres) was the most prevalent use for weed control in sweet corn followed by alachlor (15,527 pounds on 3,589 acres), butylate (2,409 pounds on 469 acres) and cyanazine (2,219 pounds on 2,273 acres). The most prevalent uses for potatoes were metalachlor, linuron, diquat and metribuzin with 6,805, 2,876, 1,428 and 1,140 pounds applied to 4,546, 4,285, 2,727 and 2,359 acres, respectively. Approximately 9,795 pounds of bensulide and 4,086 pounds of naptalam were applied to 2,439 and 1,554 acres, respectively, of cucumbers. Linuron, trifluralin and fluazifop-p-butyl were the prevalent herbicides used for carrot production. Chlorthal-dimethyl (DCPA) and trifluralin were the herbicides that had the most common use for all vegetables reported.

Insecticide Use on Vegetable Crops

Approximately 169,310 pounds a.i. of insecticides were applied to the vegetable crops reported in 1990 (Table 17). Approximately 28.4% of that total was applied to potatoes, 19.2% to sweet corn, 9.7% to pumpkins, 8.5% to tomatoes, 6.5% to greens, 5.8% to peppers, 5.7% to cabbage, 5.2% to beans, 4.8% to cucumbers, and the balance of 6.2% to the remaining vegetables. Carbaryl was the insecticide used in the largest quantity (39,302 pounds) with 32.0% of that applied to sweet corn, 19.0% to tomatoes, 13.8% to pumpkins and 9.6% to cucumbers. Endosulfan was the insecticide of third greatest quantity with 12,326 pounds applied of which 41.3% was applied to tomatoes, 24.0% to potatoes, 9.1% to squash, and 8.7% to pumpkins. The insecticides used in the greatest quantities on potatoes were piperonyl butoxide, phorate, methamidophos, and azinphosmethyl at 11,691, 9,096, 6,587 and 6,112 pounds, respectively. The most significant uses of malathion were 9,552 pounds used on 342 acre treatments of pumpkins. Approximately 5,247 pounds of ethyl parathion, the insecticide of second most quantity for vegetable crops, were used on 1,432 acre treatments of peppers which constituted 30.9% of the total use for that insecticide. Another 5,259 pounds (31%) was used on greens, 3,636 pounds (21.4%) on sweet corn, 1,457 pounds (8.6%) on cabbage and 793 pounds (4.7%) on potatoes. Almost all the methyl parathion reported was used on sweet corn (82.6%). All of the thiodicarb and terbufos reported was used on sweet corn and 48.2% of the methomyl. Another 35.7% of the methomyl was applied to peppers.

Fungicide Use on Vegetable Crops

Fungicide use far exceeded other categories of pesticide use on vegetable crops in Ohio in 1990. Of the 372,098 pounds applied (Table 17) 63.8% was attributed to chlorothalonil (237,501 pounds) of which 88.8% was applied to 127,710 acre treatments of tomatoes (Table 16). The next greatest uses for tomatoes were 14,636 pounds of copper hydroxide applied to 39,837 acre treatments, 22,136 pounds of anilazine applied to 18,817 acre treatments, 1,179 pounds of metallic copper applied to 766 acre treatments and 756 pounds of benomyl on 4,820 acre treatments. The second largest use of copper hydroxide was the 6,597 pounds on peppers. Of the total poundage of fungicides applied to tomatoes chlorothalonil accounted for 84.4%. Other significant uses of chlorothalonil on vegetable crops in Ohio consisted of 10,000 pounds applied to pumpkins, 4,168 pounds for cucumbers, 5,337 pounds to carrots, 4,727 pounds to squash and 1,022 pounds to sweet corn. Mancozeb (40,647 pounds and 58% of the total fungicides applied to potatoes) and maneb (22,892 pounds and 32.6%) accounted for 90.6% of the fungicides used on potatoes and 91.5% of the total use of those materials (Table 17). The only other significant use on potatoes was 6,340 pounds of metalaxyl applied to 3,073 acre treatments. Most of the captan use was for cauliflower and most of the benomyl was for tomatoes. Vinclozolin use (2,623 pounds on 262 acre treatments and 131 acres) was exclusively for lettuce.

Other Pesticide Use on Vegetable Crops

The most significant use of other pesticide type materials used on vegetables was ethephon with the 14,833 pounds used exclusively on tomatoes accounting for 75.8% of the total use of other materials on all crops reported. The other significant use was 4,099 pounds of maleic hydrozide on potatoes.

Pesticide Application for Processed Tomatoes

Pesticide use survey data for tomatoes were obtained from both producers and processors; the latter who scheduled and kept track of pesticide application according to contract. Because of the probable duplication in data, tomato acreages treated and reported under contract by the processor were not included in data presented previously in this report and in Tables 15, 16 and 17. Including such originally in preliminary calculation of total State usage caused a tremendous excess in pounds used versus the expert opinion estimate, particularly for anilazine, chlorothalonil and copper treatments.

Survey returns from contract processors reported on approximately 21% of the planted processing tomato acreage (3675 of 17,500 acres). Data for pesticide use on tomatoes as reported from processors are presented in Table 18 which includes the data as reported and the extrapolations to state totals for 17,500 acres. The tomato data in Tables 15, 16 and 17 are that reported by individual growers and extrapolated to the 20,800 acre state production. Comparison of the data reported in the tables indicates some differences in type and quantity of some pesticide used for tomatoes between some individual growers and where application is controlled by the processor. Yet if the data reported from both sources are each extrapolated for the total planted tomato acreage (20,800 acres), the quantities of certain pesticides such as chlorothalonil, anilazine, ephephon, carbaryl, endosulfan, esfenvalerate and methomyl are fairly constant; i.e. chlorothalonil 218,153 pounds from the processor data (17.7% reported of the total acreage) vs. 210,892 pounds from reports minus any identified as processor; anilazine 22,627 pounds vs. 22,136; ephephon 16, 397 pounds vs. 14,833; carbaryl 6,181 pounds vs. 7,463; esfenvalerate 649 pounds vs. 451 and methomyl 271 pounds vs. 286. On that same basis the total amount of insecticide applied to the 20,800 becomes 17,565 pounds using the processor data vs. 14,452 using grower reported data; fungicide at 297,610 pounds vs. 249,834; and herbicide 52,893 vs. 28,302 pounds.

Application of Pesticides

Application of pesticides to fruit and vegetable crops was mostly done with ground equipment by the grower/producer or someone affiliated with the operation (Table 19). However, there was significant custom or commercial application of some pesticides on strawberries, bedding plants, cabbage, eggplant, cucumbers, greens, peas, peppers, potatoes, pumpkins, squash, sweet corn and tomatoes. Also there was a significant number of growers who did not report this information for certain classes of pesticides on strawberries, cabbage, eggplant, peas, and squash. Except for potatoes where 28% of the insecticides and 32% of the fungicides were applied by aerial means, almost all the pesticides were applied by ground equipment. However, a significant percentage of the application of some categories of pesticides for apples, blueberries, strawberries, cabbage, eggplant, peas, and squash was not designated. It is highly probable that such unreported data apply to ground application.

Data on the percentage of pesticides applied to each crop by method of application, type of material used and crop target to which the material was directed are also indicated in Tables 19. The majority of returned questionnaires did not specify the method of application for most of the crops listed. When specified the method of application depended upon the type of pesticide and the crop to which applied. For instance approximately 47% of the herbicides applied for tomatoes was by broadcast, 25% by incorporation and 53% not specified; whereas 58% of the insecticides, 56% of the fungicides and 55% of the other pesticides were broadcast applied. For sweet corn 62% of the herbicides were broadcast applied and 38% not specified; whereas 35% of the insecticides and 54% of the fungicides were broadcast and 22% of the insecticides, 38% of the fungicides and 58% of the other pesticides were applied by banding. Data for other fruit and vegetable crops can be reviewed by reference to the Table.

The information on type of formulation and the plant area or target for application is also found in Table 19. For vegetables dilute sprays were common, although many reports did not specify the type. Likewise dilute sprays were prevalent for fruit crops although low volume sprays were prevalent for insecticide and fungicide application to most tree fruits. Again, a large percentage of applicators did not respond to the question. Response to the area of application was almost unanimously not-specified. Further interpretation of the method of application and type of formulation must be referred for response from the research and extension specialists. For instance, it would generally be assumed that insecticide and fungicide application in apple orchards done mostly by the grower with ground equipment and using both dilute and LV spray would be by air blast systems directed to the foliage. Other comparisons on other crops using the common knowledge of such crop production can be made, but unfortunately many respondents to the survey questionnaire failed to designate such information.

Major Pest Problems for Ohio Fruit and Vegetable Crops

Pest problems in tree fruit plantings for which specific pesticides were applied are indicated in Tables 20, 21, 22 and 23 for weeds, insects and diseases, respectively. For bramble, bush and ground fruits the data are listed in Tables 24, 25, 26 and 27. Similar data for vegetables are found in Tables 28, 29, 30 and 31. Tables 20 through 31 also provide data on the range of the number of applications of each pesticide to the specific crop and the range in application rate. Interpretation of the data in these Tables may be somewhat confusing. The data are based upon the grower indication of using several pesticides to control specific pests on the same crop acreage and different pesticides used on different acreages for control of the same pest (spray programs as per control recommendations). The vertical column for percent of treated acreage represents the sum of all pesticides in the horizontal line for that pest, but adjusted to no more than 100%. The total for the vertical column, however, may exceed 100% because of the manner of reporting and the consequent count of the grower providing multiple answers relative to specific pest control for the crop.

For the most part weed problems in tree fruit orchards were identified as only weeds or not specified (Table 20). A similar reporting situation existed also for the bramble, bush and ground fruits (Table 24) except some specific weeds are identified for strawberries. Although a large percentage of the weed problems in all vegetable crops are designated as weeds, broadleaves and grasses, some specific problems were reported (Table 28). Foxtail was a specific weed problem in 31% of the asparagus acreage with half of it treated with diuron and half with terbacil. Lambsquarter was indicated as a weed problem in 26% of the cabbage acreage with trifluralin as the herbicide of choice. Lambsquarter was also a weed problem in greens and peppers with DCPA and trifluralin the herbicides of choice for greens and trifluralin and some napropamide for peppers. Ragweed was reported as a pest problem in potatoes, pumpkins and squash. Pigweed and yellow nutsedge with some Johnson grass and quackgrass were reported in potato fields. In addition to broadleaves, grasses and general weeds in sweet corn, smartweed and yellow nutsedge were of significant concern with atrazine and alachlor, respectively, the herbicides of choice. The choice of herbicides for broadleaf, general and grass weeds can be ascertained by referring to the Tables. Herbicides were applied generally only 1 to 3 times in most tree and bramble-bush- ground fruit acreages but up to 4 times in some vegetable acreage. However, in some apple orchards glyphosate was applied up to 12 times and polychlorobenzoic acid 8 times. These were probably spot treatments but were not reported as such in the returned questionnaire.

Although significant percentages of the insect problems for tree and bramble-bush-ground fruits were not identified, fruit growers tended to provide rather detailed lists of insects for which insecticides were applied for control (Tables 21 and 25). The reader is referred to those tables for information on the insect problems and the pesticide chemicals chosen for their control. Prevalent insect problems in apples included aphids, maggots, codling moth, leafhoppers, leafminers, leafrollers, mites and scales. In nectarines and peaches the insect problems were borers, codling moths, fruit moths, Japanese beetles, mites, oriental fruit moths and stink bugs. Some similar insect problems were reported from pears and plums. For blackberries and raspberries borers, fruitworm, Japanese beetles, leafhoppers, mosquitoes, aphids and sap beetles were reported as problems. Berry moths, beetles, Japanese beetles, codling moth, cutworms, mites, and mosquitoes were reported for grapes. Cucumber beetles, aphids, beetles and worms were prevalent in melons. In strawberries the prevalent insect problems were tarnished plant bug, spittlebug, clippers, mites, leafhoppers, beetles, and fruitworm. Aphids were common to all fruits and the reporting of general insects in all fruits constituted a high percentage of the reports. Insecticides were applied to some fruit sites up to 16 times during the season for pest control. In the Tables both mites and red mites, borers and peach tree borers, and scale and San Jose scale are listed because those are the designations that growers reported.

Respondents were also more specific on the insect problems in vegetables for which insecticides were applied (Table 29). Aphids and various beetles were common problems in most vegetables. Diamondback moths, loopers, various worms, thrips, leafhoppers, maggots, borers, mites and plant bugs were insects common to one or more vegetable crops. The common corn insect problems were reported for sweet corn as were also the common reported problems for bean, cabbage, cucumber, pepper, potato, pumpkin, squash, and tomato crops. The reader is again referred to that Table for information on the percentage of acreage infested with specific insects, the insecticide selected for such control, the range in number of applications and the range in rates of application.

Growers also provided more detail on specific disease problems for which fungicides were chosen and applied to tree and bramble-bush-ground fruit and to vegetables (Tables 22, 26 and 30). Scab was the major disease reported for apples, nectarines and peaches, and pears. Fruit rots, fire blight, mildew, sooty blotch, leaf curl and leaf spot were also reported. In grapes the various mildews were prevalent. Fungus, fruit rots, mildew and anthracnose were reported for raspberries. Leaf blight, botrytis, leaf spot, fruit rots and fungus problems were reported for strawberries. However again a large percentage of survey respondents did not specify the disease for which controls were applied. The range in number of applications and rate of application varied among the crops and the pesticide chemical used.

Not very much specific data were provided regarding the use of chemicals for other pest control, except for some uses in apples, some growth regulation in grapes, potatoes and tomatoes, prevention of seed decay in some vegetables, and coloring and ripening control in tomatoes. Tables 23, 27 and 31 provide this information with the chemicals of choice and the number of times and rates of application.

TRENDS IN PESTICIDE USE

Crop Acreages

Comparison between Table 2 and 3 of this publication with Table 1 of the survey publication for 1983[6] shows some changes in production acreages for fruits and vegetables over the 7 year span. In some cases the difference may only reflect the yearly variation that occurs in the production of that crop, but in others it does reflect a more definite change particularly in perennial type crops. Crops such as apples, cherries, peaches, strawberries, cucumbers, potatoes, sweet corn and tomatoes tend to have a more consistent production acreage from year to year, although comparison

of the two surveys show some variation. The 1990 survey shows a significant increase in production acreages for blueberries, melons, raspberries, green and dry beans, broccoli, carrots, greens, lettuce, onions, peppers and pumpkins, and a significant decrease in production acreage for grapes, pears, plums, cucumbers, eggplant, peas, potatoes, and sweet corn. However some of those increases or decreases may only be seasonal. The most profound changes in the two reports are the acreages for beans (green and dried), escarole and radishes for 1990. Data on celery was not reported, although there is still significant acreage in Ohio.

Pest Problems

The major weed, insect and disease problems reported by survey respondents for fruits and vegetables in 1990 were essentially the same as that for 1983. Pest problems generally remain the same over the space of years unless new crops, pest resistant fruit cultivars and/or vegetable plants, different cropping practices, eradication programs, etc., occur. Advances in research are being made to improve practices of pest management, but for the most part pest problems remain constant from year to year although the intensity of the problem may vary.

Pesticide Use on Fruit Crops

The most notable change in fungicide use reported in the two surveys was the acreage decrease for the EBDC fungicides on apples but increase on grapes, and the increase of captan use on apples. This change is due to the special review and probable cancellations of EBDC registrations. This is also reflected in the quantity of product applied; i.e. captan on apples increasing by about 38% and maneb-mancozeb-metiram-zineb decreasing by almost 25-fold. The use of sulfur on apples decreased by slightly less than one-third, copper use increased 4-fold, dodine use decreased by 2.7-fold and benomyl by 2.6-fold. Ferbam, sythane and thiram were reported used on apples in 1990 but not in 1983.

In a survey report conducted by the OCES-PIAP in 1990[7] on EBDC fungicides use in Ohio, submitted to EPA in a package prepared by the Ohio Farm Bureau Federation in response for solicited comments on the Special Review and proposed cancellations of registrations data was requested for 1987, 1988, 1989 and 1990. A major purpose, besides indicating the importance of EBDC fungicides for fruits and vegetable production, was to show production changes and attitudes of growers relative to the proposed registration cancellations. It was found that whereas approximately 89.5% of the reporting apple growers had used EBDC fungicides in crop production during the 1987-89 period on 92.7% of the crop (65% of that usage attributed to mancozeb and 35% to metiram), the use of mancozeb in 1990 was reduced to 3.9% of that used in prior years. Metiram use was reduced to 48.5% of that used in 1989. This drastic reduction in mancozeb use was due to the likelihood of cancellation and the advice to the growers from processors to avoid the use of EBDC fungicides wherever possible. The reduction in the use of EBDC's for apples as well as for other fruit crops probably had a significant effect on the use of other fungicides on those crops in 1990.

The use of sulfur on all fruits crops reported increased in 1990 by 2.7-fold over 1983 (100,777 pounds versus 37,749). However, lime sulfur reported used on grapes and raspberries (4,339 and 9,033 pounds respectively) in 1983 was not reported as such in 1990. Sulfur was reported used on cherries and plums, where it was not used in 1983 and increased in use on peaches and grapes by almost 2- and 42-fold. Captofol and folpet were of significant importance in 1983 but had only 84 pounds for cherries and no pounds, respectively, reported for 1990.

In 1983, three herbicides constituted the major weed control use in apple orchards - simazine, oryzalin and paraquat. In 1990 eight herbicides were in common use with glyphosate used in the largest quantity, followed by simazine, napropamide, dacthal (DCPA), diuron, paraquat, dichlobenil and terbacil next in order. Other herbicides of significant use in 1990 were 2,4-D norflurazon, diphenamid, oryzalin, metolachlor, cyanazine and bensulide. Whereas glyphosate was the most used for weed control in grapes in 1983, simazine and diuron were more commonly used in 1990. Cyanazine was the prevalent herbicide used for blueberries in 1990 but was not reported used in 1983. Dichlobenil was the prevalent weed control chemical used in peach orchards in 1990 but not reported used in 1983 where paraquat and napropamide were prevalent. Simazine and dichlobenil were the most common uses in raspberries as compared to oryzalin, DCPA and diphenamid in 1983. The major uses of DCPA and napropamide for strawberries remained as such for both reporting periods but reversed order. In general, the acreage of fruit crops treated for weed control in 1990 increased 1.3-fold over 1983 and the quantity applied increased 1.5-fold.

The acre treatments and quantity of insecticides applied for fruit crops significantly decreased in 1990 from that of 1983. Insecticide use of 143,642 pounds applied in 104,696 acre treatments in 1990 contrasted to 243,503 pounds in 222,475 acre treatments in 1983. Insecticide poundage use on apples decreased by 40%, on grapes decreased 3.4-fold, decreased significantly on cherries and strawberries but increased on melons, peaches, and raspberries. Some of the changes are undoubtedly due to some differences in acreages between the two reported years.

The most notable changes in insecticide use on apples were a reduction is azinphos-methyl of approximately 3.0-fold, carbaryl of 8.7-fold and phosmet of 2.4-fold. By contrast

chlorpyrifos and barium polysulfide (see explanation in paragraph on Insecticide Use on Fruit Crops) attained significant use of 9,725 and 8,920 pounds in 1990. Only 5 pounds of chlorpyrifos were reported in 1983. Significant increases were also noted for dimethoate, malathion, permethrin, propargite and pyrethrum uses in 1990, but decreases for diazinon, dicofol, fenvalerate, methomyl, methyl parathion and ethyl parathion uses. Carbaryl use on grapes decreased in poundage by 3.5-fold and methoxychlor use was not reported in 1990. Azinphos-methyl use on grapes decreased from 3,377 pounds in 1983 to 68 pounds in 1990. Parathion (ethyl and methyl) use on grapes remained about the same.

Phosmet use on peaches was number one for both reporting years but increased from 2,323 pounds in 1983 to 3,218 pounds in 1990. Azinphos-methyl use decreased by 2.6-fold, whereas carbaryl was increased by over 1.8-fold. Malathion and chlorpyrifos use was reported in 1990 but not in 1983. The only insecticide use reported on raspberries in 1983 was carbaryl at 117 pounds, which remained relatively the same at 110 pounds for 1990 on about 1.7 times the acre treatments. However, malathion became the prevalent insecticide used on raspberries with 1,838 pounds on 112 acre treatments compared to none in 1983. Malathion was also the prevalent use on strawberries in 1990 with a 4.2-fold increase over that reported in 1983. By contrast carbaryl use on strawberries decreased almost 22-fold. Dicofol was not reported used for strawberries in 1990, but some chlorpyrifos was used. Other significant strawberry use of azinphos-methyl and endosulfan differed only by +247 and -104 pounds, respectively, for 1990.

Pesticide Use on Vegetable Crops

As to be expected because of the EBDC situation, the most pronounced change in fungicide use in 1990 on tomatoes was the almost complete removal of mancozeb and maneb application and the 11.7-fold increase in chlorothalonil application in contrast to 1983 data. In addition, anilazine use was very common with 22,136 pounds used in 1990 in contrast to none in 1983. Benomyl use increased by 2.0-fold from 377 pounds in 1983 to 756 pounds in 1990. Copper use on tomatoes decreased by about 50% By contrast the use of mancozeb on potatoes increased by 22.9% over that of 1983 whereas maneb use decreased by almost one-third. Metalaxyl became the third largest poundage fungicide use for potatoes, whereas none was reported in 1983. Metalaxyl became of significant importance in use on potatoes, pumpkins, squash and peppers in 1990.

In addition to the 1990 use of chlorothalonil on tomatoes as indicated above, it became of prominent importance for squash replacing captafol and metiram, remained the most common fungicide used on cucumbers but decreased by 4-fold relative to the poundage applied in 1983, became of prominent use on carrots and second in use on cauliflower, and was noted of significant use on several other crops for which no use was reported in 1983. There was also a significant increase in the use of copper on beans, carrots, cucumbers, greens, peppers, pumpkins, squash and sweet corn, but decrease of 58 fold on cabbage. The most significant use of captan in 1990 was for cauliflower, whereas the only use in 1983 was reported for cabbage at a very small amount.

Changes in fungicide uses can generally be attributed to the substitution attempts to replace the troubled EBDC fungicides and the label expansion of others. The EBDC survey report of 1990 showed that 100% of the potato and tomato growers used EBDC fungicides during the 1987-89 period with approximately 90% of the potato use being mancozeb and the balance maneb. Approximately 95% of the tomato use was attributed to mancozeb. In 1990, EBDC use on potatoes continued as 100% on the acreage reported (32% of the total planted acreage as reported by 14 respondents), whereas tomato use was reported by only a few growers representing only about 3% of the planted acreage. Those figures are of course reflected in the data for EBDC use on potatoes and tomatoes reported in Table 17, and the consequent increase in anilazine and chlorothalonil use on tomatoes.

The use of herbicides in vegetable crops increased approximately 2.2-fold in 1990 over that reported in 1983. The most significant increase was the 3.3-fold increase in tomatoes, 3.4-fold increase in sweet corn, 2.8-fold increase in cucumbers, and 9.3-fold increase in pumpkins. In addition significant herbicide use was reported on carrots, cauliflower, greens and cabbage of which very little, if any, was reported for 1983. A significant reduction of herbicide use was noted for squash and onions.

Metribuzin, pebulate, sethoxydim and trifluralin were the four prominent herbicides used for tomato acreage in 1990, although not in the same order of poundage importance. Sethoxydim was not used in 1983 but chloramben was. The quantities of the herbicides were 4.7-fold greater in 1990 than in 1983. For sweet corn alachlor and atrazine replaced cyanazine and butylate as the herbicides of preference, and with increases of 12.7- and 7-fold in quantity, respectively. Cyanazine and butylate use decreased somewhat. For potatoes metolachlor and linuron were the most prominent uses increasing 12.6- and 1.7-fold, respectively, replacing EPTC which had no reported use in 1990. Alachlor was not used in potato acreages in 1990, whereas diphenamid was used in significant amounts and metribuzin use increased from 918 pounds in 1983 to 1,140 pounds in 1990. The other most notable changes in 1990 were the use of bensulide on cucumbers, naptalam use reduced by 816 pounds, the use of chemical weed control in carrots and the increased use of DCPA and trifluralin for vegetable crops.

The most notable change in insecticide use on vegetables was the 2.5-fold decrease in total use in 1990 compared to 1983. The majority of that decrease can be attributed to carbaryl use noting a reduction from 266,604 pounds in 1983 to 39,302 pounds in 1990 with contrasts of 12,000 pounds to zero for carrots, 12,417 to 3,787 for cucumbers, 20,767 to 549 for potatoes, 16,924 to 12,596 for sweet corn and 198,723 to 7,463 pounds for tomatoes. On the other hand the poundage use on pumpkins, green beans, cabbage and cauliflower increased very significantly. Total endosulfan used overall remained relatively constant, but increased approximately 19.5% for tomatoes. It amounted to 2,957 pounds for potatoes, whereas none was reported in 1983. Some endosulfan use was reported for additional vegetable crops in 1990, but the use for cucumbers, onions, pumpkins and squash declined.

Other significant insecticide changes between 1983 and 1990 include a reduction in aldicarb use in potatoes from 19,603 pounds to 164 pounds; an increase in azinphos-methyl use from 2,549 to 8,038 pounds with most of that use in potatoes; an increase in malathion use from 472 to 12,177 pounds attributed to 9,552 pounds used on pumpkins, 1,795 pounds on cucumbers and 652 pounds on tomatoes, crops which had no reported use in 1983; a 2.8-fold increase in phorate use on potatoes; and an increases from 629 to 2,532 pounds of phosmet with almost all of that poundage applied to potatoes. Another significant change was the use of 11,691 pounds of piperonyl butoxide used on potatoes, whereas none was reported in 1983. (Piperonyl butoxide is a synergist used with several insecticides and is listed as an active ingredient, but is not in itself considered a toxin.) The use of methamidophos on potatoes dropped from 11,898 pounds in 1983 to 6,587 pounds in 1990 and from 9,608 to zero pounds on tomatoes. Ethyl parathion use increased by 3,416 pounds due to a 5.5-fold increase and use on greens and pumpkins not reported in 1983. However, some of the increase was offset by decreased use on squash, and sweet corn. Overall methyl parathion use decreased 2.8-fold.

The most notable contrasts in use of other pesticide materials between the two reporting periods was the increase of ethephon use on tomatoes from 1,795 to 14,833 pounds and of maleic hydrazide on potatoes from 2,290 to 4,099 pounds.

General

The preceding discussion has indicated changes in pesticide use during the period for which surveys were conducted. However, the 7-year span may be too large of an interval from which to determine trends. Several factors such as the changes in pesticide development, production and registration; and regulatory action against some pesticides that were in common use; changes in crop production practices; and perhaps changes in pest problems may account for some of the differences. It was noted that pesticide use for weed control had increased considerably since the 1983 survey, but pesticides used for insect control had significantly decreased. Fungicides total use increased by nearly 69% on vegetables but decreased 24.6% on fruits. However, there was considerable change on the type of and quantity of fungicide used on individual crops. Undoubtedly a significant impact causing change is due to the EPA "Special Review" and subsequent changes or expected changes in the registration of certain pesticides. The cancellation or potential cancellation of registration of some pesticides such as the EBDC fungicides, Alar, parathion, etc., and review of others of public and/or environmental health concern has caused the grower to seek other pest control agents, some of which require more intensive application. These changes would not justifiably constitute a trend in pesticide usage, but would rather reflect an immediate adjustment perpetuated by regulatory action. The attitude of the grower and the availability of suitable and economic alternatives has a direct affect on the pesticides that will be used. The grower has become more environmentally concerned as influenced by public (and media) involvement in food and water safety issues regardless of whether or not such concerns are based on factual or nonfactual panic driven information. It becomes difficult thus to interpret the changes in pesticide chemical use noted in this publication as the normal evolution over a period of time or changes driven strictly from the changes in private/public opinion and registration/regulation activities. Nevertheless, the data obtained via this survey indicates some drastic and significant changes in pesticide use. Many more interpretations and comparison of the data can be made by the reader as he(she) peruses the contents of this and past surveys.

1.Ohio Agricultural Statistics-1990. Ohio Agricultural Statistics Service and Ohio Department of Agriculture Annual Report.

2."Pesticide Use on Field Grown Fresh Market Vegetable Crops in Ohio 1977." Ohio Cooperative Extension Service (OCES) Bulletin 648. May 1979.

3."Pesticide Use on Vegetable Crops for Processing in Ohio-1979." OCES/OARDC Bulletin 701/1152. Agdex 250/606. January 1983.

4."Pesticide Use on Selected Tree Fruit Crops, Ohio-1978." OCES/OARDC Bulletin 696/1145. Agdex 210/608. May 1982.

5."Pesticide Use on Fruit and Vegetables in Ohio-1983." OCES/OARDC Bulletin/circular 731/1173. Agdex 606/202. January 1986.

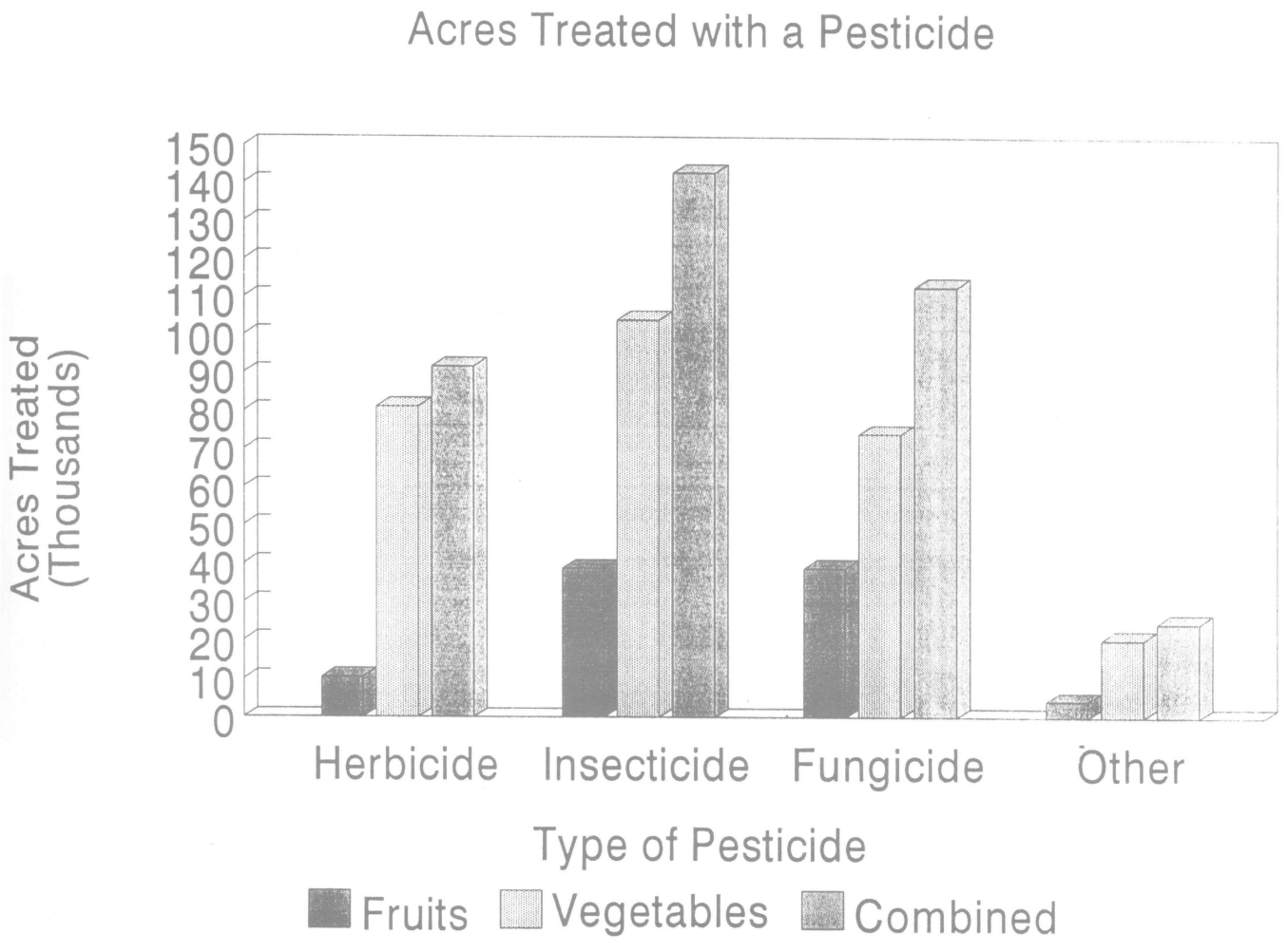
6.*Ibid.*

7."The Use and Importance of EBDC Fungicides for Fruit and Vegetable Production in Ohio." Acie C. Waldron. Report of survey of fruit and vegetable growers conducted for the Ohio Farm Bureau Federation and submitted to EPA in response to request for comments on proposed cancellation of registration.

FIGURES

Figure 1. Treated Acres Pesticides Applied to Fruit & Vegetable Crops in Ohio

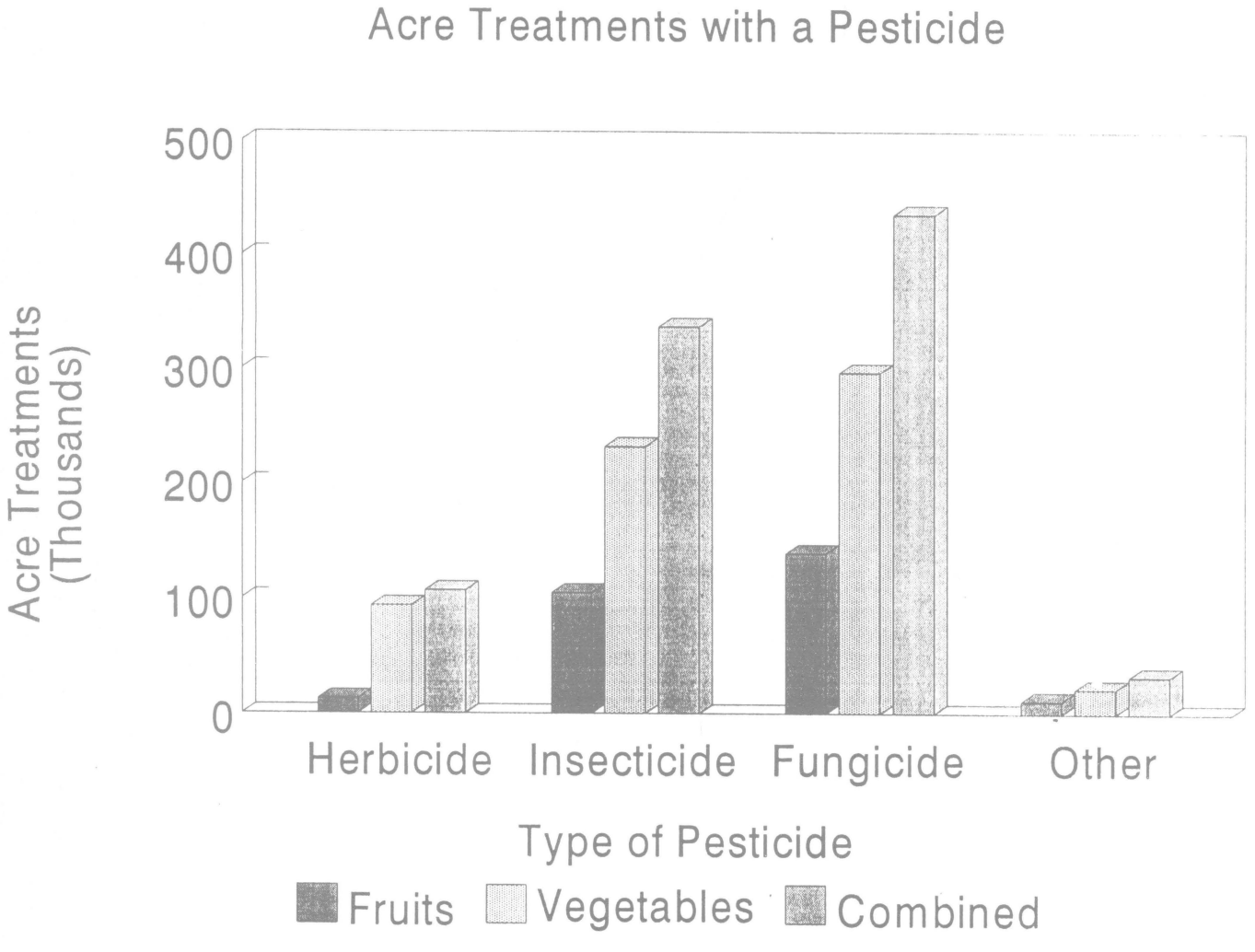
	Treated Acres				
	Herbicide	Insecticide	Fungicide	Other	Ohio Total
Total Fruit	10447	38811	38842	4291	92392
Total Vegetables	81186	104008	74066	20290	279549
Total Overall	91633	142820	112907	24581	371941



FIGURES

Figure 2. Acre Treatments of Pesticides Applied to Fruit & Vegetable Crops in Ohio

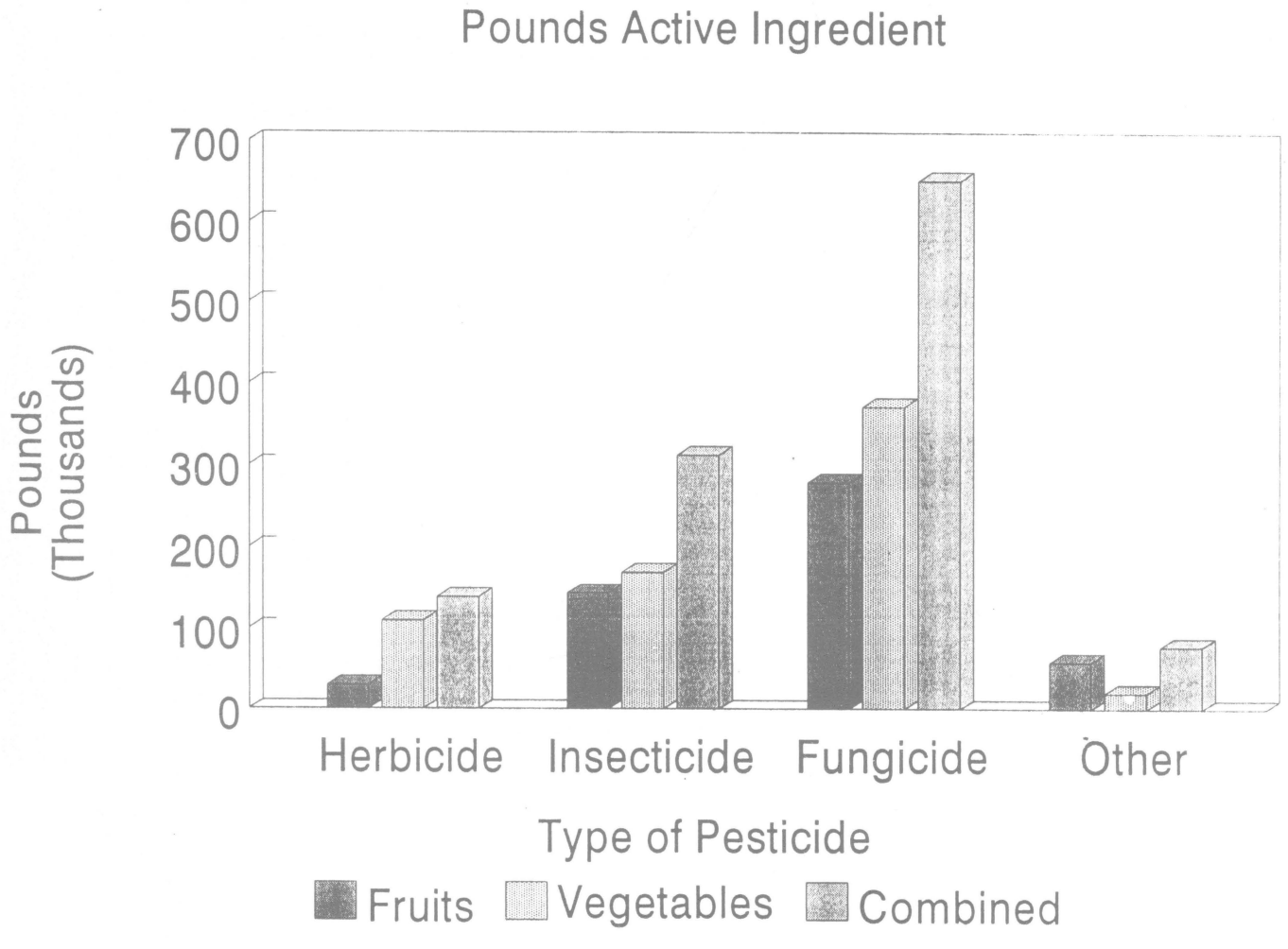
	Acre Treatments				
	Herbicide	Insecticide	Fungicide	Other	Ohio Total
Total Fruit	13031	104696	138830	11136	267693
Total Vegetables	93723	231815	296587	21593	643718
Total Overall	106754	336510	435417	32729	911411



FIGURES

Figure 3. Pounds Active Ingredient Applied to Fruit & Vegetable Crops in Ohio

	Pounds Treated				
	Herbicide	Insecticide	Fungicide	Other	Ohio Total
Total Fruit	29362	143642	279409	58358	510771
Total Vegetables	109470	169310	372098	19576	670454
Total Overall	138832	312951	651508	77934	1181225



DATA TABLES

Table 1. Surveys Sent to Fruit and Vegetable Producers in Ohio-1990

	Total Sent	First Contact	Second Contact
1st mail out	1,959	1,959	
2nd mail out	880	193	687

	No. returned	Percent Response
Useable	265	12.31
Deceased	13	0.60
Did not grow fruit & vegetables during 1990	306	14.22
Discontinued farming	108	5.02
Blank	33	1.53
Bad address	60	2.79
Not usable total	520	24.16
Total returned	785	36.47

Table 2. Fruit Crop Acreages in Ohio - 1990

Crop	Production Acres[a]	Reported in Survey		
		Acres	Percent	Number of Respondents
Apples	10,000	2,077	20.8	120
Apricots	6(?)	6	100.0(?)	1
Blueberries	275	63	23.0	10
Bramble berries	45[b]	18	39.7	8
Cherries	230[c]	55	23.9	9
Grapes	2,000	174	8.7	30
Melons	654[d]	89	13.6	25
Nectarines & Peaches	1,020	101	9.9	36
Pears	80	34	42.1	18
Plums	120	17	13.9	14
Raspberries	675	103	15.2	19
Strawberries	1,400	174	12.4	30
Total	16,503	2,910	17.6	320

[a]Acreage estimates from Crop Specialists, The Ohio State University or the Ohio Agricultural Statistics Service
[b]Reported as 45 acres of blackberries. Not reported with raspberries because of desire to keep such crop designation separate.
[c]Includes 200 acres of tart and 30 acres of sweet cherries
[d]Includes cantaloupes, muskmelons, watermelons

Table 3. Vegetable Crop Acreages in Ohio-1990

Crop	Production Acres[a]	Reported in Survey		
		Acres	Percent	Number of Respondents
Asparagus	50	7	13.0	5
Beans[b]	5,000[c]	420	8.4	26
Bedding Plants[d]	242	15	6.2	2
Beets[e]	250	74.2	29.7	3
Broccoli	250	18	7.0	6
Cabbage	3,000	1,179	39.3	30
Carrots	1,500	257	17.1	2
Cauliflower	350	3	0.9	3
Cucumbers[f]	4,400	343	7.8	25
Eggplant	50	28	56.2	8
Escarole[g]	250[g]	87	34.8	1
Greens[h]	1,500	114	7.6	5
Lettuce	1,400	320.3	22.9	3
Onions	1,000	31.1	3.1	2
Ornamental Corn	14	14	100.0	3
Parsley	82	82	100.0	2
Peas	<50	14.3	>28.6	6
Peppers	1,100	195	17.5	28
Potatoes	8,000	1,849	23.1	15
Pumpkins	2,500	230	9.2	37
Radishes	4,000	268	6.7	2
Squash[i]	1,000	187	18.7	15
Sweet Corn	12,300	3,276	26.6	70
Tomatoes	20,800[j]	2,880	13.8	61
Turnips	5	5	100	3
Total	69,094	11,895	17.2	365

[a] Estimates from Crop Specialists, The Ohio State University or Ohio Agricultural Statistics Service
[b] Includes green, snap, and string beans, navy, great northern pinto and kidney
[c] 2000 acres of green beans and 3000 acres of dry beans Acreage for dry in survey report is for navy beans
[d] Approximately 10,560,000 sq ft of bedding plants with 1,132,560 sq ft reported in the survey
[e] Includes table and red beets, does not include sugar beets
[f] Includes fresh and processing cucumbers and pickles
[g] Acreage is for escarole and endive But only escarole acres reported in the returned survey Another estimate indicates possibly 1750 acres of escarole
[h] Includes collards, kale, mustard, spinach and turnip greens
[i] Includes gourds, squash, zucchini and other vine crops
[j] Includes fresh and processing tomatoes

Table 04 Percent of Fruit Acreage Treated with Pesticide by Category in Ohio –

	Production Acres	Percent Acres Treated with a Pesticide			
		Herbicide	Insecticide	Fungicide	Other
Apples	10000	25	78	70	26
Apricots	6	100	100	100	0
Blackberries & Brambles	45	11	84	84	0
Blueberries	275	76	38	18	0
Cherries	230	1	81	80	0
Grapes (Table, Juice, & Wine)	2000	39	87	85	8
Melons (Cantaloupe, Melon, Muskmelon, Watermelon)	654	24	94	75	0
Nectarines & Peaches	1020	28	88	84	2
Pears	80	14	96	80	31
Plums (Plums & Prunes)	120	22	61	67	6
Raspberries	675	18	22	27	0
Strawberries	1400	73	75	80	5
Total Fruit	16505	31	77	71	18

Table 05 Percent of Vegetable Acreage Treated with Pesticide by Category in Ohio – 1990

	Production Acres	Percent Acres Treated with a Pesticide			
		Herbicide	Insecticide	Fungicide	Other
Asparagus	50	38	54	0	0
Beans (Green, Lima, Navy, Sprouts, String)	5000	35	63	18	0
Bedding Plants	242	73	100	73	0
Beets (Red & Table)	250	100	100	100	0
Broccoli	250	3	82	1	0
Cabbage	3000	52	78	9	12
Carrots	1500	100	<1	99	0
Cauliflower	350	9	100	70	0
Cucumbers (Cucumber & Processed Pickles)	4400	64	90	29	0
Eggplant	50	54	80	78	0
Escarole	250	0	100	0	0
Greens (Spinach, Kale, Mustard)	1500	35	88	22	0
Lettuce	1400	0	100	9	0
Onions	1000	55	<1	<1	0
Ornamental Corn	14	100	100	0	64
Parsley	82	0	73	0	0
Peas	50	10	8	84	4
Peppers	1100	71	90	79	0
Potatoes	8000	73	81	71	25
Pumpkins	2500	45	84	67	0
Radishes	4000	0	75	0	0
Squash (Squash, Zucchini, Vine Crops)	1000	78	79	66	0
Sweet Corn	12300	51	68	11	2
Tomatoes	20800	81	54	96	85
Turnips	5	0	20	0	0
Total Vegetables	69544	59	67	51	29
Total Overall	86049	54	69	55	27

Table 6. Acreage of Fruit Crops Treated with Pesticides in Ohio by Category - 1990

Crop Treated	Acreage for Type of Pesticide Active Ingredient Applied - (1)				
	Herbicide	Insecticide	Fungicide	Other	Ohio Total
APPLES	6876	30103	25479	3976	66434
APRICOTS	6	18	24		48
BLACKBERRIES & BRAMBLES	5	53	81		139
BLUEBERRIES	213	119	92		424
CHERRIES	37	212	708		957
GRAPES (TABLE, JUICE, & WINE)	1577	2729	5939	164	10408
MELONS (CANTALOUPE, MELON, MUSKMELON, WATERMELON)	242	1179	762		2183
NECTARINES & PEACHES	485	1971	1872	25	4352
PEARS	23	165	138	30	356
PLUMS (PLUMS & PRUNES)	59	172	110	7	347
RASPBERRIES	224	213	525		962
STRAWBERRIES	2702	1879	3098	89	7767
Total for Fruit	12448	38811	38827	4291	94378

1) Acreage listed is a summation of all acres reported for each pesticide in that category applied. Some acreage may have received application of several pesticides in each category, and thus total acreage will exceed the planted acreage in some cases.

ıble 7. Acre Treatments of Fruit Crops Treated with Pesticides in Ohio by Category - 1990

op Treated	Acre Treatments of Pesticide Active Ingredient Applied				
	Herbicide	Insecticide	Fungicide	Other	Ohio Total
'PLES	6919	84151	99075	9620	199766
'RICOTS	6	66	108		180
.ACKBERRIES & BRAMBLES	15	101	192		308
.UEBERRIES	399	232	135		767
IERRIES	3	468	1564		2036
ŁAPES (TABLE, JUICE, & WINE)	1577	5860	19749	1155	28341
ELONS (CANTALOUPE, MELON, MUSKMELON, WATERMELON)	255	3822	1740		5817
ECTARINES & PEACHES	605	5598	6748	146	13098
:ARS	28	512	489	103	1132
.UMS (PLUMS & PRUNES)	59	735	879	7	1680
ASPBERRIES	263	590	1319		2172
'RAWBERRIES	2900	2561	6759	105	12325
ıtal for Fruit	13031	104696	138758	11136	267621

Table 8. Quantity of Pesticides Used on Fruit Crops in Ohio by Category - 1990

	Pounds of Pesticide Active Ingredient Applied				
Crop Treated	Herbicide	Insecticide	Fungicide	Other	Ohio Total
APPLES	13576	116187	136159	40623	306546
APRICOTS	1	21	35		57
BLACKBERRIES & BRAMBLES	3	142	241		386
BLUEBERRIES	576	551	130		1257
CHERRIES	7	564	4505		5076
GRAPES (TABLE, JUICE, & WINE)	2680	7626	85344	542	96191
MELONS (CANTALOUPE, MELON, MUSKMELON, WATERMELON)	829	2579	1888		5296
NECTARINES & PEACHES	2332	7861	31008	285	41486
PEARS	56	1239	824	109	2227
PLUMS (PLUMS & PRUNES)	42	696	1893	5	2635
RASPBERRIES	833	2223	1520		4576
STRAWBERRIES	8429	3952	15835	16794	45010
Total for Fruit	29362	143642	279382	58358	510744

Table 9. Acreage of Vegetable Crops Treated with Pesticides in Ohio by Category - 1990

Crop Treated	Acreage for Type of Pesticide Active Ingredient Applied - (1)				Ohio Total
	Herbicide	Insecticide	Fungicide	Other	
ASPARAGUS	38	35			73
BEANS (GREEN, LIMA, NAVY, SNAP, SPROUTS, STRING)	1760	4041	1730	12	7544
BEDDING PLANTS	177	371	177		726
BEETS (RED & TABLE)	250	250	249		749
BROCCOLI	10	222	6	1	239
CABBAGE	1561	8581	288	354	10784
CARROTS	4150		2965		7115
CAULIFLOWER	64	721	488		1273
CUCUMBERS (CUCUMBERS & PROCESSED PICKLES)	3996	4928	1924		10848
EGGPLANT	48	190	55		294
ESCAROLE		750			750
GREENS (SPINACH, KALE, MUSTARD)	973	4984	329		6285
LETTUCE		4183	131		4315
ONIONS	550	10	3		563
ORNAMENTAL CORN	33	14		9	57
PARSLEY		60			60
PEAS	6	5	126	2	139
PEPPERS	838	3280	2190		6308
POTATOES	14609	28861	9207	1969	54647
PUMPKINS	1222	3046	4470		8738
RADISHES		2985			2985
SQUASH (SQUASH, ZUCCHINI, VINE CROPS)	939	1660	2712		5311
SWEET CORN	12937	19874	1307	257	34375
TOMATOES	37132	14955	45708	17685	115480
TURNIPS		1			1
Total for Vegetable	81295	104008	74066	20290	279658
Total for all crops	93743	142820	112893	24581	374036

1) Acreage listed is a summation of all acres reported for each pesticide in that category applied. Some acreage may have received application of several pesticides in each category, and thus total acreage will exceed the planted acreage in some cases.

Table 10. Acre Treatments of Vegetable Crops Treated with Pesticides in Ohio by Category - 1990

Crop Treated	Acre Treatments of Pesticide Active Ingredient Applied				
	Herbicide	Insecticide	Fungicide	Other	Ohio Total
ASPARAGUS	54	62			115
BEANS (GREEN, LIMA, NAVY, SNAP, SPROUTS, STRING)	1829	7624	4426	24	13903
BEDDING PLANTS	177	565	177		920
BEETS (RED & TABLE)	250	500	748		1498
BROCCOLI	27	1145	11	6	1189
CABBAGE	1819	27188	826	709	30541
CARROTS	5632		8895		14527
CAULIFLOWER	255	2036	976		3267
CUCUMBERS (CUCUMBERS & PROCESSED PICKLES)	4001	6660	3605		14266
EGGPLANT	49	340	102		491
ESCAROLE		1500			1500
GREENS (SPINACH, KALE, MUSTARD)	973	15305	657		16935
LETTUCE		8367	262		8629
ONIONS	553	13	6		572
ORNAMENTAL CORN	33	32		9	75
PARSLEY		180			180
PEAS	7	10	126	2	144
PEPPERS	841	8874	10595		20310
POTATOES	15587	54854	47701	1969	120112
PUMPKINS	1028	8110	13570		22709
RADISHES		2986			2986
SQUASH (SQUASH, ZUCCHINI, VINE CROPS)	940	3345	8377		12662
SWEET CORN	13335	54779	3364	257	71736
TOMATOES	46332	27337	192162	18617	284448
TURNIPS		2			2
Total for Vegetable	93723	231815	296587	21593	643718
Total for all crops	106754	336510	435345	32729	911339

Table 11. Quantity of Pesticides Used on Vegetable Crops in Ohio by Category - 1990

Crop Treated	Pounds of Pesticide Active Ingredient Applied				
	Herbicide	Insecticide	Fungicide	Other	Ohio Total
ASPARAGUS	108	93			201
BEANS (GREEN, LIMA, NAVY, SNAP, SPROUTS, STRING)	2310	8773	1018		12101
BEDDING PLANTS	1331	1022	71		2424
BEETS (RED & TABLE)	787	251	75		1113
BROCCOLI	77	55	12		144
CABBAGE	3142	9720	817	212	13891
CARROTS	2405		5782		8186
CAULIFLOWER	843	812	1458		3114
CUCUMBERS (CUCUMBERS & PROCESSED PICKLES)	13884	8098	4660		26641
EGGPLANT	244	139	153		537
ESCAROLE		358			358
GREENS (SPINACH, KALE, MUSTARD)	3379	10952	592		14922
LETTUCE		1996	2623		4619
ONIONS	458	5	10		473
ORNAMENTAL CORN	32	23			55
PARSLEY		22			22
PEAS	5	6	109		121
PEPPERS	561	9753	8036		18350
POTATOES	12595	48036	70118	4404	135152
PUMPKINS	2271	16497	14667		33435
RADISHES		4031			4031
SQUASH (SQUASH, ZUCCHINI, VINE CROPS)	2032	1690	8581		12303
SWEET CORN	34703	32521	3485	19	70728
TOMATOES	28302	14452	249834	14941	307529
TURNIPS	1	3			4
Total for Vegetable	109470	169310	372098	19576	670454
Total for all crops	138832	312951	651481	77934	1181198

Table 12. Acreage of Fruit Crops Treated, by Pesticide Category and Specific Pesticides in Ohio - 1990

Active Ingredient:	Crop and Acres Treated												
	Apples	Apricots	Blueberry	Brambles	Cherries	Grapes	Melons	Peaches	Pears	Plums	Raspberry	Strawberry	Total Acres Treated / Year
Herbicide													
	1967				33								2000
2,4-D	73							20				278	371
2,4-DB												82	82
BENSULIDE							82						82
CHLORTHAL-DIMETHYL (DCPA)												343	343
CYANAZINE			148										148
DICHLOBENIL								20			33		53
DIPHENAMID												198	198
DIURON	319		4		1	586		11		1	7		929
FLUAZIFOP-P-BUTYL												32	32
GLYPHOSATE	1322	6	39		2	298		111	3		18	153	1952
METOLACHLOR												40	40
NAPROPAMIDE	1		17			3						746	768
NAPTALAM							112						112
NORFLURAZON	356												356
ORYZALIN	152							126	5	18	33		333
PARAQUAT	1207		4			319		106	5	18			1659
POLYCHLOROBENZOIC ACID	48												48
SETHOXYDIM				5							39	76	121
SIMAZINE	1011				1	369		91	10	22	66		1572
TERBACIL	420										27	753	1200
TRIFLURALIN							48						48
Herbicide Totals	6876	6	213	5	37	1577	242	485	23	59	224	2702	12448
Insecticide													
AMIDITHION	5												5
AMITRAZ									2				2
AZINPHOS-METHYL	3360	6	7	5	153	126	155	417	14	47	46	728	5064
B.T. VAR. KURSTAKI						149	1						151
BARIUM POLYSULFIDE	390												390
BENDIOCARB	164												164
CARBARYL	829		98	8	1	1038	416	263	5	26	48	141	2873
CARBOFURAN							44						44
CHLORPYRIFOS	3820							253				130	4204
DIAZINON	432			25							20		477
DICOFOL	116							31	31				178
DIMETHOATE	337												337
DORMANT OIL	964					7				22			992
ENDOSULFAN	2521	6				126	258	131	2		7	596	3647
ESFENVALERATE	111						88	40	5				244
ETHION	14												14
ETHYL PARATHION	96					763	1	81		1	10		953
FENBUTATIN-OXIDE	1503											80	1583
FENVALERATE	45								9				54
FORMETANATE HYDROCHLORIDE	862												862
MALATHION	37		15	8		93	1	10	5		66	85	320
METHIOCARB					21								21
METHOMYL	265						74				10	24	372
METHOXYCHLOR	3							2				5	10
METHYL PARATHION	72				1	231						89	392

Table 12. Acreage of Fruit Crops Treated, by Pesticide Category and Specific Pesticides in Ohio - 1990 (Continued)

Active Ingredient:	Crop and Acres Treated												
	Apples	Apricots	Blueberry	Brambles	Cherries	Grapes	Melons	Peaches	Pears	Plums	Raspberry	Strawberry	Total Acres Treated / Year
MEVINPHOS						1							1
OXAMYL	515												515
OXYDEMETON-METHYL							74						74
PERMETHRIN	1589						66	5	4				1664
PETROLEUM OIL	2818				1	47		52	21	4			2944
PHOSMET	6637	6		8	36	147		684	62	43			7621
PIPERONYL BUTOXIDE											7		7
PROPARGITE	2396									29			2424
PYRETHRUM	202												202
THIODICARB									5				5
Insecticide Totals	30103	18	119	53	212	2729	1179	1971	165	172	213	1879	38811
Fungicide													
BENOMYL	4017	6	24	38	3	274	208	289	9	30	168	937	6001
CALCIUM POLYSULFIDES				25		229					125		380
CAPTAFOL					105								105
CAPTAN	6109	6	28	18	41	567		592	52	58	103	954	8528
CHLOROTHALONIL							346	171					517
COPPER (METALLIC)	378					229			7				615
COPPER HYDROXIDE	404					172	88						665
COPPER OXYCHLORIDE/CUSO4	14												14
CUPRIC SO4 PENTAHYDRATE	358					161							518
DICHLONE	29							10					39
DINOCAP	48						1						50
DODINE	3101					103		5					3209
FENARIMOL	2178												2178
FERBAM	489	6			142	990		192	2				1821
IPRODIONE					142	138					84	80	445
MANCOZEB	368					1157	44	10	21				1601
MANEB	183					585	29						798
METALAXYL	39	6						60			45	40	190
METAM-SODIUM								20					20
METIRAM-COMPLEX	657												657
OXYTHIOQUINOX	1843												1843
PHALTAN	10		17			3						64	95
STREPTOMYCIN	2119					103			42				2265
SULFUR	347				142	195		402	5	22			1112
SYSTHANE (MYCLOBUTANIL)	1989					195							2184
THIOPHANATE-METHYL	72											161	233
THIRAM	455											225	680
TRIADIMEFON						836	44						881
TRIFORINE	229		22		134			121					505
VINCLOZOLIN												636	636
ZINEB	43												43
Fungicide Totals	25479	24	92	81	708	5939	762	1872	138	110	525	3098	38827

Table 12. Acreage of Fruit Crops Treated, by Pesticide Category and Specific Pesticides in Ohio - 1990 (Continued)

Active Ingredient:	Crop and Acres Treated												
	Apples	Apricots	Blueberry	Brambles	Cherries	Grapes	Melons	Peaches	Pears	Plums	Raspberry	Strawberry	Total Acres Treated / Year
Other Pesticides													
6-BENZYLADENINE	159												159
ALKYLARYLPOLYOXYETHYLENE	24					3							28
BROMOETHANE												24	24
CALCIUM CHLORIDE	440												440
CALCIUM HYDROXIDE	24												24
CHLOROPICRIN												24	24
CREOSOTE COAL TAR	303												303
DI-1-P-MENTHENE: PINOLENE	58					161							218
DICHLOROPROPENE												24	24
IRON SOIL NUTRIENTS	48											16	64
NAPHTHALENEACETIC ACID	1235								5				1240
NH3+ SOAPS OF FATTY ACIDS	29												29
NITROGEN	63												63
POTASSIUM SALTS	1464							25	21	7			1517
SODIUM 2-PROPIONATE	10												10
SOYBEAN/VEGETABLE OILS	48								5				53
ZINC PHOSPHATE	72												72
Other Pesticides Totals	3976	0	0	0	0	164	0	25	30	7		89	4291
Total for each crop	66434	48	424	139	957	10408	2183	4352	356	347	962	7767	94378

Brambles = (Blackberries & Brambles)
Grapes = (Table, Juice, & Wine)
Melons = (Cantaloupe, Melon, Muskmelon, Watermelon)
Peaches = (Nectarines & Peaches)
Plums = (Plums & Prunes)

Table 13. Acre Treatments of Fruit Crops Treated by Pesticide Category and Specific Pesticides in Ohio - 1990

Active Ingredient:	Crop and Acre Treatments												
	Apples	Apricots	Blueberry	Brambles	Cherries	Grapes	Melons	Peaches	Pears	Plums	Raspberry	Strawberry	Total Acre Trtmnts / Year
Herbicide													
2,4-D	121							40				278	439
2,4-DB												82	82
BENSULIDE							88						88
CHLORTHAL-DIMETHYL (DCPA)												403	403
CYANAZINE			295										295
DICHLOBENIL								20			33		53
DIPHENAMID												198	198
DIURON	319		4		1	586		11		1	7		929
FLUAZIFOP-P-BUTYL												32	32
GLYPHOSATE	2591	6	78		2	298		171	8		18	153	3325
METOLACHLOR												80	80
NAPROPAMIDE	1		17			3						780	802
NAPTALAM							117						117
NORFLURAZON	356												356
ORYZALIN	152							126	5	18	33		333
PARAQUAT	1525		4			319		126	5	18			1997
POLYCHLOROBENZOIC ACID	385												385
SETHOXYDIM				15							79	76	171
SIMAZINE	1050				1	369		112	10	22	66		1630
TERBACIL	420										27	818	1265
TRIFLURALIN							50						50
Herbicide Totals	6919	6	399	15	3	1577	255	605	28	59	263	2900	13031
Insecticide													
AMIDITHION	5												5
AMITRAZ									2				2
AZINPHOS-METHYL	12619	12	20	15	337	126	906	1438	57	285	263	978	17055
B.T. VAR. KURSTAKI						149	4						154
BARIUM POLYSULFIDE	679												679
BENDIOCARB	164												164
CARBARYL	3096		198	8	3	3052	1491	572	10	70	96	201	8796
CARBOFURAN							44						44
CHLORPYRIFOS	9472							253				227	9952
DIAZINON	723			55							59		837
DICOFOL	311							34	104				449
DIMETHOATE	385												385
DORMANT OIL	1180					7				22			1209
ENDOSULFAN	4630	24				161	876	352	5		13	706	6766
ESFENVALERATE	236							80	5				321
ETHION	144												144
ETHYL PARATHION	207					1383	2	133		1	20		1746
FENBUTATIN-OXIDE	3586											80	3666
FENVALERATE	74								9				83
FORMETANATE HYDROCHLORIDE	1329												1329
MALATHION	151		15	15		96	4	70	33		112	100	598
METHIOCARB					21								21
METHOMYL	323						147				20	72	562
METHOXYCHLOR	12							8				19	39
METHYL PARATHION	159				1	563						177	900
MEVINPHOS						1							1

Table 13. Acre Treatments of Fruit Crops Treated by Pesticide Category and Specific Pesticides in Ohio - 1990 (Continued)

Active Ingredient:	Crop and Acre Treatments												
	Apples	Apricots	Blueberry	Brambles	Cherries	Grapes	Melons	Peaches	Pears	Plums	Raspberry	Strawberry	Total Acre Trtmnts / Year
OXAMYL	645												645
OXYDEMETON-METHYL							74						74
PERMETHRIN	1589						273	60	6				1928
PETROLEUM OIL	3151				1	47		53	21	4			3277
PHOSMET	31899	30		8	107	274		2544	254	295			35410
PIPERONYL BUTOXIDE											7		7
PROPARGITE	5217									58			5275
PYRETHRUM	2167												2167
THIODICARB									5				5
Insecticide Totals	84151	66	232	101	468	5860	3822	5598	512	735	590	2561	104696
Fungicide													
BENOMYL	15189	42	37	103	14	571	613	1573	65	262	487	2294	21251
CALCIUM POLYSULFIDES				25		229					191		446
CAPTAFOL					105								105
CAPTAN	40818	42	41	63	191	2163		2545	240	422	405	2369	49300
CHLOROTHALONIL							855	211					1066
COPPER (METALLIC)	426					229			40				696
COPPER HYDROXIDE	1146					172							1318
COPPER OXYCHLORIDE/CUSO4	14												14
CUPRIC SO4 PENTAHYDRATE	695					321							1016
DICHLONE	29							10					39
DINOCAP	77						7						84
DODINE	8665					103		15					8783
FENARIMOL	6765												6765
FERBAM	812	12			284	3756		293	2				5158
IPRODIONE					284	379					172	161	996
MANCOZEB	1553					3969	81	10	21				5634
MANEB	356					2886	88						3331
METALAXYL	39	12						121			63	80	315
METAM-SODIUM								20					20
METIRAM-COMPLEX	1510												1510
OXYTHIOQUINOX	1843												1843
PHALTAN	10		17			3						64	95
STREPTOMYCIN	5281					103			83				5468
SULFUR	2003				427	1882		1780	38	195			6324
SYSTHANE (MYCLOBUTANIL)	7348					390							7738
THIOPHANATE-METHYL	361											322	683
THIRAM	3554											386	3940
TRIADIMEFON						2591	96						2687
TRIFORINE	453		40		259			171					923
VINCLOZOLIN												1082	1082
ZINEB	130												130
Fungicide Totals	99075	108	135	192	1564	19749	1740	6748	489	879	1319	6759	138758

Table 13. Acre Treatments of Fruit Crops Treated by Pesticide Category and Specific Pesticides in Ohio - 1990 (Continued)

Active Ingredient:	Crop and Acre Treatments												
	Apples	Apricots	Blueberry	Brambles	Cherries	Grapes	Melons	Peaches	Pears	Plums	Raspberry	Strawberry	Total Acre Trtmnts / Year
Other Pesticides													
6-BENZYLADENINE	159												159
ALKYLARYLPOLYOXYETHYLENE	48					31							79
BROMOETHANE												24	24
CALCIUM CHLORIDE	2019												2019
CALCIUM HYDROXIDE	96												96
CHLOROPICRIN												24	24
CREOSOTE COAL TAR	303												303
DI-1-P-MENTHENE: PINOLENE	299					1124							1423
DICHLOROPROPENE												24	24
IRON SOIL NUTRIENTS	144											32	177
NAPHTHALENEACETIC ACID	1750								5				1755
NH3+ SOAPS OF FATTY ACIDS	173												173
NITROGEN	63												63
POTASSIUM SALTS	4170							146	60	7			4383
SODIUM 2-PROPIONATE	10												10
SOYBEAN/VEGETABLE OILS	289								38				327
ZINC PHOSPHATE	96												96
Other Pesticides Totals	9620	0	0	0	0	1155	0	146	103	7		105	11136
Total for each crop	199766	180	767	308	2036	28341	5817	13098	1132	1680	2172	12325	267621

Brambles = (Blackberries & Brambles)
Grapes = (Table, Juice, & Wine)
Melons = (Canataloupe, Melon, Muskmelon, Watermelon)
Peach = (Nectarines & Peaches)
Plums = (Plums & Prunes)

Table 14. Quantity of Specific Pesticides by Category Applied to Fruit Crops in Ohio - 1990

Active Ingredient:	Crop and Pounds of Pesticide Active Ingredient Applied												Total Pounds Treated / Year
	Apples	Apricots	Blueberry	Brambles	Cherries	Grapes	Melons	Peaches	Pears	Plums	Raspberry	Strawberry	
Herbicide													
2,4-D	391							153				342	886
2,4-DB												182	182
BENSULIDE							419						419
CHLORTHAL-DIMETHYL (DCPA)												2714	2714
CYANAZINE			472										472
DICHLOBENIL								1207			263		1470
DIPHENAMID												853	853
DIURON	642		14		2	976		27	1	2	16		1679
FLUAZIFOP-P-BUTYL												8	8
GLYPHOSATE	6703	1	78		3	344		352	30		18	731	8261
METOLACHLOR												527	527
NAPROPAMIDE	2		8			5						2676	2691
NAPTALAM							351						351
NORFLURAZON	812												812
ORYZALIN	346							258	1	5	99		709
PARAQUAT	1250		4			113		110		5			1483
POLYCHLOROBENZOIC ACID	6												6
SETHOXYDIM				3							15	14	32
SIMAZINE	2713				2	1242		225	22	30	401		4635
TERBACIL	711										21	381	1113
TRIFLURALIN							59						59
Herbicide Totals	13576	1	576	3	7	2680	829	2332	56	42	833	8429	29362
Insecticide													
AMIDITHION	2												2
AMITRAZ									1				1
AZINPHOS-METHYL	9541	6	2	11	243	68	471	867	17	118	179	702	12224
B.T. VAR. KURSTAKI						1							1
BARIUM POLYSULFIDE	8920												8920
BENDIOCARB	249												249
CARBARYL	2414		458	12	3	3842	1502	1188	10	128	110	148	9814
CARBOFURAN							20						20
CHLORPYRIFOS	9725							680				210	10615
DIAZINON	501			63							59		623
DICOFOL	329							86	114				529
DIMETHOATE	265												265
DORMANT OIL	3255					14				14			3283
ENDOSULFAN	6158					192	468	121	7		13	665	7624
ESFENVALERATE	79							7					86
ETHION	79												79
ETHYL PARATHION	169					2451		88			5		2713
FENBUTATIN-OXIDE	1783											80	1863
FENVALERATE	70								2				72
FORMETANATE HYDROCHLORIDE	1072												1072
MALATHION	2872		90	53		219		1313	620		1838	1896	8901
METHIOCARB					12								12
METHOMYL	182						66				18	65	331
METHOXYCHLOR	52							40				97	188
METHYL PARATHION	141					477						89	707

Table 14. Quantity of Specific Pesticides by Category Applied to Fruit Crops in Ohio - 1990 (Continued)

Active Ingredient:	Crop and Pounds of Pesticide Active Ingredient Applied												
	Apples	Apricots	Blueberry	Brambles	Cherries	Grapes	Melons	Peaches	Pears	Plums	Raspberry	Strawberry	Total Pounds Treated / Year
MEVINPHOS						1							1
OXAMYL	943												943
OXYDEMETON-METHYL							9						9
PERMETHRIN	297						42	4	6				350
PETROLEUM OIL	20999				2	44		250	88	14			21395
PHOSMET	38726	15		4	305	317		3218	372	370			43328
PIPERONYL BUTOXIDE											1		1
PROPARGITE	5325									52			5376
PYRETHRUM	2042												2042
THIODICARB									1				1
Insecticide Totals	116187	21	551	142	564	7626	2579	7861	1239	696	2223	3952	143642
Fungicide													
BENOMYL	3154		11	35	6	262	153	464	23	81	161	1124	5475
CALCIUM POLYSULFIDES				105		532					735		1373
CAPTAFOL					84								84
CAPTAN	79232	21	64	101	511	3770		3991	624	916	421	5868	95519
CHLOROTHALONIL							1276	249					1525
COPPER (METALLIC)	1504					707			36				2246
COPPER HYDROXIDE	5227					172							5399
COPPER OXYCHLORIDE/CUSO4	36												36
CUPRIC SO4 PENTAHYDRATE	3844					1606							5451
DICHLONE	14							10					24
DINOCAP	11						17						28
DODINE	6948					134		7					7090
FENARIMOL	1304												1304
FERBAM	2040	14			427	8434		857	2				11774
IPRODIONE					284	310					140	80	814
MANCOZEB	1883					5624	298	7	93				7905
MANEB	919					5106	133						6157
METALAXYL	1							30			63	60	155
METAM-SODIUM								1918					1918
METIRAM-COMPLEX	3495												3495
OXYTHIOQUINOX	897												897
PHALTAN	10		43			7						64	124
STREPTOMYCIN	1110					5			12				1127
SULFUR	15351				3139	58244		23112	35	895			100777
SYSTHANE (MYCLOBUTANIL)	2960					49							3008
THIOPHANATE-METHYL	237											225	462
THIRAM	5825											1119	6944
TRIADIMEFON						381	12						393
TRIFORINE	136		12		54			362					563
VINCLOZOLIN												7293	7293
ZINEB	21												21
Fungicide Totals	136159	35	130	241	4505	85344	1888	31008	824	1893	1520	15835	279382

Table 14. Quantity of Specific Pesticides by Category Applied to Fruit Crops in Ohio - 1990 (Continued)

Active Ingredient:	Crop and Pounds of Pesticide Active Ingredient Applied												
	Apples	Apricots	Blueberry	Brambles	Cherries	Grapes	Melons	Peaches	Pears	Plums	Raspberry	Strawberry	Total Pounds Treated / Year
Other Pesticides													
6-BENZYLADENINE	1												1
ALKYLARYLPOLYOXYETHYLENE	15					2							17
BROMOETHANE												4829	4829
CALCIUM CHLORIDE	29738												29738
CALCIUM HYDROXIDE	385												385
CHLOROPICRIN												4660	4660
CREOSOTE COAL TAR	1140												1140
DI-1-P-MENTHENE: PINOLENE	9					540							549
DICHLOROPROPENE												7267	7267
IRON SOIL NUTRIENTS	122											39	160
NAPHTHALENEACETIC ACID	1408								1				1409
NH3+ SOAPS OF FATTY ACIDS	52												52
NITROGEN	44												44
POTASSIUM SALTS	6934							285	33	5			7256
SODIUM 2-PROPIONATE	3												3
SOYBEAN/VEGETABLE OILS	578								76				654
ZINC PHOSPHATE	194												194
Other Pesticides Totals	40623	0	0	0	0	542	0	285	109	5		16794	58358
Total for each crop	306546	57	1257	386	5076	96191	5296	41486	2227	2635	4576	45010	510744

Brambles = (Blackberries & Brambles)
Grapes = (Table, Juice, & Wine)
Melons = (Cantaloupe, Melon, Muskmelon, Watermelon)
Peaches = (Nectarines & Peaches)
Plums = (Plums & Prunes)

Table 15. Acreage of Vegetable Crops Treated by Pesticide Category and Specific Pesticides in Ohio - 1990

Active Ingredient:	Crop and Acres Treated																								Total Acres Treated / Year
	Asparagus	Beans	Bedding Plants	Beets	Broccoli	Cabbage	Carrots	Cauliflower	Eggplant	Cucumbers	Greens	Lettuce	Onions	Ornamental Corn	Parsley	Peas	Peppers	Potatoes	Pumpkins	Radishes	Squash	Sweet Corn	Tomatoes	Turnips	
Herbicide																									
																			109						109
2,4-D														1											1
2,4-DB																						120			120
ALACHLOR						255																3589			3844
ATRAZINE														10								4264			4274
BENSULIDE										2439															2439
BENTAZON		12														2						124			138
BUTYLATE																						469			469
CHLORAMBEN																	1		863		938		904		2705
CHLORTHAL-DIMETHYL (DCPA)		1	177		3	140		32	27		526		3				1								911
CYANAZINE							18							13								2273			2304
DICAMBA																						582			582
DIMETHAZONE																			196						196
DIPHENAMID																							7		7
DIQUAT																		2727							2727
DIURON	19																								19
EPTC																						19			19
FLUAZIFOP-P-BUTYL							1167																		1167
GLYPHOSATE																		87				30	433		550
LINURON							1482											4285							5767
METOLACHLOR		834																4546				1295			6676
METRIBUZIN																		2359					16703		19061
NAPROPAMIDE									21								96						51		168
NAPTALAM										1554															1554
PARAQUAT													547					433				150			1130
PEBULATE																							2911		2911
PROPACHLOR																						19			19
PYRAZON (CHLORIDAZON)				250																					250
SETHOXYDIM																		173					6458		6631
SIMAZINE	12																								12
TERBACIL	8																								8
TRIDIPHANE														9								2			11
TRIFLURALIN		913			7	1167	1482	32		3	447					5	740		54		1		9666		14517
Herbicide Totals	38	1760	177	250	10	1561	4150	64	48	3996	973	0	550	33		6	838	14609	1222		939	12937	37132		81295
Insecticide																									
ACEPHATE		1	65		3			32									710								811
ALDICARB																		82							82
AMITRAZ					71																				71
AZINPHOS-METHYL			48			1074			39		973						28	4703					61		6928
B.T. THURINGIENSIS																		366							366
B.T. VAR. KURSTAKI		1			91	1669		138			881						6		33		16		37		2871
CARBARYL	19	3034			3	234		32	8	2129				5			189	506	1235		122	3128	4376		15020
CARBOFURAN										1271							6	783				819			2878
CHLORPYRIFOS						132								9						2985		434			3560
DIAZINON				249		76											17		2			252	35		631
DIMETHOATE						786					184	1394													2615
DISULFOTON		930				916																			1846
ENDOSULFAN		60			3	8		212	32	941	184	1394				3	102	1761	773		642	139	2797		9303
ESFENVALERATE						662			39	173							79	3873	240		321	2621	6407		14415
ETHYL PARATHION		1			3	1077		32		8	657		3			1	716	857	460		472	2609	15		6911
FENVALERATE																			87			383	1047		1517
FONOFOS			177			109																15			302
MALATHION	8	1			3			32		386	14		3			1	29		176		1	8	64	1	728
METHAMIDOPHOS						64												3826							3889
METHOMYL		6				43			32	21							718		8		86	1385	96		2394
METHYL PARATHION						173												866				1307	1		2346
MEVINPHOS		1			3			32					3												39

Table 15. Acreage of Vegetable Crops Treated by Pesticide Category and Specific Pesticides in Ohio - 1990 (Continued)

Active Ingredient:	Crop and Acres Treated: Asparagus	Beans	Bedding Plants	Beets	Broccoli	Cabbage	Carrots	Cauliflower	Eggplant	Cucumbers	Greens	Lettuce	Onions	Ornamental Corn	Parsley	Peas	Peppers	Potatoes	Pumpkins	Radishes	Squash	Sweet Corn	Tomatoes	Turnips	Total Acres Treated / Year
NALED			81			560					973														1613
OXAMYL									7								23								30
OXYDEMETON-METHYL																						278			278
PERMETHRIN					43	995		212	32		1117	1394			60		653	3858	22			3424	6		12067
PHORATE																		4895							4895
PHOSMET	8	6															6	1272				6	7		1305
PIPERONYL BUTOXIDE																		1212							1212
PYRETHRUM																			11				6		17
TERBUFOS																						1217			1217
THIODICARB																						1851			1851
Insecticide Totals	35	4041	371	250	222	8581	0	721	190	4928	4984	4183	10	14	60	5	3280	28861	3046	2985	1660	19874	14955	1	104008
Fungicide																									
ANILAZINE																							8155		8155
BENOMYL		834								169							6		1013		708		2621		5351
CAPTAN		1			3	5		244									6						7		266
CHLOROTHALONIL		13			3	72	1482	244		1163			3			42	34	2	1320		650	631	19881		25540
COPPER (METALLIC)																							383		383
COPPER HYDROXIDE		834		249		188	1482		23	487	329					42	704	541	370		380		14616		20247
DINOCAP										1									57		1				59
MANCOZEB										51								3462	283		5	601	7		4410
MANEB		48				20				51							73	3527				75	36		3831
METALAXYL			177			3			32							42	720	1666	653		648		1		3942
STREPTOMYCIN																	647								647
THIOPHANATE-METHYL																		9							9
TRIADIMEFON																			773		321				1094
VINCLOZOLIN												131													131
Fungicide Totals	0	1730	177	249	6	288	2965	488	55	1924	329	131	3			126	2190	9207	4470		2712	1307	45708		74066
Other Pesticides																									
AMENOPYRIDE																						150			150
CAPTAN		12												9		2						2			25
ETHEPHON																							17676		17676
ETHYLENE DIBROMIDE					1																		9		11
GLYCOLS, IPA																						105			105
MALEIC HYDRAZIDE																		1861							1861
POT SALT MALEIC HYDRAZIDE																		108							108
POTASSIUM SALTS						354																			354
Other Pesticides Totals	0	12	0	0	1	354	0	0	0	0	0	0		9		2		1969				257	17685		20290
Total for each crop	73	7544	726	749	239	10784	7115	1273	294	10848	6285	4315	563	57	60	139	6308	54647	8738	2985	5311	34375	115480	1	279658

* The captan listed in the "Other Pesticides" category is used for corn seed treatment.

Beans = (Green, Lima, Navy, Snap, Sprouts, String)
Beets = (Red & Table)
Cucumbers = (Cucumbers & Processed Pickles)
Greens = (Kale, Mustard, Spinach)
Squash = (Squash, Zucchini, Vine Crops)

Table 16. Acre Treatments of Vegetable Crops Treated by Pesticide Category and Specific Pesticides in Ohio - 1990

Active Ingredient:	Crop and Acres Treatments																								Total Acres Treated / Year
	Asparagus	Beans	Bedding Plants	Beets	Broccoli	Cabbage	Carrots	Cauliflower	Eggplant	Cucumbers	Greens	Lettuce	Onions	Ornamental Corn	Parsley	Peas	Peppers	Potatoes	Pumpkins	Radishes	Squash	Sweet Corn	Tomatoes	Turnips	
Herbicide																									
2,4-D														1											1
2,4-DB																						120			120
ALACHLOR						509																3683			4192
ATRAZINE														10								4339			4349
BENSULIDE										2442															2442
BENTAZON		12														2						237			250
BUTYLATE																						582			582
CHLORAMBEN																	2		778		939		905		2624
CHLORTHAL-DIMETHYL (DCPA)		5	177		11	141		127	28		526		6				2								1024
CYANAZINE							18							13								2217			2248
DICAMBA																						582			582
DIMETHAZONE																			196						196
DIPHENAMID																							7		7
DIQUAT																		2727							2727
DIURON	35																								35
EPTC																						19			19
FLUAZIFOP-P-BUTYL							1167																		1167
GLYPHOSATE																		87				60	433		580
LINURON							2965											4285							7250
METOLACHLOR		834																5351				1325			7511
METRIBUZIN																		2359					25898		28257
NAPROPAMIDE									21								96						51		168
NAPTALAM										1557															1557
PARAQUAT													547					433				150			1130
PEBULATE																							2911		2911
PROPACHLOR																						19			19
PYRAZON (CHLORIDAZON)				250																					250
SETHOXYDIM																		346					6458		6804
SIMAZINE	12																								12
TERBACIL	8																								8
TRIDIPHANE														9								2			11
TRIFLURALIN		978			16	1168	1482	127		3	447					5	741		54		2		9669		14694
Herbicide Totals	54	1829	177	250	27	1819	5632	255	49	4001	973	0	553	33		7	841	15587	1028		940	13335	46332		93723
Insecticide																									
ACEPHATE		13	258		3			32									2822								3128
ALDICARB																		82							82
AMITRAZ					71																				71
AZINPHOS-METHYL			48			2158			61		1946						113	13184					202		17712
B.T. THURINGIENSIS																		1359							1359
B.T. VAR. KURSTAKI		12			900	8741		742			4378						28		131		64		112		15109
CARBARYL	31	6444			17	1559		191	30	3393				23			819	515	4507		294	10754	6086		34663
CARBOFURAN										1271							11	1865				819			3966
CHLORPYRIFOS						132								9						2985		835			3962
DIAZINON				499		153											34		13			263	254		1215
DIMETHOATE						3225					552	4183													8710
DISULFOTON		930				916																			1846
ENDOSULFAN		179			6'	16		424	48	907	184	1394				7	335	1978	1862		2087	267	7169		17114
ESFENVALERATE						2214			91	6							281	10517	349		321	6289	10821		30889
ETHYL PARATHION		2			6	3294		64		27	1315		6			1	1432	1575	464		474	6980	59		15699
FENVALERATE																			349			2005	1047		3401
FONOFOS			177			109																15			302
MALATHION	23	7		1	11	1		127	1	772	16		3			1	59		342	1	2	8	439	1	1816
METHAMIDOPHOS						127												4008							4135
METHOMYL		24				153			48	283							1567		19		102	4637	1047		7880
METHYL PARATHION						346												866				3672	1		4884

Table 16. Acre Treatments of Vegetable Crops Treated by Pesticide Category and Specific Pesticides in Ohio - 1990 (Continued)

Active Ingredient:	Crop and Acres Treatments																							Total Acres Treated / Year
	Asparagus	Beans	Bedding Plants	Beets	Broccoli	Cabbage	Carrots	Cauliflower	Eggplant	Cucumbers	Greens	Lettuce	Onions	Ornamental Corn	Parsley	Peas	Peppers	Potatoes	Pumpkins	Radishes	Squash	Sweet Corn	Tomatoes	Turnips	
MEVINPHOS		1			3			32					3												39
NALED			81			1680					3891														5652
OXAMYL									29								45								74
OXYDEMETON-METHYL																						330			330
PERMETHRIN					128	2362		424	33		3024	2789			180		1306	7913	65			9067	18		27810
PHORATE																		4895							4895
PHOSMET	8	12															23	2463				11	29		2545
PIPERONYL BUTOXIDE																		3635							3635
PYRETHRUM																			11				52		63
TERBUFOS																						1160			1160
THIODICARB																						7667			7667
Insecticide Totals	62	7624	565	500	1145	27188	0	2036	340	6660	15305	8367	13	32	180	10	8874	54854	8110	2986	3345	54779	27337	2	231815
Fungicide																									
ANILAZINE																							18817		18817
BENOMYL		834								5							45		1296		1066		4820		8067
CAPTAN		1			3	10		456									45						58		573
CHLOROTHALONIL		63			9	533	4447	520		2405			6			42	98	9	6781		3337	1262	127710		147222
COPPER (METALLIC)																							766		766
COPPER HYDROXIDE		3337		748		188	4447		38	962	657					42	6748	1082	566		1563		39837		60215
DINOCAP										3									113		2				118
MANCOZEB										77								27049	1176		16	1802	7		30128
MANEB		191				81				154							259	16446				300	144		17576
METALAXYL			177			13			64							42	2105	3073	1568		1750		3		8795
STREPTOMYCIN																	1294								1294
THIOPHANATE-METHYL																		43							43
TRIADIMEFON																			2069		642				2711
VINCLOZOLIN												262													262
Fungicide Totals	0	4426	177	748	11	826	8895	976	102	3605	657	262	6			126	10595	47701	13570		8377	3364	192162		296587
Other Pesticides																									
AMENOPYRIDE																						150			150
CAPTAN		24												9		2						2			37
ETHEPHON																							18542		18542
ETHYLENE DIBROMIDE					6	1																	75		82
GLYCOLS, IPA																						105			105
MALEIC HYDRAZIDE																		1861							1861
POT SALT MALEIC HYDRAZIDE																		108							108
POTASSIUM SALTS						708																			708
Other Pesticides Totals	0	24	0	0	6	709	0	0	0	0	0	0		9		2		1969				257	18617		21593
Total for each crop	115	13903	920	1498	1189	30541	14527	3267	491	14266	16935	8629	572	75	180	144	20310	120112	22709	2986	12662	71736	284448	2	643718

* The captan listed in the "Other Pesticides" category is used for corn seed treatment.

Beans = (Green, Lima, Navy, Snap, Sprouts, String)
Beets = (Red & Table)
Cucumbers = (Cucumbers & Processed Pickles)
Greens = (Kale, Mustard, Spinach)
Squash = (Squash, Zucchini, Vine Crops)

Table 17. Quantities of Specific Pesticides by Category Applied to Vegetable Crops in Ohio - 1990

Active Ingredient:	Crop and Pounds of Pesticide Active Ingredient Applied																								Total Acres Treated / Year
	Aspar agus	Beans	Bed ding Plants	Beets	Broc coli	Cab bage	Car rots	Cauli flower	Egg plant	Cucum bers	Greens	Let tuce	Onions	Orna mental Corn	Pars ley	Peas	Pep pers	Pota toes	Pump kins	Rad ishes	Squash	Sweet Corn	Toma toes	Tur nips	
Herbicide																									
2,4-D														1											1
2,4-DB																						16			16
ALACHLOR						1018																15527			16545
ATRAZINE														11								12479			12490
BENSULIDE										9795															9795
BENTAZON		6														1						230			237
BUTYLATE																						2409			2409
CHLORAMBEN																	3		2048		2031		34		4116
CHLORTHAL-DIMETHYL (DCPA)		29	1331		68	321		764	205		3155		48				17							1	5939
CYANAZINE							35							15								2219			2269
DICAMBA																						142			142
DIMETHAZONE																			154						154
DIPHENAMID																							36		36
DIQUAT																		1428							1428
DIURON	74																								74
EPTC																						56			56
FLUAZIFOP-P-BUTYL							146																		146
GLYPHOSATE																		87				5	650		741
LINURON							1482											2876							4359
METOLACHLOR		1668																6805				1211			9685
METRIBUZIN																		1140					10720		11860
NAPROPAMIDE									39								138						83		260
NAPTALAM										4086															4086
PARAQUAT													410					162				32			605
PEBULATE																							8841		8841
PROPACHLOR																						375			375
PYRAZON (CHLORIDAZON)				787																					787
SETHOXYDIM																		97					1211		1308
SIMAZINE	22																								22
TERBACIL	12																								12
TRIDIPHANE														6								1			7
TRIFLURALIN		607			9	1803	741	80		3	223					4	402		68		2		6727		10669
Herbicide Totals	108	2310	1331	787	77	3142	2405	843	244	13884	3379	0	458	32		5	561	12595	2271		2032	34703	28302	1	109470
Insecticide																									
ACEPHATE		7	387		2			24									1728								2148
ALDICARB																		164							164
AMITRAZ					4																				4
AZINPHOS-METHYL			22			1037			30		681						55	6112					100		8038
B.T. THURINGIENSIS																		886							886
B.T. VAR. KURSTAKI					9	255		25			139						2		8		4		2		444
CARBARYL	54	6473			17	1565		191	30	3787				22			849	549	5441		264	12596	7463		39302
CARBOFURAN										1659							1	1528				675			3863
CHLORPYRIFOS						173								1						4030		1109			5313
DIAZINON				249		153											8		1			69	232		712
DIMETHOATE						1170					86	648													2020
DISULFOTON		2139				689																			2828
ENDOSULFAN		98			1	14		424	24	761	23	232				5	179	2957	1071		1122	282	5089		12326
ESFENVALERATE						117			3								38	4330	93		9	567	451		5609
ETHYL PARATHION		1			3	1457		29		14	5259		3			1	5247	793	230		235	3636	58		16964
FENVALERATE																			46			325	102		473
FONOFOS			532			582																19			1133
MALATHION	36	14		2	2			18		1795	34						66		9552	2		1	652	2	12177
METHAMIDOPHOS						64												6587							6651
METHOMYL		21				69			29	82							1288		40		55	1740	286		3610
METHYL PARATHION						173												216				1847	1		2237

Table 17. Quantities of Specific Pesticides by Category Applied to Vegetable Crops in Ohio - 1990 (Continued)

Active Ingredient	Asparagus	Beans	Bedding Plants	Beets	Broccoli	Cabbage	Carrots	Cauliflower	Eggplant	Cucumbers	Greens	Lettuce	Onions	Ornamental Corn	Parsley	Peas	Peppers	Potatoes	Pumpkins	Radishes	Squash	Sweet Corn	Tomatoes	Turnips	Total Acres Treated / Year
Crop and Pounds of Pesticide Active Ingredient Applied																									
MEVINPHOS		1			1			16					2												20
NALED			81			1680					3891														5652
OXAMYL									14								23								37
OXYDEMETON-METHYL																						289			289
PERMETHRIN					16	522		86	8		839	1116			22		260	650	9			3062	1		6791
PHORATE																		9096							9096
PHOSMET	3	18															8	2476				17	11		2532
PIPERONYL BUTOXIDE																		11691							11691
PYRETHRUM																			4				6		10
TERBUFOS																						1419			1419
THIODICARB																						4869			4869
Insecticide Totals	93	8773	1022	251	55	9720	0	812	139	8098	10952	1996	5	23	22	6	9753	48036	16497	4031	1690	32521	14452	3	169310
Fungicide																									
ANILAZINE																							22136		22136
BENOMYL		313								1							3		324		267		756		1663
CAPTAN		1			3	21		880									11						14		931
CHLOROTHALONIL		84			9	523	5337	578		4168			10			57	81	13	10000		4727	1022	210892		237501
COPPER (METALLIC)																							1179		1179
COPPER HYDROXIDE		334		75		125	445		32	212	592					42	6597	180	566		1774		14636		25609
DINOCAP																			11						12
MANCOZEB										48								40647	2157			2163	3		45018
MANEB		286				122				231							392	22892				300	217		24439
METALAXYL			71			25			121							10	879	6340	1371		1752		1		10571
STREPTOMYCIN																	73								73
THIOPHANATE-METHYL																		45							45
TRIADIMEFON																			237		60				297
VINCLOZOLIN												2623													2623
Fungicide Totals	0	1018	71	75	12	817	5782	1458	153	4660	592	2623	10			109	8036	70118	14667		8581	3485	249834		372098
Other Pesticides																									
AMENOPYRIDE																						15			15
CAPTAN																									
ETHEPHON																							14833		14833
ETHYLENE DIBROMIDE																							108		108
GLYCOLS, IPA																						4			4
MALEIC HYDRAZIDE																		4099							4099
POT SALT MALEIC HYDRAZIDE																		304							304
POTASSIUM SALTS						212																			212
Other Pesticides Totals	0	0	0	0	0	212	0	0	0	0	0	0						4404				19	14941		19576
Total for each crop	201	12101	2424	1113	144	13891	8186	3114	537	26641	14922	4619	473	55	22	121	18350	135152	33435	4031	12303	70728	307529	4	670454

* The captan listed in the "Other Pesticides" category is used for corn seed treatment.

Beans = (Green, Lima, Navy, Snap, Sprouts, String)
Beets = (Red & Table)
Cucumbers = (Cucumbers & Processed Pickles)
Greens = (Kale, Mustard, Spinach)
Squash = (Squash, Zucchini, Vine Crops)

Table 18. Pesticide Application for Processing Tomatoes in Ohio - 1990

Active Ingredient	Acres Treated		Acre Treatments		Pounds a.i. Applied	
	Reported	State Total	Reported	State Total	As Reported	State Total
Chloramben	353	1,681	353	1,681	965	4,595
Glyphosate	99	471	99	471	36	172
Metribuzin	3,675	17,500	4,234	20,162	1,372	6,533
Napropamide	1,536	7,314	1,536	7,314	1,628	7,752
Pebulate	1,430	6,810	1,430	6,810	4,655	22,167
Sethoxydim	232	1,105	232	1,105	46	219
Trifluralin	893	4,252	893	4,252	661	3,148
Herbicide	8,217	39,153	8,776	41,795	9,362	44,586
Azinphos-methyl	617	2,938	617	2,938	227	1,081
Carbaryl	1,044	4,971	1,044	4,971	1,094	5,210
Dimethoate	129	614	129	614	64	305
Endosulfan	1,907	9,081	1,907	9,081	1,362	6,486
Esfenvalerate	3,194	15,210	3,194	15,210	115	548
Fenvalerate	63	300	63	300	10	48
Methomyl	107	510	107	510	28	229
Methyl Parathion	169	805	169	805	67	319
Pyrethrum	787	3,748	787	3,748	122	581
Insecticide	8,015	38,167	8,015	38,167	3,109	14,807
Anilazine	3,675	17,500	4,212	20,057	4,005	19,071
Benomyl	1,441	6,862	1,441	6,862	396	1,886
Chlorothalonil	3,675	17,500	22,370	106,524	38,613	183,872
Copper	3,675	17,500	10,364	49,352	9,656	45,981
Metalaxyl	165	786	165	786	7	33
Fungicide	12,631	60,148	38,551	183,581	52,677	250,843
Ethephon	3,454	16,448	3,454	16,448	2,901	13,814
Other Pesticides	3,454	16,448	3,454	16,448	2,901	13,814
Total for each crop	**32,318**	**153,895**	**58,796**	**279,991**	**68,050**	**324,050**

Table 19. Treatment Acres & Percent of Pesticide Application by Various Techniques in Ohio - 1990

Crop	Type and Method of Application																							
	Who Applied			Equipment Used			Method of Application									Type of Application					Application Target	
	Self	Custom	Not Specified	Aerial	Ground	Not Specified	Air Blast	Band	Broadcast	Incorporation	Irrigation	Seed Treatment	Spot	Fumigation	Not Specified	Dilute Spray	LV	Mist	Fog	Not Specified	Foliar	Not Specified
ASPARAGUS																						
Herbicide	100				100				20						80	80				20		100
Insecticide	100				100				17						83	83				17		100
BEANS (GREEN, LIMA, NAVY, SNAP, SPROUTS, STRING)																						
Herbicide	100				100				49	50					51	1				99		100
Insecticide	100				100		12	11	36	1					42	40				60		100
Fungicide	100				100				1						99	99				1		100
Other Pesticides	100				100							100								100		100
BEDDING PLANTS																						
Herbicide		100			100				100											100		100
Insecticide	46	54			100			31							69	69				31		100
Fungicide		100			100										100	100						100
BEETS (RED & TABLE)																						
Herbicide	100				100				100											100		100
Insecticide	100				100										100	100						100
Fungicide	100				100										100	100						100
BROCCOLI																						
Herbicide	100				100				11	5					89	84				16		100
Insecticide	94		6		94	6			13						87	81				19		100
Fungicide	100				100										100	100						100
Other Pesticides	100				100		100													100		100
CABBAGE																						
Herbicide	84		16		82	18		9	51	20					40	2				98		100
Insecticide	40	60			100		7	58	26						10	8				92		100
Fungicide	77	23			100			23	62						16	16				84		100
Other Pesticides		100			100			100												100		100
CARROTS																						
Herbicide	100				100				53	26			21		27					100		100
Fungicide	100				100										100	100						100
CAULIFLOWER																						
Herbicide	100				100										100	100						100
Insecticide	100				100				21						79	79				21		100
Fungicide	100				100										100	100						100
EGGPLANT																						
Herbicide	1	33	66		34	66			33						67	1				99		100
Insecticide	39	38	24		76	24									100	39	38			24		100
Fungicide	63		38		63	38				38					100		25			75		100
CUCUMBERS (CUCUMBERS & PROCESSED PICKLES)																						
Herbicide	100				100				46	32					54	23				77		100
Insecticide	84	16			100		3	19	57						21	17	4			80		100
Fungicide	47	53			100		3		64						33	33				67		100

Table 19. Treatment Acres & Percent of Pesticide Application by Various Techniques in Ohio - 1990 (Continued)

Crop	Type and Method of Application																						
	Who Applied			Equipment Used			Method of Application									Type of Application					Application Target	
	Self	Custom	Not Specified	Aerial	Ground	Not Specified	Air Blast	Band	Broadcast	Incorporation	Irrigation	Seed Treatment	Spot	Fumigation	Not Specified	Dilute Spray	LV	Mist	Fog	Not Specified	Foliar	Not Specified
GREENS (SPINACH, KALE, MUSTARD)																						
Herbicide	46	54			100				54	46					46					100		100
Insecticide	9	91			100			13	24						63	63				37		100
Fungicide	100				100										100	100						100
LETTUCE																						
Insecticide	100				100										100	100						100
Fungicide	100				100										100	100						100
ONIONS																						
Herbicide	100				100										100	100						100
Insecticide	100				100										100	100						100
Fungicide	100				100										100	100						100
ORNAMENTAL CORN																						
Herbicide	100				100				97				2		2	2				98		100
Insecticide	100				100		65	29	6											100		100
Other Pesticides	100				100							100								100		100
PARSLEY																						
Insecticide	100				100										100	100						100
PEAS																						
Herbicide	100				100			25	25	30					50	20				80		100
Insecticide	100				100										100	100						100
Fungicide		50	50		50	50			17						83	33				67		100
Other Pesticides	100				100							100								100		100
PEPPERS																						
Herbicide	92	7	1		99	1			17	70					83	3				97		100
Insecticide	27	73			100		3		1						97	83	7			11		100
Fungicide	9	90			100			7							93	90	1			9		100
POTATOES																						
Herbicide	82	18			100				69				1		31	31				69		100
Insecticide	72	28		28	72			9	61						30	23	7			70		100
Fungicide	68	32		32	68				52						48	38	10			53		100
Other Pesticides	100				100				41						59	59				41		100
PUMPKINS																						
Herbicide	56	44			100				67	8					33	14				86		100
Insecticide	77	23		4	96		48	23	10						19	15				85		100
Fungicide	54	46		4	96		25	25	23						26	26				74		100
SQUASH (SQUASH, ZUCCHINI, VINE CROPS)																						
Herbicide	16	67	17		83	17			72						28	2				98		100
Insecticide	17	72	11		87	13		16	3						80	10				90		100
Fungicide	2	91	8		92	8		75	8						17	9				91		100

Table 19. Treatment Acres & Percent of Pesticide Application by Various Techniques in Ohio - 1990 (Continued)

Crop	Type and Method of Application																						
	Who Applied			Equipment Used			Method of Application									Type of Application					Application Target	
	Self	Custom	Not Specified	Aerial	Ground	Not Specified	Air Blast	Band	Broadcast	Incorporation	Irrigation	Seed Treatment	Spot	Fumigation	Not Specified	Dilute Spray	LV	Mist	Fog	Not Specified	Foliar	Not Specified
SWEET CORN																						
Herbicide	73	26	1		99	1			62						38	27				72		100
Insecticide	76	23		2	98		1	22	35						42	29	1			71		100
Fungicide	9	91			100			38	54						9	9				91		100
Other Pesticides	100				100			58				1			41	41				59		100
TOMATOES																						
Herbicide	73	27			96	4			47	25					53	21				79	3	97
Insecticide	81	18	1		100		2		58	3					40	31	6			63		100
Fungicide	90	10			99	1		1	56	3					43	38				62		100
Other Pesticides	84	15	1		100				55	4					45	41				59		100
TURNIPS																						
Herbicide	100				100										100	100						100
Insecticide	100				100				59						41	41				59		100
RADISHES																						
Insecticide	100				100			100												100		100
ESCAROLE																						
Insecticide	100				100										100	100						100
APPLES																						
Herbicide	88		12		66	34		17	3						80	28	10			62		100
Insecticide	95	1	4		96	4			5						94	37	45	1		16		100
Fungicide	96		3		97	3	2		5						93	34	51	1		14		100
Other Pesticides	92		8		88	12		1	16				1		83	34	33	3		30		100
APRICOTS																						
Herbicide	100				100										100	100						100
Insecticide	100				100										100	100						100
Fungicide	100				100										100	100						100
BLUEBERRIES																						
Herbicide	100				26	74			4						96	22				78		100
Insecticide	100				100								21		79	70	9			21		100
Fungicide	100				100				51						49	20	29			51		100
BLACKBERRIES & BRAMBLES																						
Herbicide	100				100			100												100		100
Insecticide	100				100			15	30						55	40	15			45		100
Fungicide	100				100			18	24						58	32	26			42		100
CHERRIES																						
Herbicide	100				100			50							50	50				50		100
Insecticide	100				100										100	1	99					100
Fungicide	100				100										100		100					100

Table 19. Treatment Acres & Percent of Pesticide Application by Various Techniques in Ohio - 1990 (Continued)

Type and Method of Application

Crop	Who Applied			Equipment Used			Method of Application								Type of Application					Application Target	
	Self	Custom	Not Specified	Aerial	Ground	Not Specified	Air Blast	Band	Broadcast	Incorporation	Irrigation	Seed Treatment	Spot	Fumigation	Not Specified	Dilute Spray	LV	Mist	Fog	Not Specified	Foliar	Not Specified
GRAPES (TABLE, JUICE, & WINE)																					
Herbicide	100				100			3	1				6		89	89				11		100
Insecticide	100				100		5		11						84	65	17			18		100
Fungicide	100				100		6		6						88	49	32			19		100
Other Pesticides	100				100			2							98					100		100
MELONS (CANTALOUPE, MELON, MUSKMELON, WATERMELON)																					
Herbicide	100				100			6	15	1					79	18				82		100
Insecticide	100				100		13	1	15						71	13	43			44		100
Fungicide	100				100		20		4						76	46	26			28		100
NECTARINES & PEACHES																					
Herbicide	100				100			47	3				3		47	47				53		100
Insecticide	94		6		94	6	3		4						93	50	28	1		21		100
Fungicide	100				100				2						98	60	30			10		100
Other Pesticides	100				100										100	100						100
PEARS																					
Herbicide	100				100			97							3	3				97		100
Insecticide	100				100										100	23	46	6	24	1		100
Fungicide	100				100										100	39	47		15			100
Other Pesticides	100				100										100	41	59					100
PLUMS (PLUMS & PRUNES)																					
Herbicide	100				100			98							2	2				98		100
Insecticide	100				100										100	52	42	6				100
Fungicide	100				100										100	34	66					100
Other Pesticides	100				100										100	100						100
RASPBERRIES																					
Herbicide	100				100			43	38						20	20				81		100
Insecticide	100				100			42	20						38	36	2			62		100
Fungicide	100				100			41	27						32	29	3			68		100
STRAWBERRIES																					
Herbicide	54	11	35		65	35			42		1				57	19				81		100
Insecticide	68	5	27		73	27			46		3				51	23			1	77		100
Fungicide	80	4	16		84	16			40		21				40	15	4		3	79		100
Other Pesticides	100				100									23	77	31				69		100

Table 20. Major Weed Problems on Tree Fruits for Which Growers Applied Herbicides in Ohio - 1990

Major Weed Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Herbicide for Control of Specific Weed: 2,4-D	Dichlobenil	Diuron	Glyphosate	Napropamide	Norflurazon	Oryzalin	Paraquat	Polychloroben zoic	Simazine	Terbacil
APPLES												
Not Specified	32				4		2		2		2	2
CRABGRASS	0											
DANDELIONS	0											
PERENNIAL WEEDS	0											
WEEDS	36			3	9		2	1	10		9	2
No. of Applications Low - High		1 - 2	-	1- 1	1- 12	1- 1	1- 1	1- 1	1- 3	8- 8	1- 3	1- 1
Application Rate (lb/ac) Low		0.25		1.00	0.01	4.00	2.20	0 50	0.13	0.13	0.63	0.08
High		1.00		4.00	3.00	4.00	3.50	3.00	3.50	0.13	13.00	3.00
APRICOTS												
Not Specified	100				100							
No. of Applications Low - High		-	-	-	1- 1	-	-	-	-	-	-	-
Application Rate (lb/ac) Low					0.02							
High					0.02							
CHERRIES												
Not Specified	15											
PERENNIAL WEEDS	1				1							
WEEDS	1											
No. of Applications Low - High		-	-	1- 1	1- 1	-	-	-	-	-	1- 1	-
Application Rate (lb/ac) Low				3.00	0.50						2.50	
High				3.00	0.50						2.50	
NECTARINES & PEACHES												
Not Specified	12	2			8				2			
WEEDS	36		2	1	3			12	8		9	
No. of Applications Low - High		2- 2	1- 1	1- 1	1- 3	-	-	1- 1	1- 2	-	1- 2	-
Application Rate (lb/ac) Low		1.00	150.00	3.00	0.13			0.01	0.08		0.75	
High		1.00	150.00	3.00	1.00			1.50	1.00		10.00	
PEARS												
Not Specified	6										6	
WEEDS	23			1	4			6	6		7	
No. of Applications Low - High		-	-	1- 1	1- 3	-	-	1- 1	1- 1	-	1- 1	-
Application Rate (lb/ac) Low				3.00	0.50			0.40	0.05		0.50	
High				3.00	1.00			0.40	0.05		10.00	
PLUMS (PLUMS & PRUNES)												
WEEDS	49			1				15	15		19	
No. of Applications Low - High		-	-	1- 1	-	-	-	1- 1	1- 1	-	1- 1	-
Application Rate (lb/ac) Low				3.00				0.40	0.05		0.50	
High				3.00				0.50	0.63		4.00	

Table 21. Major Insect Problems on Tree Fruit for Which Growers Applied Insecticides in Ohio - 1990

Percent of Acreage Treated with Specific Insecticide for Control of Specific Insect

Major Insect Problem	Percent Acreage Treated	Amidi thion	Ami traz	Azin phos Meth yl	Bar ium Poly slfds	Bendi ocarb	Carb aryl	Chlor pyri fos	Diaz inon	Dico fol	Di meth oate	Endo sul fan	Esfen val erate	Eth ion	Ethyl Para thion	Fenbu tatin Oxide	Fen val erate	For met anate HCL	Mala thion	Methi ocarb	Meth omyl	Meth oxy chlor	Meth yl Para thion	Oxam yl	Per meth rin	Petro leum Oil	Phos met	Pro par gite	Pyre thrum	Thio di carb
APPLES																														
Not Specified	61			6	4	2	1	3	2							2		2							3	5	14	9	1	
APPLE APHIDS	18						1	7																			1			
APPLE MAGGOTS	10			5			1																				4			
BEETLES	0																													
CODLING MOTH	43			13			1																1				26			
INSECTS, GENERAL	29			6			2	2	2																4		10			
JAPANESE BEETLES	2						1																							
LEAFHOPPER	5							1																						
LEAFMINER	17												1								3			5	3					
LEAFROLLER	9			1											1												8			
MAGGOTS	2																										2			
MITES	53			1				2		1						10		5							5	13		12		
MOTHS	1																										1			
RED MITES	7															3		2								1		2		
SAN JOSE SCALE	5							3																		1				
SCALES	32							19																	2	8				
TARNISHED PLANT BUG	3										2	2																		
WHITEFLY	0																													
WOOLY APPLE APHID	0																													
WORMS	1			1																										
No. of Applications Low - High		1- 1	-	1-12	1- 2	1- 1	1-11	1-12	1- 3	1- 8	1- 2	1- 2	1- 3	10-10	1- 5	1-12	1- 2	1- 2	2- 7	-	1- 2	2- 4	2- 3	1- 7	1- 1	1- 2	1-16	1-12	3-15	-
Application Rate (lb/ac) Low		0.50		0.25	2.00	2.00	0.06	0.06	0.69	0.50	0.06	0.06	0.06	0.07	0.06	0.01	0.01	0.25	1.00		0.25	3.50	0.16	0.13	0.03	0.50	0.06	0.01	0.13	
High		0.50		7.00	15.00	2.00	4.00	5.00	3.00	4.00	0.19	0.19	0.63	0.07	3.00	2.00	0.50	1.50	10.00		0.75	10.00	1.20	1.25	0.75	20.00	15.00	8.00	1.50	
APRICOTS																														
BORERS	100																													
INSECTS, GENERAL	100			100																							100			
No. of Applications Low - High		-	-	2- 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	5- 5	-	-	-
Application Rate (lb/ac) Low				1.00																							1.00			
High				1.00																							1.00			
CHERRIES																														
Not Specified	86			62																9							15			
FRUIT FLY	5			5																							1			
MITES	0																													
No. of Applications Low - High		-	-	2- 5	-	-	3- 3	-	-	-	-	-	-	-	-	-	-	-	-	1- 1	-	-	1- 1	-	-	1- 1	1- 5	-	-	-
Application Rate (lb/ac) Low				2.00			2.00													0.75			0.19			2.00	2.00			
High				2.40			2.00													0.75			0.19			2.00	10.00			
NECTARINES & PEACHES																														
Not Specified	34			4			2																			4	16			
APHIDS	0																													
BORERS	9							3																						
CODLING MOTH	3																										3			
FRUIT MOTH	9																										9			
INSECTS, GENERAL	54			23																							31			
JAPANESE BEETLES	3						3																							
MITES	4																									1				
MOTHS	2																										2			
ORIENTAL FRUIT MOTH	37			10			21								4												3			
PEACH TREE BORERS	33							22					4														4			
STINK BUGS	4			4																										
No. of Applications Low - High		-	-	1- 7	-	-	1- 8	1- 1	-	1- 2	-	-	2- 2	-	1- 2	-	-	-	7- 7	-	-	4- 4	-	-	12-12	1- 2	1- 8	-	-	-
Application Rate (lb/ac) Low				0.25			0.25	0.13		1.00			0.13		0.25				2.00			10.00			0.02	1.00	0.40			
High				4.00			6.00	0.75		8.00			0.13		2.00				2.00			10.00			0.02	6.00	10.00			

Table 21. Major Insect Problems on Tree Fruit for Which Growers Applied Insecticides in Ohio - 1990 (Continued)

Percent of Acreage Treated with Specific Insecticide for Control of Specific Insect

Major Insect Problem	Percent Acreage Treated	Amidi thion	Ami traz	Azin phos Meth yl	Bar ium Poly slfds	Bendi ocarb	Carb aryl	Chlor pyri fos	Diaz inon	Dico fol	Di meth oate	Endo sul fan	Esfen val erate	Eth ion	Ethyl Para thion	Fenbu tatin Oxide	Fen val erate	For met anate HCL	Mala thion	Methi ocarb	Meth omyl	Meth oxy chlor	Meth yl Para thion	Oxam yl	Per meth rin	Petro leum Oil	Phos met	Pro par gite	Pyre thrum	Thio di carb
PEARS																														
Not Specified	70		2	7			6						6				12								4	3	24			6
APPLE APHIDS	9			9																										
CODLING MOTH	17			2																							15			
INSECTS, GENERAL	36																		6								30			
LEAFMINER	3																										3			
MITES	59									39																18				
MOTHS	7						1																				6			
SCALES	6																									6				
No. of Applications Low - High		-	1- 1	2- 7	-	-	2- 2	-	-	2- 8	-	-	1- 1	-	-	-	1- 1	-	7- 7	-	-	-	-	-	1- 2	1- 1	1-12	-	-	1- 1
Application Rate (lb/ac) Low			0.50	0.50			2.00			2.00			0.07				0.03		2.00						0.06	0.25	0.05			0.06
High			0.50	1.00			2.00			4.00			0.07				0.13		2.00						1.00	6.00	8.00			0.06
PLUMS (PLUMS & PRUNES)																														
Not Specified	79			39			4								1												36			
JAPANESE BEETLES	18						18																							
MITES	43																									1		24		
SCALES	3																									3				
No. of Applications Low - High		-	-	4- 7	-	-	1-12	-	-	-	-	-	-	-	2- 2	-	-	-	-	-	-	-	-	-	-	1- 1	1- 8	2- 2	-	-
Application Rate (lb/ac) Low				0.50			0.17								1.00											0.13	2.00	3.00		
High				1.20			5.00								1.00											4.00	3.00	3.00		

Table 22. Major Disease Problems on Tree Fruit for Which Growers Applied Fungicides in Ohio - 1990

Major Disease Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Fungicide for Control of Specific Disease																														
		Ben omyl	Cap tafol	Cap tan	Chlor othal onil	Cop per, Metal lic	CuOH	Cop per OxyCl	Cu pric SO4 Penta	Dich lone	Dino cap	Do dine	Fenar imol	Fer bam	Ipro dione	Man cozeb	Maneb	Meta laxyl	Metam Sodi um	Meti ram Com plex	Oxy thio qui nox	Phal tan	Strep to mycin	Sul fur	Sys thane	Thio phan ate CH3	Thi ram	Tri for ine	Zineb				
APPLES																																
Not Specified	100	22		36		2	4		3			28	17	4		3	2			6	12		16	3	15		1	2				
BACTERIAL DISEASES	0																															
BULLS-EYE	0																															
DISEASES	0																															
FIRE BLIGHT	5					1			1														3									
FLY SPECK	1																															
FUNGUS	1			1																												
LEAF SPOT	2																						2									
MILDEW	6																				6											
POWDERY MILDEW	0																															
ROTS	0																															
SCAB	54	15		23								3	5			1									5	1	1					
SOOTY BLOTCH	6	3		1																							2					
No. of Applications Low - High		1-13	-	1-15	-	1- 2	1- 8	1- 1	1- 8	1- 1	1- 3	1-14	1-10	1- 4	-	1- 8	1- 3	1- 1	-	1-12	1- 1	1- 1	1- 7	1-10	1-12	5- 5	2-10	1- 3	3- 3				
Application Rate (lb/ac) Low		0.02		0.06		4.00	5.00	5.00	0.17	1.00	0.25	0.01	0.01	1.40		0.05	0.75	0.02		1.00	1.00	2.00	0.09	1.00	0.01	0.94	1.40	0.08	0.22				
High		5.00		15.00		8.00	16.00	5.00	16.00	1.00	2.00	4.00	1.13	5.00		8.00	5.00	1.00		7.50	5.00	2.00	12.00	14.00	8.00	0.94	6.00	0.28	0.22				
APRICOTS																																
Not Specified	100	100		100										100				100														
No. of Applications Low - High		7- 7	-	7- 7	-	-	-	-	-	-	-	-	-	2- 2	-	-	-	2- 2	-	-	-	-	-	-	-	-	-	-	-				
Application Rate (lb/ac) Low		0.02		1.00										1.50				0.13														
High		0.02		1.00										1.50				0.13														
CHERRIES																																
Not Specified	100	1	45	18										62	62									62				55				
LEAF SPOT	4																											4				
No. of Applications Low - High		2- 6	1- 1	3- 6	-	-	-	-	-	-	-	-	-	2- 2	2- 2	-	-	-	-	-	-	-	-	3- 3	-	-	-	1- 2	-			
Application Rate (lb/ac) Low		0.25	1.00	2.00										3.00	2.00									8.00				0.13				
High		1.00	1.00	10.75										3.00	2.00									8.00				0.26				
NECTARINES & PEACHES																																
Not Specified	100	24		45	17					1				15		1		6	2					34				12				
BROWN ROT	8			4																				4								
CURL LEAF	4													4																		
DISEASES	1			1																												
FUNGUS	0																															
POWDERY MILDEW	0																															
ROTS	2			2																												
SCAB	12	4		6																				2								
No. of Applications Low - High		2- 9	-	1- 8	1- 3	-	-	-	-	1- 1	-	3- 3	-	1- 2	-	1- 1	-	2- 2	1- 1	-	-	-	-	1- 7	-	-	-	1- 2	-				
Application Rate (lb/ac) Low		0.03		0.38	0.13					2.00		0.75		0.75		1.00		0.13	30.00					0.50				0.08				
High		0.80		10.00	0.38					2.00		0.75		6.00		1.00		0.13	30.00					18.00				2.38				
PEARS																																
Not Specified	100	11		35		3								2		27							44	6								
DISEASES	6			6																												
FIRE BLIGHT	9																						9									
PEAR SCAB	6					6																										
SCAB	21	1		21																												
SOOTY BLOTCH	3			3																												
No. of Applications Low - High		3- 8	-	1- 8	-	1- 8	-	-	-	-	-	-	-	1- 1	-	1- 1	-	-	-	-	-	-	1- 4	8- 8	-	-	-	-	-				
Application Rate (lb/ac) Low		0.25		0.04		1.00								1.50		1.00							0.06	1.00								
High		0.75		8.00		5.00								1.50		6.00							2.00	1.00								
PLUMS (PLUMS & PRUNES)																																
Not Specified	79	19		43																				18								
BROWN ROT	12	6		6																												
No. of Applications Low - High		3- 9	-	4- 9	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	9- 9	-	-	-	-	-				
Application Rate (lb/ac) Low		0.25		2.00																				5.00								
High		0.67		6.00																				5.00								

Table 23. Major Other Problems on Tree Fruit for Which Growers Applied Other Pesticides in Ohio - 1990

Major Other Pesticide Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Other Pesticide for Control of Specific Problem												
		6-Benzyladenine	Spreader X-77	CaOH	Creosote Coal Tar	Pinolene	Dichloropropine	Iron Soil Nutrients	NAA	Nitrogen	Potassium Salts	Sodium 2-Propionate	Soybean Oil	Zinc Phosphate
APPLES														
Not Specified	21				3				2	1	14			
ELONGATION	1	1												
GROWTH REGULATOR	9	1							4					
MICE	0													
NUTRIENT DEFICIENCY	2													
STICKER	0													
STOP DROP	0													
THINNING	5								5					
VOLES	0													
No. of Applications Low - High		1- 1	2- 2	4- 4	1- 1	1- 6	-	2- 2	1- 7	1- 1	1- 10	1- 1	6- 6	1- 2
Application Rate (lb/ac) Low		0.06	0.31	4.00	6.40	0.03		0.25	0.01	3.50	1.00	0.50	2.00	6.00
High		2.00	0.31	4.00	6.40	0.09		0.25	20.00	3.50	10.00	0.50	2.00	20.00
NECTARINES & PEACHES														
Not Specified	2										2			
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	1- 7	-	-	-
Application Rate (lb/ac) Low											0.67			
High											2.00			
PEARS														
Not Specified	38								6		26		6	
No. of Applications Low - High		-	-	-	-	-	-	-	1- 1	-	2- 3	-	8- 8	-
Application Rate (lb/ac) Low									0.06		0.50		2.00	
High									0.06		1.25		2.00	
PLUMS (PLUMS & PRUNES)														
Not Specified	6										6			
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	1- 1	-	-	-
Application Rate (lb/ac) Low											0.67			
High											0.67			

Table 24. Major Weed Problems on Bramble, Bush, and Ground Fruits for Which Growers Applied Herbicides in Ohio - 1990

Major Weed Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Herbicide for Control of Specific Weed													
		2,4-D	2,4-DB	Bensulide	DCPA	Cyanazine	Diphenamid	Diuron	Fluazifop-P Butyl	Glyphosate	Metolachlor	Napropamide	Naptalam	Terbacil	Trifluralin
BLACKBERRIES & BRAMBLES															
WEEDS	11														
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low															
High															
BLUEBERRIES															
Not Specified	54					54									
WEEDS	24							2		14		6			
No. of Applications Low - High		-	-	-	-	2- 2	-	1- 1	-	2- 2	-	1- 1	-	-	-
Application Rate (lb/ac) Low						2.00		4.00		0.25		0.88			
High						2.00		4.00		0.25		0.88			
GRAPES (TABLE, JUICE, & WINE)															
Not Specified	12							11							
BROADLEAVES	2														
WEEDS	64							18		15					
No. of Applications Low - High		-	-	-	-	-	-	1- 1	-	1- 1	-	1- 1	-	-	-
Application Rate (lb/ac) Low								1.00		0.13		3.04			
High								3.50		0.50		3.04			
MELONS (CANTALOUPE, MELON, MUSKMELON, WATERMELON)															
Not Specified	24			11									11		1
GRASSES	2			1											1
WEEDS	11												6		6
No. of Applications Low - High		-	-	1- 3	-	-	-	-	-	-	-	-	1- 3	-	1- 1
Application Rate (lb/ac) Low				0.25									1.25		0.25
High				1.50									2.00		0.25
RASPBERRIES															
WEEDS	33							1		3				4	
No. of Applications Low - High		-	-	-	-	-	-	1- 1	-	1- 1	-	-	-	1- 1	-
Application Rate (lb/ac) Low								3.00		0.25				0.15	
High								3.00		0.25				1.00	
STRAWBERRIES															
Not Specified	87	5	3		19		3			11	3	20		20	
BROADLEAVES	10	7	2												
CANADA THISTLE	0														
FOXTAIL	1														
GRASSES	3						1		2						
WEEDS	92	7	1		5		11					34		34	
No. of Applications Low - High		1- 1	1- 1	-	1- 2	-	1- 1	-	1- 1	1- 1	2- 2	1- 2	-	1- 2	-
Application Rate (lb/ac) Low		0.13	0.25		6.00		4.40		0.25	0.13	1.00	2.00		0.25	
High		0.38	2.00		12.00		10.00		0.25	2.67	1.00	8.00		1.00	

Table 25. Major Insect Problems on Bramble, Bush, and Ground Fruits for Which Growers Applied Insecticides in Ohio - 1990

Major Insect Problem	Percent Acreage Treated	Azinphos Methyl	Carbaryl	Chlorpyrifos	Diazinon	Endosulfan	Ethyl Parathion	Fenbutatin Oxide	Malathion	Methomyl	Methoxychlor	Methyl Parathion	Mevinphos	Oxydemeton Methyl	Permethrin	Petroleum Oil	Phosmet	Piperonyl Butoxide
Percent of Acreage Treated with Specific Insecticide for Control of Specific Insect																		
BLACKBERRIES & BRAMBLES																		
BORERS	28		17		11													
FRUITWORM	45				45													
JAPANESE BEETLES	17																17	
LEAFHOPPER	11	11																
MOSQUITOS	17								17									
No. of Applications Low - High		3- 3	1- 1	-	2- 3	-	-	-	2- 2	-	-	-	-	-	-	-	1- 1	-
Application Rate (lb/ac) Low		2.00	2.00		2.00				0 38								1.00	
High		2.00	2.00		3.00				0.38								1.00	
BLUEBERRIES																		
APHIDS	6								6									
FRUITWORM	9		9															
MAGGOTS	21	2	18															
SCALES	8		8															
No. of Applications Low - High		3- 3	1- 5	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low		0.25	0.03						0.09									
High		0.25	2.50						2.00									
GRAPES (TABLE, JUICE, & WINE)																		
Not Specified	17					6	9					2						
BEETLES	11		1			1	9											
BERRY MOTH	61	1	23				19					10					1	
CODLING MOTH	5	5																
CUTWORMS	5																5	
INSECTS, GENERAL	10		9														2	
JAPANESE BEETLES	19		19															
LEAFMINER	0																	
LEAFROLLER	0																	
MITES	3															2		
MOSQUITOS	5								5									
MOTHS	1						1											
No. of Applications Low - High		1- 1	1- 8	-	-	1- 3	1- 4	-	1- 4	-	-	1- 5	1- 1	-	-	1- 1	1- 5	-
Application Rate (lb/ac) Low		1.00	0.25			1.00	0.03		0.25			0.25	0.13			1.00	1.00	
High		2.00	4.00			3.00	3.00		2.00			0.50	0.13			1.00	3.00	
MELONS (CANTALOUPE, MELON, MUSKMELON, WATERMELON)																		
Not Specified	54	12	2			15				11								
APHIDS	11		11															
BEETLES	21		15			7												
CABBAGE LOOPER	0																	
CUCUMBER BEETLES	86	11	32			14								11	10			
FLEA BEETLE	1		1															
INSECTS, GENERAL	2		2															
WORMS	5					5												
No. of Applications Low - High		2-10	1- 6	-	-	2- 8	1- 1	-	2- 2	2- 2	-	-	-	1- 1	3- 5	-	-	-
Application Rate (lb/ac) Low		1.00	0.25			0.17	1.00		0.06	0.25				0.06	0.05			
High		1.50	3.00			1.50	1.00		0.06	0.25				0.06	0.06			

Table 25. Major Insect Problems on Bramble, Bush, and Ground Fruits for Which Growers Applied Insecticides in Ohio - 1990 (Continued)

Major Insect Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Insecticide for Control of Specific Insect																
		Azinphos Methyl	Carbaryl	Chlorpyrifos	Diazinon	Endosulfan	Ethyl Parathion	Fenbutatin Oxide	Malathion	Methomyl	Methoxychlor	Methyl Parathion	Mevinphos	Oxydemeton Methyl	Permethrin	Petroleum Oil	Phosmet	Piperonyl Butoxide
RASPBERRIES																		
Not Specified	3						1			1								
APHIDS	6	1							5									
BEETLES	0																	
FRUITWORM	1					1												
INSECTS, GENERAL	9		3		3				3									
JAPANESE BEETLES	2								1									1
LEAFHOPPER	9	6	3															
SAP BEETLE	2		1						1									
No. of Applications Low - High		4- 6	1- 4	-	3- 3	2- 2	2- 2	-	1- 2	2- 2	-	-	-	-	-	-	-	1- 1
Application Rate (lb/ac) Low		0.25	0.06		2.00	2.00	0.03		1.50	1.00								0.25
High		2.00	2.00		2.00	2.00	0.03		8.00	1.00								0.25
STRAWBERRIES																		
Not Specified	27	12	1			12				2								
APHIDS	1	1																
BEETLES	5		5															
CLIPPERS	9			9														
FRUITWORM	3		3															
INSECTS, GENERAL	14	6				1						6						
LEAFHOPPER	6								6									
MITES	6							6										
SPITTLEBUG	32	9	1			22												
TARNISHED PLANT BUG	31	24				7												
No. of Applications Low - High		1- 3	1- 2	1- 2	-	1- 2	-	1- 1	1- 4	3- 3	4- 4	2- 2	-	-	-	-	-	-
Application Rate (lb/ac) Low		0.25	1.00	0.13		0.14		2.00	0.13	1.00	10.00	0.25						
High		3.50	2.00	0.25		2.00		2.00	10.00	1.00	10.00	0.25						

Table 26. Major Disease Problems on Bramble, Bush, and Ground Fruit for Which Growers Applied Fungicides in Ohio - 1990

Major Disease Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Fungicide for Control of Specific Disease																								
		Ben omyl	Cal cium Poly sulfd	Cap tan	Chlor othal onil	Cop per, Metal lic	Cu pric SO4 CuOH	Penta	Dino cap	Do dine	Fer bam	Ipro dione	Man cozeb	Maneb	Meta laxyl	Phal tan	Strep to mycin	Sul fur	Sys thane	Thio phan ate CH3	Thi ram	Triad ime fon	Tri for ine	Vin clo zolin
BLACKBERRIES & BRAMBLES																										
Not Specified	100	73	45	28																						
FUNGUS	34	11	11	11																						
No. of Applications Low - High		2- 5	1- 1	3- 5	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low		0.13	12.00	2.00																						
High		1.00	15.00	5.00																						
BLUEBERRIES																										
Not Specified	33	9		10												6							8			
No. of Applications Low - High		1- 3	-	1- 3	-	-	-	-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	1- 2	-		
Application Rate (lb/ac) Low		0.25		1.00												5.00							0.13			
High		1.00		5.00												5.00							0.19			
GRAPES (TABLE, JUICE, & WINE)																										
Not Specified	100	8		28			9		8	5	32	7	24	27			5	10	10			34				
BLACK ROT	5												4													
DOWNY MILDEW	9												9													
MILDEW	74	5	11			11					17		20	3								7				
POWDERY MILDEW	2												2									1				
ROTS	0																									
SCAB	0																									
No. of Applications Low - High		1- 4	1- 1	1- 7	-	1- 1	1- 1	-	2- 2	1- 1	1- 8	1- 8	1-20	1- 5	-	1- 1	1- 1	8-10	2- 2	-	-	1-15	-	-		
Application Rate (lb/ac) Low		0.06	8.00	0.06		4.00	2.00		10.00	2.00	0.06	1.50	0.03	0.38		4.00	0.25	0.25	0.31			0.06				
High		1.50	8.00	4.00		4.00	2.00		10.00	2.00	4.00	2.00	7.00	3.00		4.00	0.25	6.00	0.31			2.00				
MELONS (CANTALOUPE, MELON, MUSKMELON, WATERMELON)																										
Not Specified	100	32			36		14						7	5								7				
LEAF SPOT	10				10																					
MILDEW	7				7																					
No. of Applications Low - High		1- 6	-	-	1- 5	-	-	-	-	-	-	-	1- 2	3- 3	-	-	-	-	-	-	-	2- 3	-	-		
Application Rate (lb/ac) Low		0.50			0.19								1.00	0.38								0.25				
High		0.50			2.50								5.00	0.38								0.25				
RASPBERRIES																										
Not Specified	53	13	11	11								12			7											
ANTHRACNOSE	1			1																						
BLIGHTS	0																									
FRUIT ROT	1	1																								
FUNGUS	20	9	8	3																						
MILDEW	0																									
POWDERY MILDEW	1	1																								
ROTS	1	1																								
No. of Applications Low - High		1- 6	1- 1	1- 8	-	-	-	-	-	-	-	1- 4	-	-	1- 2	-	-	-	-	-	-	-	-	-	-	
Application Rate (lb/ac) Low		0.06	7.50	0.06								1.00			0.50											
High		0.75	20.00	4.00								2.00			0.50											
STRAWBERRIES																										
Not Specified	100	58		50											3	5				6	10				37	
BOTRYTIS GRAY MOLD	7																								7	
FRUIT ROT	1	1																								
FUNGUS	2	1		1																						
LEAF BLIGHT	29	6		6								6								6	6					
LEAF SPOT	11			11																					1	
ROTS	3	1		1																					1	
No. of Applications Low - High		1-10	-	1- 8	-	-	-	-	-	-	-	2- 2	-	-	2- 2	1- 1	-	-	-	2- 2	1- 2	-	-	1- 4		
Application Rate (lb/ac) Low		0.50		1.00								1.00			3.00	2.00				1.00	3.00			0.50		
High		5.00		10.00								1.00			3.00	2.00				1.00	5.00			3.00		

Table 27. Major Other Problems on Bramble, Bush, and Ground Fruits for Which Growers Applied Other Pesticides in Ohio - 1990

Major Other Pesticide Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Other Pesticide for Control of Specific Problem: Sprea der X-77	Bromo eth ane	Chlor opic rin	Pino lene	Di chlor opro pene	Iron Soil Nutr ients
GRAPES (TABLE, JUICE, & WINE)							
GROWTH REGULATOR	8				8		
STICKER	0						
No. of Applications Low - High		8 - 8	-	-	7- 7	-	-
Application Rate (lb/ac) Low		0.03			0.50		
High		0.03			0.50		
STRAWBERRIES							
Not Specified	5		2	2		2	
NUTRIENT DEFICIENCY	1						1
No. of Applications Low - High		-	1- 1	1- 1	-	1- 1	2- 2
Application Rate (lb/ac) Low			200.00	200.00		35.00	5.00
High			200.00	200.00		35.00	5.00

Table 28. Major Weed Problems on Vegetables for Which Growers Applied Herbicides in Ohio - 1990

Major Weed Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Herbicide for Control of Specific Weed																																		
		2,4-D	2,4-DB	Alachlor	Atrazine	Bensulide	Bentazon	Butylate	Chloramben	DCPA	Cyanazine	Dicamba	Dimethazone	Dimethenamid	Diquat	Diuron	EPTC	Fluazifop-P Butyl	Glyphosate	Linuron	Metolachlor	Metribuzin	Napropamide	Naptalam	Paraquat	Pebulate	Propachlor	Pyrazon	Sethoxydim	Simazine	Terbacil	Tridiphane	Trifluralin
ASPARAGUS																																				
BROADLEAVES	8															8																				
FOXTAIL	31															15														15					
GRASSES	8																													8					
WEEDS	31															15														15					
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 1	1- 1	-	-		
Application Rate (lb/ac) Low																2.00														2.00	2.00				
High																3.00														2.50	2.00				
BEANS (GREEN, LIMA, NAVY, SNAP, SPROUTS, STRING)																																				
Not Specified	0																																			
GRASSES	18																				17															1
WEEDS	17																																			17
No. of Applications Low - High		-	-	-	-	-	1- 1	-	-	4- 4	-	-	-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 4
Application Rate (lb/ac) Low							0.13			8.00											0.25															0.13
High							0.13			8.00											0.25															0.38
BEDDING PLANTS																																				
WEEDS	73									73																										
No. of Applications Low - High		-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low										10.00																										
High										10.00																										
BEETS (RED & TABLE)																																				
Not Specified	0																																			
GRASSES	0																																			
WEEDS	100																											100								
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low																												0.75								
High																												1.00								
BROCCOLI																																				
Not Specified	3									1																										2
GRASSES	1																																			1
No. of Applications Low - High		-	-	-	-	-	-	-	-	4- 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 4
Application Rate (lb/ac) Low										8.00																										0.02
High										8.00																										0.25
CABBAGE																																				
Not Specified	10			8																																1
GRASSES	0																																			
LAMBSQUARTERS	26																																			26
WEEDS	16									5																										11
No. of Applications Low - High		-	-	1- 1	-	-	-	-	-	1- 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 4
Application Rate (lb/ac) Low				0.50						3.00																										0.13
High				0.50						8.00																										0.50
CARROTS																																				
Not Specified	1										1																									
GRASSES	78																	78																		
WEEDS	100																			99																99
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	1- 1	-	2- 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 1
Application Rate (lb/ac) Low											0.50							0.13		0.13																0.13
High											0.50							0.13		0.13																0.13
CAULIFLOWER																																				
Not Specified	18									9																										9
No. of Applications Low - High		-	-	-	-	-	-	-	-	4- 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	4- 4
Application Rate (lb/ac) Low										8.00																										0.13
High										8.00																										0.13
CUCUMBERS (CUCUMBERS & PROCESSED PICKLES)																																				
Not Specified	0																																			
BROADLEAVES	16																							16												
GRASSES	16					16																														
WEEDS	59					40																		20												
No. of Applications Low - High		-	-	-	-	1- 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 3	-	-	-	-	-	-	-	-	-	-	-	1- 1
Application Rate (lb/ac) Low						1.00																		0.75												0.25
High						1.50																		2.00												0.25

Table 28. Major Weed Problems on Vegetables for Which Growers Applied Herbicides in Ohio - 1990 (Continued)

Major Weed Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Herbicide for Control of Specific Weed																																		
		2,4-D	2,4-DB	Alachlor	Atrazine	Bensulide	Bentazon	Butylate	Chloramben	DCPA	Cyanazine	Dicamba	Dimethazone	Dimephenamid	Diquat	Diuron	EPTC	Fluazifop-P Butyl	Glyphosate	Linuron	Metolachlor	Metribuzin	Napropamide	Naptalam	Paraquat	Pebulate	Propachlor	Pyrazon	Sethoxydim	Simazine	Terbacil	Tridiphane	Trifluralin
EGGPLANT																																				
Not Specified	65									33													32													
GRASSES	32									21													11													
No. of Applications Low - High		-	-	-	-	-	-	-	-	1- 4	-	-	-	-	-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low										8.00													2.50													
High										10.00													4.00													
GREENS (SPINACH, KALE, MUSTARD)																																				
LAMBSQUARTERS	65									35																										30
No. of Applications Low - High		-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 1
Application Rate (lb/ac) Low										8.00																										0.13
High										8.00																										0.13
ONIONS																																				
Not Specified	0																																			
BROADLEAVES	55																								55											
No. of Applications Low - High		-	-	-	-	-	-	-	-	2- 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low										10.00															0.50											
High										10.00															0.50											
ORNAMENTAL CORN																																				
BINDWEED	4	4																																		
FALL PANICUM	67										67																									
WEEDS	100				70						30																					67				
No. of Applications Low - High		1- 1	-	-	1- 1	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 1	-			
Application Rate (lb/ac) Low		0.50			1.20						0.50																					0.15				
High		0.50			1.50						0.80																					0.15				
PEAS																																				
Not Specified	1																																			1
GRASSES	8																																			8
VENICE MALLOW	3						3																													
No. of Applications Low - High		-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 2
Application Rate (lb/ac) Low							0.13																													0.15
High							0.13																													0.25
PEPPERS																																				
Not Specified	7																																			7
BROADLEAVES	3																						3													
GRASSES	0																																			
LAMBSQUARTERS	59																						5													54
WEEDS	7																						1													6
No. of Applications Low - High		-	-	-	-	-	-	-	2- 2	2- 2	-	-	-	-	-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	1- 2
Application Rate (lb/ac) Low									15.00	10.00													2.60													0.07
High									15.00	10.00													4.00													0.25
POTATOES																																				
Not Specified	54														34						7	7			5											
BROADLEAVES	28																			28																
GRASSES	13																				13															
JOHNSON GRASS	2																																			
PIGWEED	15																					15													
QUACKGRASS	1																		1																	
RAGWEED	15																			15																
WEEDS	37																			11	19	8														
YELLOW NUTSEDGE	18																				18															
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	-	-	-	-	1- 1	-	-	-	1- 1	1- 1	1- 1	1- 1	-	-	1- 1	-	-	-	2- 2	-	-	-	-	-	-	-
Application Rate (lb/ac) Low															0.13				0.25	0.19	0.06	0.60			0.25				0.19							
High															0.70				0.25	2.00	0.25	1.00			0.25				0.19							

Table 28. Major Weed Problems on Vegetables for Which Growers Applied Herbicides in Ohio - 1990 (Continued)

Major Weed Problem	Percent Acreage Treated	2,4-D	2,4-DB	Ala chlor	Atra zine	Ben sul ide	Ben tazon	Buty late	Chlor amben	DCPA	Cyan azine	Di camba	Di meth azone	Di phe namid	Di quat	Di uron	EPTC	Flu azi fop-P Butyl	Gly pho sate	Lin uron	Met ola chlor	Metri buzin	Na prop amide	Nap talam	Para quat	Pebu late	Propa chlor	Pyra zon	Seth oxy dim	Sim azine	Ter bacil	Tridi phane	Tri flur alin
Percent of Acreage Treated with Specific Herbicide for Control of Specific Weed																																	
PUMPKINS																																	
Not Specified	12								8																								
FOXTAIL	0																																
GRASSES	3								3																								
RAGWEED	18								18																								
WEEDS	14								4				8																				2
No. of Applications Low - High		-	-	-	-	-	-	-	1- 2	-	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 1
Application Rate (lb/ac) Low									0.38				0.19																				0.25
High									4.00				0.21																				0.25
SQUASH (SQUASH, ZUCCHINI, VINE CROPS)																																	
Not Specified	24								24																								
BROADLEAVES	5								5																								
GRASSES	0																																
RAGWEED	63								63																								
WEEDS	2								2																								
No. of Applications Low - High		-	-	-	-	-	-	-	1- 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	1- 1
Application Rate (lb/ac) Low									0.38																								0.25
High									3.60																								0.25
SWEET CORN																																	
Not Specified	8			2	4						2										1												
BROADLEAVES	10				2						4	4																					
FALL PANICUM	0																																
FOXTAIL	0																																
GRASSES	4							4																									
SMARTWEED	12				12																												
VELVET LEAF	0																																
WEEDS	58		1	15	17		1				12	1									10				1								
YELLOW NUTSEDGE	12			12																													
No. of Applications Low - High		-	1- 1	1- 6	1- 1	-	1- 7	1- 7	-	-	1- 1	1- 1	-	-	-	-	1- 1	-	2- 2	-	1- 5	-	-	-	1- 1	-	1- 1	-	-	-	-	1- 1	-
Application Rate (lb/ac) Low			0.06	0.38	0.13		0.19	0.59			0.25	0.05					0.50		0.02		0.06				0.13		5.00					0.15	
High			0.09	2.00	2.00		0.31	0.63			1.30	0.13					0.50		0.02		0.38				0.19		5.00					0.15	
TOMATOES																																	
Not Specified	0																																
BROADLEAVES	11																					11											
CANADA THISTLE	2																		2														
GRASSES	28																					3											9
WEEDS	100								4													67				14							37
No. of Applications Low - High		-	-	-	-	-	-	-	1- 3	-	-	-	-	1- 1	-	-	-	-	1- 1	-	-	1- 2	1- 1	-	-	- 1	-	-	1- 1	-	-	-	1- 5
Application Rate (lb/ac) Low									0.33					5.50					0.38			0.04	3.00			0.50			0.13				0.13
High									20.00					5.50					0.38			1.00	4.00			0.63			0.13				0.50
TURNIPS																																	
Not Specified	2									2																							
No. of Applications Low - High		-	-	-	-	-	-	-	-	2- 2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low										8.00																							
High										8.00																							

Table 29. Major Insect Problems on Vegetables for Which Growers Applied Insecticides in Ohio - 1990

Percent of Acreage Treated with Specific Insecticide for Control of Specific Insect

Major Insect Problem	Percent Acreage Treated	Ace phate	Aldi carb	Ami traz	Azin phos Me thyl	B.T. Thur ing ience	B.T. Var. Kur staki	Carb aryl	Carbo furan	Chlor pyri fos	Diaz inon	Di meth oate	Disul foton	Endo sul fan	Esfen val erate	Ethyl Para thion	Fen val erate	Fono fos	Mala thion	Meth amid ophos	Meth omyl	Meth yl Para thion	Mevin phos	Naled	Ox amyl	Oxyde meton Meth yl	Per meth rin	Phor ate	Phos met	Piper onyl Butox ide	Pyre thrum	Ter bufos	Thio di carb
ASPARAGUS																																
ASPARAGUS BEETLE	54							38											15													
BEETLES	15																											15				
No. of Applications Low - High		-	-	-	-	-	-	1- 2	-	-	-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	1- 1	-	-	-	-
Application Rate (lb/ac) Low								3.00											0.13									0.75				
High								4.00											0.13									0.75				
BEANS (GREEN, LIMA, NAVY, SNAP, SPROUTS, STRING)																																
Not Specified	2							1																								
APHIDS	2												2																			
BEAN BEETLES	5							5																								
BEETLES	36							35						1																		
CABBAGE LOOPER	0																															
FLEA BEETLE	19							19																								
MEXICAN BEAN BEETLE	17												17																			
SQUASH BUG	0																															
THRIPS	0																															
No. of Applications Low - High		1- 1	-	-	-	-	10-10	1- 6	-	-	-	-	1- 1	3- 3	-	2- 2	-	-	4- 4	-	4- 4	-	1- 1	-	-	-	-	-	2- 2	-	-	-	-
Application Rate (lb/ac) Low		1.00					1.00	0.03					1.00	1.00		3.00			0.25		1.00		0.13						3.00				
High		1.00					1.00	2.00					11.00	1.50		3.00			0.25		1.00		0.13						3.00				
BEDDING PLANTS																																
DIAMONDBACK MOTH	53				20																		33									
LICE	27	27																														
MAGGOTS	73																	73														
No. of Applications Low - High		4- 4	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low		2.00			1.30													0.75						0.13								
High		2.00			1.30													0.75						0.13								
BEETS (RED & TABLE)																																
LEAFMINER	100										100																					
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	2- 2	-	-	-	-	-	-	-	4- 4	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low											0.13								2.50													
High											0.13								2.50													
BROCCOLI																																
Not Specified	63			28			34																									
APHIDS	1																		1													
CABBAGE LOOPER	24	1					2	1						1									1				17					
THRIPS	1															1																
No. of Applications Low - High		1- 1	-	1- 1	-	-	3-10	6- 6	-	-	-	-	-	2- 2	-	2- 2	-	-	4- 4	-	-	-	1- 1	-	-	-	3- 3	-	-	-	-	-	-
Application Rate (lb/ac) Low		1.00		0.13			0.25	2.00						0.50		3.00			0.25				0.13				0.06					
High		1.00		0.13			1.00	2.00						0.50		3.00			0.25				0.13				0.06					
CABBAGE																																
Not Specified	20				1																		19									
APHIDS	31												31																			
BEETLES	0																															
CABBAGE LOOPER	24						1	2								1											19					
CABBAGE WORMS	28						4	1							19					2							2					
CUTWORMS	2				2																											
DIAMONDBACK MOTH	49						48				2																					
FLEA BEETLE	5							5																								
IMPORTED CAB. WORM	11																										10					
LEAFHOPPER	2																										2					
MAGGOTS	35				32													4														
ROOT MAGGOTS	4									4																						
THRIPS	69										1	26				35					1	6										
WORMS	6				1		2								3																	
No. of Applications Low - High		1- 1	-	-	1- 4	-	2-15	1-28	-	1- 1	1- 3	3- 3	1- 1	2- 2	2- 8	1- 6	-	1- 1	4- 4	2- 2	2- 4	2- 2	1- 1	3- 3	-	-	1-13	-	-	-	-	-	-
Application Rate (lb/ac) Low		1.00			0.25		0.25	0.25		8.70	0.13	0.13	0.09	0.25	0.05	0.04		1.33	0.25	0.13	0.25	0.25	0.13	0.13			0.03						
High		1.00			1.50		1.00	2.00		8.70	0.19	0.13	0.09	2.00	0.39	3.00		1.33	0.25	0.13	0.25	0.25	0.13	0.13			0.38						
CAULIFLOWER																																
APHIDS	70													61					9													
CABBAGE LOOPER	100	9					39	9															9				61					
THRIPS	9															9																
No. of Applications Low - High		1- 1	-	-	-	-	4-10	6- 6	-	-	-	-	-	2- 2	-	2- 2	-	-	4- 4	-	-	-	1- 1	-	-	-	2- 2	-	-	-	-	-	-
Application Rate (lb/ac) Low		1.00					1.00	2.00						2.00		3.00			0.25				0.13				0.06					
High		1.00					1.00	2.00						2.00		3.00			0.25				0.13				0.06					

Table 29. Major Insect Problems on Vegetables for Which Growers Applied Insecticides in Ohio - 1990 (Continued)

Major Insect Problem	Percent Acreage Treated	Ace phate	Aldi carb	Ami traz	Azin phos Me thyl	B.T. Thur ing ience	B.T. Var. Kur staki	Carb aryl	Carbo furan	Chlor pyri fos	Diaz inon	Di meth oate	Disul foton	Endo sul fan	Esfen val erate	Ethyl Para thion	Fen val erate	Fono fos	Mala thion	Meth amid ophos	Meth omyl	Meth yl Para thion	Mevin phos	Naled	Oxyde meton Meth yl Ox amyl	Per meth rin	Phor ate	Phos met	Piper onyl Butox ide	Pyre thrum	Ter bufos	Thio di carb
Percent of Acreage Treated with Specific Insecticide for Control of Specific Insect																															
CUCUMBERS (CUCUMBERS & PROCESSED PICKLES)																															
Not Specified	12							4						4	4																
APHIDS	13													4					9												
BEETLES	11							10						1																	
BORERS	0																														
COLORADO POT BEETLE	0																														
CUCUMBER BEETLES	63							34	29																						
FLEA BEETLE	7													7																	
THRIPS	5													5																	
WHITEFLY	0																														
No. of Applications Low - High		-	-	-	-	-	-	1- 5	1- 1	-	-	-	-	1- 4	1- 1	1- 4	-	-	2- 2	-	1-20	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low								0.03	8.70					0.25	0.02	0.06			0.13		0.13											
High								2.00	12.00					1.50	0.02	3.00			0 25		1.00											
EGGPLANT																															
Not Specified	100				32									32	32						32				32						
APHIDS	33																				32										
COLORADO POT BEETLE	65														32										33						
CUCUMBER BEETLES	1																														
FLEA BEETLE	90				46			15							14									14							
LEAFHOPPER	32													32																	
No. of Applications Low - High		-	-	-	1- 4	-	-	4- 4	-	-	-	-	-	1- 2	1- 6	1- 1	-	-	3- 3	-	1- 2	-	-	-	4- 4	1- 4	-	-	-	-	-	-
Application Rate (lb/ac) Low					0.25			0.25						0.17	0.02	3.00			0.25		0.25				0.25	0.06						
High					1.50			2.00						0.17	0.06	3.00			0.25		1.00				0.25	0.75						
ESCAROLE																															
CUTWORMS	100																									100					
LEAFHOPPER	100											100																			
WORMS	100													100																	
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	-	3- 3	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	2- 2	-	-	-	-	-	-
Application Rate (lb/ac) Low												0 06		0.33												0.20						
High												0.06		0.33												0.20						
GREENS (SPINACH, KALE, MUSTARD)																															
APHIDS	34											12														22						
CABBAGE LOOPER	1						1																								
LEAFHOPPER	1																		1												
LEAFMINER	0																														
LOOPERS	100						58									44							65		53						
MAGGOTS	65				65																										
WORMS	12													12																	
No. of Applications Low - High		-	-	-	2- 2	-	3- 5	-	-	-	-	3- 3	-	1- 1	-	2- 2	-	-	1- 2	-	-	-	-	4- 4	-	2- 3	-	-	-	-	-	-
Application Rate (lb/ac) Low					1.00		0.25					0.06		0.25		0.50			0.25					0.13		0.04						
High					1.00		0.50					0.06		0.25		0.50			2.00					0.13		0.10						
LETTUCE																															
CUTWORMS	100																									100					
LEAFHOPPER	100											100																			
WORMS	100													100																	
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	-	3- 3	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	2- 2	-	-	-	-	-	-
Application Rate (lb/ac) Low												0.06		0.33												0.20						
High												0.06		0.33												0.20						
ONIONS																															
THRIPS	1																														
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	-	-	-	-	-	2- 2	-	-	1- 1	-	-	-	1- 1	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low																3.00			0.13				0.13								
High																3.00			0.13				0.13								
ORNAMENTAL CORN																															
CORN EARWORMS	33							33																							
ROOTWORM	67									67																					
No. of Applications Low - High		-	-	-	-	-	-	4- 5	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low								0.25		0.90																					
High								1.00		0.90																					
PARSLEY																															
WORMS	73																									73					
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	3- 3	-	-	-	-	-	-
Application Rate (lb/ac) Low																										0.04						
High																										0.04						

Table 29. Major Insect Problems on Vegetables for Which Growers Applied Insecticides in Ohio - 1990 (Continued)

Percent of Acreage Treated with Specific Insecticide for Control of Specific Insect

Major Insect Problem	Percent Acreage Treated	Ace phate	Aldi carb	Ami traz	Azin phos Me thyl	B.T. Thur ing ience	B.T. Var. Kur staki	Carb aryl	Carbo furan	Chlor pyri fos	Diaz inon	Di meth oate	Diul foton	Endo sul fan	Esfen val erate	Ethyl Para thion	Fen val erate	Fono fos	Mala thion	Meth amid ophos	Meth omyl	Meth yl Para thion	Mevin phos	Naled	Oxyde meton Ox amyl	Oxyde meton Meth yl	Per meth rin	Phor ate	Phos met	Piper onyl Butox ide	Pyre thrum	Ter bufos	Thio di carb
PEAS																																
BEETLES	3															1			1													
PEA WEEVIL	7													7																		
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	-	-	-	2- 2	-	2- 2	-	-	2- 2	-	-	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low														0.25		3.00			0.25													
High														0.25		3.00			0.25													
PEPPERS																																
Not Specified	9	3																			6											
APHIDS	100	59									2			3		6			3		59			2								
BEETLES	1													1																		
BORERS	59																									59						
CORN BORER	25	2			2		1	13	1						7																	
CORN EARWORMS	1	1																														
CUCUMBER BEETLES	1							1																								
CUTWORMS	0																															
FLEA BEETLE	1																									1						
INSECTS, GENERAL	3				1			2						1														2				
LEAFMINER	59															59																
WORMS	7							2						5																		
No. of Applications Low - High		1- 5	-	-	4- 4	-	5- 5	2-12	2- 2	-	2- 2	-	-	2- 4	3- 5	2- 2	-	-	2- 2	-	1- 4	-	-	-	2- 2	-	2- 2	-	4- 4	-	-	-	-
Application Rate (lb/ac) Low		0.67			1.00		1.00	0.25	1.00		0.50			0.17	0.06	0.06			0.13		0.25				0.25		0.03		0.75				
High		1.25			1.50		1.00	2.00	1.00		0.50			2.00	0.30	3.00			0.13		0.50				0.25		0.10		0.75				
POTATOES																																
Not Specified	7																										7					
APHIDS	20																			20												
BEETLES	11																									11						
COLORADO POT BEETLE	100		1		36	5		6	1					22	39	11				28		11				37	1	1	15			
FLEA BEETLE	41				5				8																		28					
LEAFHOPPER	42				18										9												15					
MITES	11																										11					
No. of Applications Low - High		-	1- 1	-	1-12	2- 4	-	1- 2	1-11	-	-	-	-	1- 3	1- 4	1- 2	-	-	-	1- 1	-	1- 1	-	-	-	-	1- 5	1- 1	1-12	3- 3	-	-	-
Application Rate (lb/ac) Low			20.00		0.08	1.00		0.13	0.13					0.13	0.05	0.06				0.21		0.13					0.04	3.40	2.00	0.40			
High			20.00		2.00	1.25		2.00	0.25					12.00	0.56	2.00				0.80		0.13					0.80	15.80	5.00	0.40			
PUMPKINS																																
Not Specified	11							4						3	3																	
BEETLES	2							2																								
CUCUMBER BEETLES	44							32							6		3									1						
INSECTS, GENERAL	9						1	7						1																		
JAPANESE BEETLES	37													18		18																
MITES	7																		7													
SQUASH BUG	3							3																								
VINE BORER	10							2						8																		
WHITEFLY	0																															
No. of Applications Low - High		-	-	-	-	-	4- 4	1-15	-	-	6- 6	-	-	2- 3	2- 3	1- 3	4- 4	-	1- 2	-	1- 6	-	-	-	-	-	3- 3	-	-	-	1- 1	-	-
Application Rate (lb/ac) Low							1.00	0.25			0.02			0.17	0.25	0.06	0.06		0.38		1.00					0.05				6.00		
High							1.00	4.00			0.02			2.00	0.50	3.00	0.06		4.00		1.50					0.05				6.00		
RADISHES																																
ROOT MAGGOTS	75									75																						
No. of Applications Low - High		-	-	-	-	-	-	-	-	1- 1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low										9.00																						
High										9.00																						
SQUASH (SQUASH, ZUCCHINI, VINE CROPS)																																
Not Specified	41													16	16						9											
BORERS	1							1																								
CUCUMBER BEETLES	27							11							16																	
FLEA BEETLE	0																															
INSECTS, GENERAL	2						2																									
JAPANESE BEETLES	47															47																
SQUASH BUG	1													1																		
VINE BORER	47													47																		
No. of Applications Low - High		-	-	-	-	-	4- 4	2-36	-	-	-	-	-	1- 3	1- 1	1- 3	-	-	2- 2	-	1- 4	-	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low							1.00	0.03						0.17	0.02	0.06			0.38		0.25												
High							1.00	2.00						2.00	0.02	3.00			0.38		1.00												

Table 29. Major Insect Problems on Vegetables for Which Growers Applied Insecticides in Ohio - 1990 (Continued)

Major Insect Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Insecticide for Control of Specific Insect																																		
		Ace phate	Aldi carb	Ami traz	Azin phos Me thyl	B.T. Thur ing ience	B.T. Var. Kur staki	Carb aryl	Carbo furan	Chlor pyri fos	Diaz inon	Di meth oate	Disul foton	Endo sul fan	Esfen val erate	Ethyl Para thion	Fen val erate	Fono fos	Mala thion	Meth amid ophos	Meth omyl	Meth yl Para thion	Mevin phos	Naled	Ox amyl	Oxydo meton Meth yl	Per meth rin	Phor ate	Phos met	Piper onyl Butox ide	Pyre thrum	Ter bufos	Thio di carb
SWEET CORN																																				
Not Specified	3							2																												
APHIDS	4													1			2								2											
ARMYWORM	7															7																				
BEETLES	1							1																												
BORERS	0																																			
CODLING MOTH	0																																			
CORN BORER	11									1					1	2					5															1
CORN EARWORMS	88							5		1				1	20	9	2				6	11				21									13
EARWORM	0																																			
EUROPEAN CORN BORER	24							11	1	1						3										6										
FLEA BEETLE	6							2	4																											
INSECTS, GENERAL	5							5																												
JAPANESE BEETLES	0																																			
MAGGOTS	2										2																									
ROOTWORM	9								1																						7					
TIP WORM	0																																			
WIREWORM	2																														2					
WORMS	0																																			
No. of Applications Low - High		-	-	-	-	-	-	1- 7	1- 1	1-12	1- 2	-	-	1- 2	2- 6	1- 7	1- 7	1- 1	1- 1	-	1- 8	2- 4	-	-	-	1- 2	2-10	-	2- 2	-	-	1- 1	1-10			
Application Rate (lb/ac) Low								0.03	0.13	0.19	0.31			0.25	0.02	0.03	0.05	5.00	0.13		0.09	0.25				0.25	0.03		3.00			1.09	0.13			
High								4.00	8.70	6.00	1.09			3.00	0.50	4.00	0.50	10.00	0.13		0.50	0.38				0.80	0.62		3.00			10.00	0.88			
TOMATOES																																				
Not Specified	15							5						1	8																					
APHIDS	1																																			
BEETLES	0																																			
COLORADO POT BEETLE	16							3							10		3																			
FLEA BEETLE	4							3																												
FRUITWORM	3							3																												
GRASSHOPPERS	0																																			
HORNWORMS	2													2																						
INSECTS, GENERAL	23							5						3	12		2																			
THRIPS	4													4																						
WHITEFLY	1																																			
WORMS	3							1						2																						
No. of Applications Low - High		-	-	-	2-10	-	3- 5	1- 6	-	-	7- 9	-	-	1-17	1- 4	1- 4	1- 1	-	3-12	-	1-36	1- 1	-	-	-	-	2- 5	-	4- 4	-	9- 9	-	-			
Application Rate (lb/ac) Low					1.00		0.50	0.25			0.14			0.05	0.01	0.13	0.04		0.05		0.05	0.38				0.01		0.75		2.00					
High					1.50		0.50	3.00			0.25			2.00	0.50	2.00	0.04		0.25		1.00	0.38				0.33		0.75		2.00					
TURNIPS																																				
BEETLES	6							2								2			2																	
LEAFHOPPER	20																		20																	
No. of Applications Low - High		-	-	-	-	-	-	2- 2	-	-	-	-	-	-	-	2- 2	-	-	1- 3	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low								3.00								3.00			0.25																	
High								3.00								3.00			0.25																	

Table 30. Major Disease Problems on Vegetables for Which Growers Applied Fungicides in Ohio - 1990

Major Disease Problem	Percent Acreage Treated	Anilazine	Benomyl	Captan	Chlorothalonil	Copper, Metallic	CuOH	Dinocap	Mancozeb	Maneb	Metalaxyl	Streptomycin	Thiophanate CH3	Triadimefon	Vinclozolin
Percent of Acreage Treated with Specific Fungicide for Control of Specific Disease															
BEANS (GREEN, LIMA, NAVY, SNAP, SPROUTS, STRING)															
Not Specified	34		17				17			1					
RUST	0														
No. of Applications Low - High		-	1- 1	1- 1	2- 3	-	4- 4	-	-	4- 4	-	-	-	-	-
Application Rate (lb/ac) Low			0.75	2.00	0.25		0.20			0.38					
High			0.75	2.00	1.50		0.20			0.38					
BEDDING PLANTS															
Not Specified	73										73				
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	1- 1	-	-	-	-
Application Rate (lb/ac) Low											0.20				
High											0.20				
BEETS (RED & TABLE)															
Not Specified	100						100								
No. of Applications Low - High		-	-	-	-	-	3- 3	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low							0.20								
High							0.20								
BROCCOLI															
Not Specified	2			1	1										
No. of Applications Low - High		-	-	1- 1	3- 3	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low				2.00	0.25										
High				2.00	0.25										
CABBAGE															
Not Specified	9				2		6								
DISEASES	0														
LEAF SPOT	0														
MILDEW	1									1					
No. of Applications Low - High		-	-	1- 2	2- 8	-	1- 1	-	-	4- 4	5- 5	-	-	-	-
Application Rate (lb/ac) Low				2.00	0.19		1.33			0.38	1.00				
High				4.00	1.00		1.33			0.38	1.00				
CARROTS															
Not Specified	99				99										
LEAF SPOT	99						99								
No. of Applications Low - High		-	-	-	3- 3	-	3- 3	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low					0.20		0.20								
High					0.20		0.20								
CAULIFLOWER															
Not Specified	79			70	9										
LEAF SPOT	61				61										
No. of Applications Low - High		-	-	1- 2	2- 3	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low				2.00	0.19										
High				4.00	0.25										
CUCUMBERS (CUCUMBERS & PROCESSED PICKLES)															
Not Specified	38		4		21		11		1						
ANTHRACNOSE	4				4										
LEAF SPOT	1				1										
MILDEW	1									1					
No. of Applications Low - High		-	2- 2	-	2- 5	-	3- 3	2- 2	1- 3	3- 3	-	-	-	-	-
Application Rate (lb/ac) Low			0.50		0.19		0.44	0.50	0.03	0.38					
High			0.50		2.25		0.44	0.50	2.00	0.38					

Table 30. Major Disease Problems on Vegetables for Which Growers Applied Fungicides in Ohio - 1990 (Continued)

Major Disease Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Fungicide for Control of Specific Disease													
		Anilazine	Benomyl	Captan	Chlorothalonil	Copper, Metallic	CuOH	Dinocap	Mancozeb	Maneb	Metalaxyl	Streptomycin	Thiophanate CH3	Triadimefon	Vinclozolin
EGGPLANT															
Not Specified	100						46				64				
No. of Applications Low - High		-	-	-	-	-	1- 3	-	-	-	1- 2	-	-	-	-
Application Rate (lb/ac) Low							1.50				0.38				
High							2.00				1.60				
GREENS (SPINACH, KALE, MUSTARD)															
Not Specified	22						22								
No. of Applications Low - High		-	-	-	-	-	2- 2	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low							0.20								
High							0.20								
LETTUCE															
Not Specified	9														9
No. of Applications Low - High		-	-	-	-	-	-	-	-	-	-	-	-	-	2- 2
Application Rate (lb/ac) Low															2.00
High															2.00
ONIONS															
Not Specified	0														
No. of Applications Low - High		-	-	-	2- 2	-	-	-	-	-	-	-	-	-	-
Application Rate (lb/ac) Low					0.38										
High					0.38										
PEAS															
Not Specified	100				84		84				84				
No. of Applications Low - High		-	-	-	1- 1	-	1- 1	-	-	-	1- 1	-	-	-	-
Application Rate (lb/ac) Low					1.50		2.00				0.13				
High					1.50		2.00				0.13				
PEPPERS															
Not Specified	100				1		63			2	65	59			
BLIGHTS	1				1										
DISEASES	1				1						1				
FUNGUS	2		1	1	1		1								
LEAF ROT	5									5					
No. of Applications Low - High		-	8- 8	8- 8	1- 6	-	4- 10	-	-	2- 4	1- 5	2- 2	-	-	-
Application Rate (lb/ac) Low			0.13	0.50	0.06		0.50			0.38	0.20	0.33			
High			0.13	0.50	1.00		2.00			2.00	1.00	0.33			
POTATOES															
Not Specified	74						7		27	27	14				
BLIGHTS	30								15	15					
DISEASES	4								2	2					
MOLDS	0														
TUBER ROT	7										7				
No. of Applications Low - High		-	-	-	4- 4	-	2- 2	-	1- 9	1- 10	1- 2	-	5- 5	-	-
Application Rate (lb/ac) Low					0.25		0.33		1.00	0.90	1.50		1.50		
High					0.25		0.33		2.00	25.00	2.00		1.50		

Table 30. Major Disease Problems on Vegetables for Which Growers Applied Fungicides in Ohio - 1990 (Continued)

Major Disease Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Fungicide for Control of Specific Disease													
		Anil azine	Ben omyl	Cap tan	Chlor othal onil	Cop per, Metal lic	CuOH	Dino cap	Man cozeb	Maneb	Meta laxyl	Strep to mycin	Thio phan ate CH3	Triad ime fon	Vin clo zolin
PUMPKINS															
Not Specified	100		14		30		15	2	11		25			13	
DISEASES	3				1						1				
GUMMY STEM BLIGHT	40		21		19										
LEAF SPOT	18													18	
MILDEW	5		5												
POWDERY MILDEW	3				3										
No. of Applications Low - High		-	1- 3	-	1- 15	-	2- 2	2- 2	1- 9	-	1- 2	-	-	2- 3	-
Application Rate (lb/ac) Low			0.50		0.25		2.00	0.50	0.03		0.20			0.03	
High			0.50		1.75		2.00	0.63	2.50		1.50			0.50	
SQUASH (SQUASH, ZUCCHINI, VINE CROPS)															
Not Specified	100		16		16		38		1		63				
DISEASES	3				2						2				
LEAF SPOT	32													32	
POWDERY MILDEW	55		55												
SCAB	47				47										
No. of Applications Low - High		-	1- 36	-	1- 6	-	2- 2	2- 2	3- 3	-	1- 1	-	-	2- 2	-
Application Rate (lb/ac) Low			0.50		0.25		1.50	0.63	0.03		0.75			0.19	
High			0.50		1.50		1.50	0.63	0.03		1.00			0.19	
SWEET CORN															
Not Specified	6				5					1					
FUNGUS	5								5						
No. of Applications Low - High		-	-	-	2- 2	-	-	-	3- 3	4- 4	-	-	-	-	-
Application Rate (lb/ac) Low					0.90				1.50	0.25					
High					0.90				1.50	0.25					
TOMATOES															
Not Specified	100	26	10		68	2	55								
ANTHRACNOSE	10				10										
BACTERIAL DISEASES	27	13			3		10								
BACTERIAL SPOT	3						3								
BLIGHTS	4				3										
BOTRYTIS GRAY MOLD	0														
DISEASES	2		2												
EARLY BLIGHT	9				9										
FUNGUS	5				2		2								
MOLDS	0														
SEPTORIA GLUMEBLOTCH	0														
No. of Applications Low - High		1- 3	1- 9	8- 8	1- 15	2- 2	1- 10	-	1- 1	4- 4	4- 4	-	-	-	-
Application Rate (lb/ac) Low		1.00	0.13	0.50	0.06	2.00	0.19		1.00	0.38	2.00				
High		3.00	1.00	0.50	5.00	2.00	2.25		1.00	0.38	2.00				

Table 31. Major Other Problems on Vegetables for Which Growers Applied Other Pesticides in Ohio - 1990

Major Other Pesticide Problem	Percent Acreage Treated	Percent of Acreage Treated with Specific Other Pesticide for Control of Specific Problem: Ameno pyr ide	Captan	Eth ephon	Gly cols IPA	Mal eic Hydra zide	Potas Salts Malec Hydra	Potas sium Salts
BEANS (GREEN, LIMA, NAVY, SNAP, SPROUTS, STRING)								
SEED DECAY	0							
No. of Applications Low - High		-	1- 1	-	-	-	-	-
Application Rate (lb/ac) Low			0.04					
High			0.04					
BROCCOLI								
Not Specified	1							
No. of Applications Low - High		-	-	-	-	-	-	-
Application Rate (lb/ac) Low								
High								
CABBAGE								
Not Specified	12							12
No. of Applications Low - High		-	-	-	-	-	-	2- 2
Application Rate (lb/ac) Low								0.30
High								0.30
ORNAMENTAL CORN								
SEED DECAY	67		67					
No. of Applications Low - High		-	1- 1	-	-	-	-	-
Application Rate (lb/ac) Low			0.04					
High			0.04					
PEAS								
SEED DECAY	3		3					
No. of Applications Low - High		-	1- 1	-	-	-	-	-
Application Rate (lb/ac) Low			0.04					
High			0.04					
POTATOES								
GROWTH REGULATOR	25					23	1	
No. of Applications Low - High		-	-	-	-	1- 1	1- 1	-
Application Rate (lb/ac) Low						1.30	1.25	
High						2.00	1.25	
SWEET CORN								
Not Specified	1				1			
BIRDS	1	1						
SEED DECAY	0							
No. of Applications Low - High		1- 1	1- 1	-	1- 1	-	-	-
Application Rate (lb/ac) Low		10.00	0.04		0.13			
High		10.00	0.04		0.13			
TOMATOES								
Not Specified	8			8				
COLORING, UNIFORM	9			9				
DEFOLIANT	1			1				
GROWTH REGULATOR	2			2				
RIPENER	65			65				
No. of Applications Low - High		-	-	1- 1	-	-	-	-
Application Rate (lb/ac) Low				0.31				
High				0.50				

APPENDIX I

1990 Ohio Pesticide Use Survey for Fruits and Vegetables

The Ohio State University
Ohio Cooperative Extension Service
Pesticide Impact Assessment Program
Extension Entomology Building
1991 Kenny Road
Columbus, Ohio 43210–1090
(614) 292–7541

Please update information if different or missing from label above.

NAME: _____
SS#: ___/___/___
COMPANY or FARM NAME: _____
ADDRESS: _____
CITY: _____ STATE: _____ ZIP: _____
COUNTY: _____ TOWNSHIP: _____
PHONE Bus: (___) ___–_____ Home: (___) ___–_____

Dear Fruit and/or Vegetable Grower:

Current federal, public and environmental concerns relative to pesticide use/food and water safety in addition to EPA Special Review investigations of many existing registered pesticides and the policies in the reregistraton process cause increased concern in having factual data on pesticide/commodity use as a defense for agricultural production practices. The use of pesticides remains of major importance in modern agriculture. It is essential that those necessary for effective crop production, which can be used without adverse effects to man and the environment, continue to be available when and where needed. This survey will contribute to that defense by providing information on the types and quantities of pesticides necessary for profitable crop production as determined by the grower. Alternatives in pest control practices will be considered which should influence EPA in making reliable scientific decisions.

Similar surveys were conducted in 1978, 1979 and 1983 and were highly successful. The recent survey on EBDC use provided important information on apple, potato, and tomato crops, and has received support from Ohio Congressmen, Farm Bureau, and Growers Groups designed to influence EPA towards making a reasonable, agriculturally satisfactory decision on the future use of those materials. The 1990 survey will identify trends and major changes in pesticide use since 1983 and will be important in providing data that will be highly useful during the future regulatory decisions that may affect the continued registration of many pesticide materials. Your cooperation by providing the information requested in the following survey is important in measuring the importance of pesticides in fruit and vegetable production in Ohio. Your reply is confidential and will be used only to determine area, region or state totals. A glossary of some pesticides and some pest problems is provided as assistance in completing the survey.

Please return your completed questionnaire in the envelope provided by December 21, 1990.

Thank you.

Acie C Waldron

Acie C. Waldron, Coordinator
Pesticide Impact Assessment Program
OCES–OSU

In the past surveys have collected data on:

Fruits

apples	cherries	melons	pears	raspberries	
blueberries	grapes	peaches	plums	strawberries	

Vegetables

broccoli	cauliflower	eggplant	lettuce	peppers	squash
cabbage	celery	green beans	onions	potatoes	sweet corn
carrots	cucumbers	greens	peas	pumpkins	tomatoes

We will accept data on all fruit and vegetable crops and publish all significant data.

If you did not raise Fruit or Vegetable crops in 1990 please check the box below and return the survey unanswered so we may update our database. ☐

If you have quit farming all together (raise no crops) please check the box below and return the survey unanswered so we may update our database. ☐

Name: _____ County: _____ Date: _____

1990 Ohio Pesticide Use Survey for Fruits and Vegetables

Report for the Farm You Operate (Owned and Rented Acreage)						Practices	Type of Operation			
		How Many Acres or Square Feet Greenhouse Were Treated For				List Cultural or Biological Pest Management Practices	Fresh Market		Contracted Processing	
		List Acres or Square Feet Only Once Even If Same Area Treated More Than Once								
1990 Crop	Total Acres in Field per Crop (or Square Footage for Greenhouse)	Weed Control (Herbicide)	Insect/ Nematode Control (Insecticides)	Disease Control (Fungicides)	Other Control: Rodents, Deer, Defoliant, Dessicant Growth Regulator etc.	Root Pruning (Growth Reg) Cultivation (Herbicide) Parasitic Insects (Insecticide) etc.	Field Grown Acres	Greenhouse (Acres or Sq. Ft.)	Field Grown Acres	Greenhouse (Acres or Sq. Ft.)
Example										
Sweet Corn	25 ac		25 Ac			Cultivation	25 ac			
Apple	50 ac		50 ac	50 ac		Root Pruning	10 ac		40 ac	

1990 Fruit and Vegetable Use Survey – Pesticides Used on Each Crop

Crop Treated	Total Acres in Field Per Crop (or Square Footage for Greenhouse)	Pesticide Used	Concentration of Pesticide	Formulation of Pesticide	Quantity of Undiluted Pesticide Formulation Used Per Acre or 1000 Sq Ft GH For Each Application	Total Volume or Quantity Applied per Application	Acres Treated (or Square Footage for Greenhouse) per Application	Number of Applications per year	Who Applied the Pesticides	Type of Equipment used to Apply Pesticide	Form of Application Dilute Spray LV Spray, Fog Irrigation Soil Fumigant Fumigation Incorporated Broadcast Band, Spot, Other (Specify)	Pest Target (Identify Major Reasons for Pesticide Use for Each Chemical and/or Tank Mix)
			Percent of Active Ingredient Dry Materials or Number of Pounds A.I. for liquids	WP., DF., G., E., EC., L., Dust, Bait, Aerosol, Other (etc.) (Specify)	(Specify lb., pt.,qt.,gal., oz., etc.)	(Specify lb., pt.,qt.,gal., oz., etc.)			Self or Custom Applied	Helicopter Airplane Ground Equipment		
List	List	List	List	List	List	List	List	List	List	List	List	List
Example												
Sweet Corn	25	Carbaryl(Sevin)	50 %	W	4 lb	100 lb	25	4	Self	Ground	Broadcast	Corn Earworm
Apple	50	Dodine	65 %	WP	2.3 lb *	115 lb *	50	7	Self	Ground	Broadcast	Scab
	50	Mancozeb	80 %	WP	5 lb *	250 lb *	50	7	Self	Ground	Broadcast	Blotch
	50	Imidan	50 %	WP	8 lb *	400 lb *	50	7	Self	Ground	Broadcast	Codling Moth
	50	Cygon	4 lb	E	.5 pt *	3.13 gal *	50	3	Self	Ground	Broadcast	Apple Aphid
* Based on Quantity of formulation used in 100 gallons of water and 400 gallons applied per acre												

(Over)

1990 Fruit and Vegetable Use Survey – Pesticides Used on Each Crop

Crop Treated	Total Acres in Field Per Crop (or Square Footage for Greenhouse)	Pesticide Used	Concentration of Pesticide Percent of Active Ingredient Dry Materials or Number of Pounds A.I. for liquids	Formulation of Pesticide WP , DF., G., E., EC., L., Dust, Bait, Aerosol, Other (etc.) (Specify)	Quantity of Undiluted Pesticide Formulation Used Per Acre or 1000 Sq Ft GH For Each Application (Specify lb., pt.,qt.,gal , oz., etc)	Total Volume or Quantity Applied per Application (Specify lb., pt ,qt.,gal., oz , etc.)	Acres Treated (or Square Footage for Greenhouse) per Application	Number of Applications per year	Who Applied the Pesticides Self or Custom Applied	Type of Equipment used to Apply Pesticide Helicopter Airplane Ground Equipment	Form of Application Dilute Spray LV Spray, Fog Irrigation Soil Fumigant Fumigation Incorporated Broadcast Band, Spot, Other (Specify)	Pest Target (Identify Major Reasons for Pesticide Use for Each Chemical and/or Tank Mix)
List	List	List	List	List	List	List	List	List	List	List	List	List

APPENDIX II

Glossary of Some Common Pesticides

Herbicides

Common Name	Trade Name
2,4-D	2,4-D, Dacamine 4D, Formula 40
2,4-D amine salt	Weedar 64, Weedone
2,4-DB	Butoxone, Butyrac
Acifluorfen	Blazer, Tackle
Alachlor	Lasso
Ametryn	Evik
Amitrole	Amitrol T, Weedazol T
Atrazine	AAtrex, Atrazine
Benefin	Balan
Bensulide	Prefar, Betasan
Bentazon	Basagran
Bromoxynil	Brominal, Buctril
Butylate	Sutan, Sutan+
CDAA	Randox
CDEC	Vegadex
Chloramben	Amiben
Chlorpropham	Chloro IPC, Furloe
Cyanazine	Bladex
Cycloate	Ro-Neet
Dalapon	Dowpon-M
DCPA	Dacthal
Dicamba	Banvel
Diclobenil	Casoran
Diethatyl ethyl	Antor
Dimethazone	Command
Diphenamid	Enide, Dymid
Diquat	Aquacide, Diquat
Diuron	Karmex
EPTC	Eptam, Genep
EPTC +	Eradicane Extra
Endothal	H-273, Endothall
Fluazifop-p-butyl	Fusilade
Glyphosphate	Roundup
Imazaquin	Scepter
Linuron	Lorox, Linex
MCPA	Amine, Chiptox
Metolachlor	Dual
Metribuzin	Sencor, Lexone
Napropamide	Devrinol
Naptalam	Alanap, Rescue
Oryzalin	Surflan
Oxyfluorfen	Goal
Paraquat	Gramoxone, Paraquat
Pebulate	Tillam
Pendimethalin	Prowl
Prometryne	Caparol
Pronamide	Kerb
Propachlor	Ramrod
Pyrazon	Pyramin FL
Sethoxydim	Poast
Simazine	Aquazine, Princep, Sim-Trol
Stoddard Mineral Spirits	Stoddard Solvent
Terbacil	Sinbar
Thifensulfuron methyl	Harmony
Tribenuron methyl	Express
Trifluralin	Treflan, Trilin
Vernolate	Reward, Surpass, Vernam

Insecticides

Common Name	Trade Name
Acephate	Orthene
Aldicarb	Temik
Amitraz	BAAM, Mitac
Azinphos-methyl	Guthion
Bacillus thuringiensis	Trident
B.T. var. kurstaki	Biobit, Dipel, Javelin, Thuricide
Biphenthrin	Brigade, Talstar
Carbaryl	Sevin
Carbofuran	Furadan
Chlorpyrifos	Dursban, Lorsban, Killmaster
Clofentezine	Apollo, Acaristop
Cypermethrin	Cymbush, Ammo
Cythion	Malathion
Cyhexatin	Plictran
DDVP	Dichlorvos
Diazinon	Diazinon, Spectrocide, Alfa-tox, MG-50
Dicofol	Kelthane
Diflubenzuron	Dimilin
Dimecron	Phosphamidon
Dimethoate	Cygon, Defend, Rebelate
Disulfoton	Di-Syston
DNOC	DNOC, Sinox
Endosulfan	Thiodan
EPN	EPN
Esfenvalerate	Asana
Ethion	Ethion, Ethanox
Ethoprop	Mocap
Fenamiphos	Nemacur
Fenbutatin-Oxide	Vendex, Hexakis
Fenvalerate	Pydrin
Fonofos	Dyfonate
Flucythrinate	Pay-Off, Cybolt
Fluvalinate	Mavrik, Spur
Lead Arsenate	Lead Arsenate, Gypsine, Soprabel
Lindane	Fulex Aphid Smoke, Isotox
Malathion	Malathion, Cythion
Methamidophos	Monitor
Methidathion	Supracide
Methiocarb	Draza, Mesurol
Methomyl	Lannate, Nudrin
Methoxychlor	Marlate, Methoxychlor
Methyl parathion	Penncap-M, Methyl Parathion
Mevinphos	Phosdrin
Monocrotophos	Azodrin
Naled	Dibrom
Oil, Dormant	Dormant Oil
Oil, Superior	Superior Oil, SunSpray
Oxamyl	Oxamyl 10G, Vydate L
Oxydemeton-Methyl	Metasystox-R
Oxythioquinox	Morestan
Parathion (ethyl)	Parathion, Phoskil
Parathion (methyl)	Penncap-M, Methyl Parathion
Permethrin	Pounce, Ambush
Phorate	Phorate, Thimet
Phosalone	Zolone
Phosmet	Imidan
Phosphamidon	Dimecron, Phosphamidon
Propargite	Omite
Pyrethrins	Pyrethrum, Rotenone, Pyrenone Spray
Sodium Fluoaluminate	Cryolite, Kryocide, Prokil
Sulfotep (Tetradifon)	Tedion
Terbufos	Counter
Thiodicarb	Larvin
Trichlorfon	Dipterex, Dylox, Proxol

Fungicides & Nematicides

Common Name	Trade Name	Common Name	Trade Name
Anilazine	Dyrene		
Benomyl	Benlate, Tersan	Mancozeb	Dithane M-45 (&DF), Manzate 200
Bordeaux Mixture	Bordeaux Mixture, Comac Macuprax	Maneb	Manex, Maneb 80WP, Ronilan
Botran	DCNA	Maneb + Zinc Sulfate	Dithane M-22, Manex, Manzate
Calcium Polysulfides	Lime Sulfur	Metalaxyl	Apron, Ridomil
Captafol	Difolatan	Methyl Bromide	Brom-O-Gas, Bromosol, Meth-O-Gas
Captan	Orthocide, Captan		
Chloropicrin	Chlor-O-Pic, Also used in combination with Methyl Bromide	Metiram	Pallinal, Pallitop, Polyram
Chlorothalonil	Bravo	Oxamyl	Oxamyl 10G, Vydate L
Copper Hydroxide	Comac Parasol, Criscobre, Kocide	PCNB	Terraclor
Copper, Fixed	Champ, Champion, Copper Sulfate, Nutra-Spray		
DCNA	Botran		
Dichlone	Dichlone, Phygon	Streptomycin	Agri-Mycin, Agri-Strep, AgStrep
Dichloropropene	Telone II, Telone C-17, Vorlex	Sulfur	Alfa Wettable Sulfur, Suffa, Super Six Liquid Sulfur, Thiolux
Dinocap	Karathane		
Dithiocarbamic Acids/Salts	Polyram, Metam-Sodium		
Dodine	Cyprex	Thiophanate-methyl	Topsin M
D-D	D-D Soil Fumigant		
		Thiram	AAtack, Arasen, Thiram
Fenamiphos	Nemacur	Triadimefon	Bayleton
Ferbam	Carbamate	Triforine	Funginex
Folpet	Faltex, Folpan, Phaltan, Thiophal	Triphenyltin hydroxide	Brestanid, Du-Ter, Super-Tin, Tubotin
Formaldehyde	Formalin, Methanal, Formaldehyde Solution	Vinclozin	Ronilan
Glyodin	Crag 341 Fungicide	Zineb	Zineb, Dithane Z-78, Parzate C, Aspor
Glyoxide	Glyoxide		
Iprodione	Rovral		

Other Chemicals & Pesticides

Amenopyride	Avitrol	NAA	NAA, Naphthalene Acetic Acid, Fruitone N
Ethephon	Ethrel		
Methyl Bromide	Brom-O-Gas, Bromosol, Meth-O-Gas, Terr-O-Gas	Zinc Phosphide	Phosvin, ZP Tracking Powder, ZP Rodent Bait

Glossary of Some Common Pest Problems in Ohio Fruit and Vegetable Crops

Weed Problems: Fruit and Vegetable Crops

Artichoke
Barnyardgrass
Bindweed
Canada Thistle
Chickweed
Climbing Milkweed
Crabgrass
Cocklebur
Common Ragweed
Dandelion
Fall Panicum
Foxtails
General Broadleaves
General Grasses
Giant Ragweed
Jimsonweed
Johnsongrass
Lambsquarter
Morning Glory
Multiflora Rose
Nightshade
Peppergrass
Pigweed
Quackgrass
Smartweed
Tall Ironweed
Velvetleaf
Wild Cucumber
Wild Garlic/Onion
Wild Mustard
Yellow Nutsedge
Yellow Rocket

Disease Problems: Fruit and Vegetable Crops

Angular Leaf Spot
Anthracnose
Bacterial Blight
Bacterial Diseases
Bacterial Spot
Black Rot
Blight
Blotch
Botrytis
Brown Rot
Downy Mildew
Fire-blight
Fruit Rot
General Diseases
Gray Mold
Leaf Blight
Leaf Curl
Powdery Mildew
Root Rot
Rust
Scab
Scorch
Sooty Blotch
Wirestem muhly

Insect Problems: Fruit Crops

Aphids
Apple Maggot
Berry Moth
Codling Moth
Fruit Flies
General Insects
Japanese Beetle
Leafhopper
Leafminer
Leafroller
Mites
Peach Tree Borer
Pear Psylla
Plum Curculio
Scale
Spittlebug
Tarnished Plant Bug

Insect Problems: Vegetable Crops

Aphids
Armyworm
Cabbage Looper
Colorado Potato Beetle
Corn Earworm
Crown Borer
Cucumber Beetle
Cutworms
European Corn Borer
Flea Beetle
Fruitworm
General Insects
Grubs
Hornworm
Japanese Beetle
Leafhopper
Mexican Bean Beetle
Nematodes
Rootworm
Sap Beetle
Stink Bug
Squash Beetle
Tarnished Plant Bug
Thrips
Vine Borer
Wireworms

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OCES Ohio Cooperative Extension Service
The Ohio State University