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PATTERNS OF PESTICIDE USE ON NEW YORK STATE PRODUCED SWEET CORN

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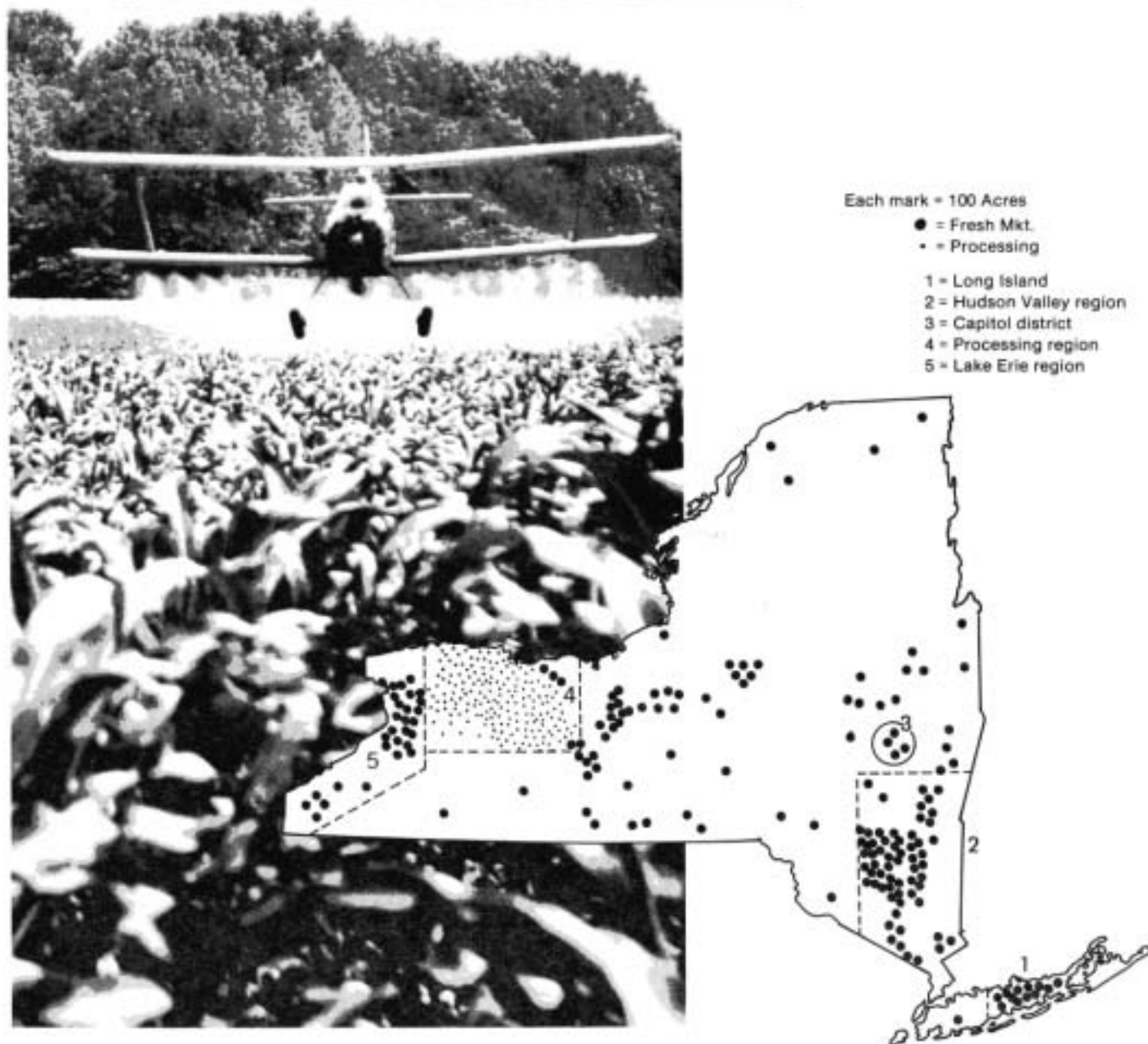


Figure 1.—Distribution of sweet corn acreage in New York, 1981.

INTRODUCTION

Sweet corn is one of New York's most important vegetable crops being grown on about 1,700 farms (Fig. 1) and representing 11.4 per cent of total vegetable cash - receipts. New York ranks first among states in the production of summer season fresh market sweet corn and seventh in the production of sweet corn for processing. Although the acreage for each is about the same, sale value for fresh market is about 2.8 times that of processing. Statistics on production, value, and utilization of New York state sweet corn are presented in Table 1.

Fresh market sweet corn is grown on about 1,400 widely distributed farms. Several rather large farms that ship corn throughout the eastern half of the nation and into parts of Canada are concentrated in the Hudson Valley. Considerable wholesale marketing by growers with smaller acreages occurs at regional markets in New York City, Albany (Menands), Syracuse, Rochester, and Buffalo, as well as at about 90 farmers' markets located in about 75 towns and cities. Additionally, New York currently leads the nation in the number of direct marketing outlets

with more than 1,600 roadside markets and pick-your-own farms.

The processing sweet corn crop is grown on about 250 farms concentrated in the area of Rochester, NY. Three companies in New York make contract agreements with growers to produce sweet corn for canning or freezing: Seneca Foods, Comstock Foods, and Birds Eye division of General Foods. These companies processed sweet corn from 20,000 acres in 1981 while production from about 1,000 acres was shipped to Pennsylvania for processing. Production contract acreage is supplemented by sweet corn from about 200 non-contract acres annually.

Pesticide use in the production of sweet corn in New York during 1981 was documented by a survey of fresh market producers and a census of processing company fieldmen. Data include the pesticides used, quantities of pesticide used, acres treated, acre-treatments, methods and rates of application, and time intervals between applications. Pesticides were used on virtually all (93%) of the 43,300 acres of sweet corn harvested in 1981. Fungicides were only occasionally applied (outbreaks of common maize rust, *Puccinia sorghi* Schw.) and, there-

fore, were not included in the survey. Although 10 per cent of the surveyed acreage did not receive any foliar insecticide applications, herbicide treatments were universal.

PROCEDURE

Mailing lists of sweet corn growers were solicited from county Cooperative Extension associations. Where sweet corn could not be specifically identified, lists of vegetable growers were consulted. These lists were supplemented by five regional direct marketing guides produced by the New York State Department of Agriculture and Markets, Albany, NY. A total of 1,103 questionnaires and postage-paid return envelopes were mailed in mid-December 1981. Within the next month, 307 were returned, 230 of which were from fresh market sweet corn growers who provided information suitable for tabulation.

Head fieldmen for the three processing sweet corn companies were polled by personal interview. Primary survey objectives were to determine the relative number of acre-treatments and quantities of each insecticide used. It was not feasible to tabulate spray records for individual fields of sweet corn

Table 1. New York sweet corn production statistics, 1981^a

Year	Processing					Fresh market			
	Acres planted	Contract acres harvested	Total acres harvested	Yield (Tons/A)	Price (dollars/T)	Acres planted	Acres harvested	Yield (cwt/A)	Price (dollars/ctw.)
1975	22,700	22,200	22,500	4.64	70.60	23,200	22,200	65	7.47
1976	22,800	21,000	21,000	3.94	45.40	22,100	21,100	65	7.54
1977	23,400	16,900	17,000	5.68	45.70	23,500	20,500	74	6.12
1978	22,400	20,100	20,300	4.90	45.00	22,300	21,000	63	6.69
1979	21,600	19,900	20,500	5.33	47.00	22,700	21,700	65	8.43
1980	17,900	16,800	17,000	5.05	48.90	23,000	21,700	75	9.51
1981	21,700	20,900	21,100	4.66	62.10	23,000	22,200	71	10.70

^aNew York Agricultural Statistics - 1981, New York Crop Reporting Service, Albany.

Table 2. Comparison of 3 surveys of New York sweet corn pesticide use, 1978, 79, 81.

Herbicides:	Percent acreage treated				
	1981 survey			1979 USDA ^a	1978 NYPIAP ^b
	Frsh. mkt.	Proc.	Total	survey	survey
atrazine (AAtrex ^R)	89	62	76	54	59
cyanazine (Bladex ^R)	9	12	10	7	13
2,4-D	4	29	16	1	4
EPTC (Eradicane ^R)	10	5	7	-	3
alachlor (Lasso ^R)	40	25	32	17	28
glyphosphate (Roundup ^R)	11	1	6	2	1
butylate (Sutan ^R)	26	10	18	10	16
Insecticides:					
carbaryl (Sevin ^R)	21	1	11	4	15
EPN	6	64	34	24	6
methomyl (Lannate, Nudrin ^R)	47	22	35	23	21
m-parathion	34	0	17	4	
Penncap-M ^R	17	43	29	21	32 ^c

^aFerguson, Walter L. and Iris E. McCalla. 1981. Pesticide use on vegetables in the Northwest, A preliminary report. Econ. Rsh. Service Staff Rpt., AGES 811218. USDA.

^bHuka, A.A. and J.L. Heath. 1980. Patterns of pesticide use by New York vegetable growers in 1978. N.Y. Pest. Impact Assessment Program.

^cm-parathion and Penncap M are treated as the same insecticide.



grown for processing. Packers could comply with survey objectives, however, by disclosing total quantities of each pesticide used, standard application rates, and other miscellaneous information.

Data regarding foliar insecticides and methods of application, herbicides, seed treatments, and soil insecticides represent at least 95 per cent of New York's sweet corn grown for processing, and 18 per cent of the fresh market crop. The pesticide use data which follow have been computed from fresh market and processing sample means. The reader should be mindful that these data are derived from surveys. Therefore, judgements of accuracy and representation must remain subjective.

RESULTS AND DISCUSSION

Previous sweet corn pesticide use surveys in New York have not distinguished between fresh market and processing crops. Comparisons can be made between pesticide use patterns determined for the total 1981 sweet corn crop and patterns from previous surveys (Table 2).

Methods of Applications

A proportionate breakdown of acreage treated and grower utilization of various methods of foliar insecticide application is presented in Table 3. The processing industry utilized aerial application exclusively. Under the contract system employed, planting and herbicide applications are performed by individual growers, but foliar insecticide management is controlled by company fieldmen. New York processing companies do not own application equipment; therefore, pest control is contracted to private aerial applicators. In contrast, only 20 per cent of surveyed fresh market acreage was treated through aerial application by 9 per cent of the growers. Although the processing industry is dependent upon aerial application and will probably remain so in the future,

Table 3. Summary^a of equipment used for the application of foliar insecticides on New York produced sweet corn, 1981.

	Acreage treated (%)		Frsh. mkt. growers utilizing (%)
	Frsh. mkt.	Proc.	
Aerial application	20	100	9
High clearance boom sprayer	65	0	56
Airblast sprayer	15	0	17
Hand equipment	8	0	21

^aBased on surveys representing ca. 18% of fresh market acreage (4140 acres) and ca. 95% of processing acreage (21,615 acres).

many producers of fresh market sweet corn use aerial application only in situations of wet field conditions or when they cannot maintain spray schedules by other application methods.

Over half of the fresh market growers surveyed treated 65 per cent of the acreage by high clearance boom sprayer. Air blast sprayers were used primarily by growers who are also engaged in tree-fruit production. Surprisingly, 21 per cent of the fresh market crop surveyed was treated by hand-held sprayers or power sprayers with handgun nozzles, but these operations averaged only 7.4 acres in size.

Herbicide Use

Information regarding 1981 herbicide use is presented in Table 2. The predominant single herbicide used was atrazine. Alchlor was used on 32 per cent of combined processing and fresh market acreage, mostly in combination with atrazine to provide broad spectrum weed control. 2,4,-D was the second most popular herbicide in processing production but was used on only 4 per cent of the surveyed fresh market acreage. Regional differences in herbicide use may be due to crop rotation practices among fresh market growers who typically grow a variety of vegetable crops and who are concerned with herbicide residual carryover to the following planting season.

Seed Treatments and Soil Insecticides

Sweet corn is routinely treated to suppress seed rot pathogens and attack by seed maggots. Seed may be treated by the production company, by the grower, or a grower may make a supplemental seed treatment for a specific problem. The most common seed treatments were combinations of captan or thiram fungicide, and diazinon or chlorpyrifos (Lorsban®) insecticide. At least 90 per cent of all sweet corn seed was treated with

one of these combinations. About 20 per cent of the fresh market sweet corn growers surveyed made supplemental seed treatments with methiocarb (Mesuro®) to repel birds that pull newly sprouted plants.

Soil insecticide may be applied at the time of planting to control such pests as wireworms, flea beetles, and cutworms, or soil treatments may be applied as alternatives to seed treatments for control of seed maggots. About 10 per cent of the sweet corn acreage surveyed was treated with the granular soil insecticide terbufos (Counter®), and the extent of treatment was twice as great as on processing acreage. The recent registration (1982) of granular carbofuran (Furadan®) will ultimately increase "planting time" usage, particularly in east New York where bacterial wilt, *Erwinia stewartii* (E. F. Smith Dye), is a sporadic problem during seasons that follow moderate winters. These conditions allow good survival of

the flea beetle vector, *Chaetocnemea pulicaria* Melsheimer.

Foliar Insecticides

A summary of foliar insecticide use on the combined fresh market and processing sweet corn crop is presented in Table 4. On the basis of acre-treatments, methomyl was the most commonly used insecticide followed by EPN and m-parathion. However, when pounds of active insecticide per application are considered, more pounds of m-parathion were applied than any other insecticide. Since Penncap-M® and m-parathion have the same active ingredient, m-parathion was utilized significantly more than any other insect toxicant if statistics on these two materials are combined. It should be noted that for a given treated acreage or production block receiving multiple applications, more than one insecticide may be employed. Although tank mixtures of herbicides are common for weed control, insecticides are primarily used alone.

There were marked differences

Table 4. Survey of foliar insecticide use on New York produced sweet corn, 1981.

Insecticide	Acres treated	Acre-treatments ^a	Pounds active insecticide	
			Per application	Total
carbaryl	4,653	14,738	1.3	19,159
EPN	14,732	28,460	0.5	14,230
methomyl	15,220	45,173	0.45	20,328
m-parathion	7,535	22,974	1.0	22,974
Penncap-M ^{Rb}	12,742	21,175	0.6	12,705
Others	633	1,131	0.7	792
None	4,520	-	-	-
Total		133,651		90,188

^aAcres treated multiplied by no. of applications. Average number of applications for fresh market and processing combined can be determined by division.

^bEncapsulated m-parathion.

in foliar insecticide use relative to geographical location. The influence of location (Fig. 1) as determined by subsamples of survey respondents representing three New York regions is illustrated in Table 5. In general, insect pressure decreased in a northwestward progression from Long Island. Evidence is given by the decrease in number and frequency of applications, and regional differences in utilization of particular insecticides. Three foliar feeding insect species require control measures in New York: the corn earworm, *Heliothis zea* (Boddie); fall armyworm *Spodoptera frugiperda* (J. E. Smith); and European corn borer, *Ostrinia nubilalis* (Hubner). The European corn borer (ECB) first brood is the primary pest during early season on Long Island and in the Hudson Valley, but all three species are present later in the season. This necessitates a strong reliance on the broad spectrum activity of methomyl. In the capitol district (Albany and environs), the species complex fluctuates, but typically, pests in order of importance are ECB and fall armyworm (FAW). Generally, ECB second brood is the single important pest in the western region. Consequently, the more specific insecticides carbaryl and Penncap-M are

used more than methomyl.

Statewide insecticide use trends were also influenced by marketing objectives. Producers for fresh market, whether as suppliers of direct marketing operations or as shippers, strive to produce a commodity that is virtually free of insect contamination and generally treat on an "as needed" basis. The insecticide selected and the frequency of treatment is often dictated by the number of insect species present—the presence of two or three species necessitates shorter treatment intervals with broad spectrum insecticides.

Methomyl and m-parathion were the most prevalent insecticides in the fresh market industry, but they were used little or not at all in processing sweet corn production (Table 6). Fresh market producers accounted for 88 per cent of the methomyl and 100 per cent of the m-parathion acre-treatments reported by all respondents.

Insecticide use on processing sweet corn is notably different than on the fresh market crop. Although the tolerance for insect damage is higher due to "clean up" capabilities at the processing plant, some specialized products such as the

"whole ear cello pack" must be essentially free of certain kinds of insect damage, much to the same degree as fresh market sweet corn. Presently, two processors put a significant percentage of their crop into this particular product. Packers must insure that their products are associated with high quality, while concurrently minimizing production costs as governed by generally fixed budgets for pest control. As a result, they are often more concerned about the cost of materials than are fresh market producers. Additionally, the livestock grazing/feeding restrictions of a given material are a key consideration in insecticide selection, as processing wastes are often fed to livestock.

EPN was by far the most important insecticide used in processing sweet corn pest control programs in New York, and practically the least important for producing the fresh market crop (Table 6). Packers accounted for 88 per cent of the EPN acre-treatments reported by all respondents. In addition to its high efficacy against ECB, EPN is favorable from an economic standpoint as illustrated by the following data on page 6:

Table 5. Regional variation in foliar insecticide use for fresh market sweet corn production within New York, 1981.

Regional ^a subsample	Subsample acreage	Subsample acre-treatments ^b					Treatment ^c interval
		carbaryl	Penncap-M ^R	methomyl	m-parathion	total	
Long Island	179	0	0	1123	139	1262	4.7
Capitol district	182	237	0	513	261	1011	6.2
Lake Erie region	181	305	398	118	111	932	9.0

^aTen growers from each region.

^bAcres treated multiplied by no. of applications.

^cAverage no. days between applications.

	\$ cost per lb ⁶ active insecticide	\bar{x} lb active insecticide ⁷ per application	\$ cost per application
methomyl	15.08	0.45	6.79
carbaryl	3.19	1.3	4.15
PennCap-M	7.82	0.6	4.69
EPN	5.40	0.5	2.70
m-parathion	2.94	1.0	2.94

Both major segments of the sweet corn industry utilize insect monitoring programs to minimize foliar insecticide usage. Pest management scouts are employed by many fresh market producers with large acreages, and all fresh market producers are aided by established action thresholds for 1st brood ECB and for FAW (New York State Pesticide Recommendations, 1983). All three sweet corn processors in New York maintain active scouting programs to monitor pest populations, and initiate treatments when observations reveal about 1 ECB egg mass/40 plants examined.

SUMMARY

Results of this survey have demonstrated that pesticide use on the New York sweet corn crop often

differs greatly among regions and between the two major segments of this industry, i.e., fresh market or processing. Based on the surveyed acreage, a number of patterns are evident:

1. Atrazine and atrazine +alachlor were the most widely used herbicide treatments in 1981. Virtually all sweet corn acreage was treated with herbicides. Regional differences in herbicide use may be attributed to the crop rotation practices of many fresh market producers in which they must minimize harmful herbicide carryover.

2. Except as seed treatments, no respondents reported fungicide use on sweet corn. It is conceded however, that negligible amounts of maneb, mancozeb, or chlorothalonil fungicides may have been applied to control sporadic outbreaks of common maize rust.

3. Soil insecticides were applied to about 10 per cent of the sweet corn acreage. Approximately twice as many fresh market producers applied soil treatments as did processing producers.

4. Aerial application services were employed for foliar insecticide treatments to about 60 per cent of the sweet corn acreage. The entire processing crop was treated by aerial application. High clearance boom sprayers were the most widely used type of equipment in production of the fresh market crop.

5. Foliar insecticide acre-treatments and treatment intervals on fresh market sweet corn decreased in a northwestward progression from Long Island to the Lake Erie region. This is indicative of varying insect infestation pressures and species complex.

6. Methomyl and m-parathion were the most commonly used foliar insecticides on fresh market sweet corn while EPN was the most commonly used in processing.

Table 6. Survey of foliar insecticide use in New York fresh market and processing sweet corn production, 1981.

Insecticide	Fresh market				Processing			% of total acre-treat.
	# growers using	Acres treated	Avg. no. appl.	Acre treatments ^a	Acres treated	Avg. no. appl.	Acre treatments ^a	
carbaryl	30	4,637	3.2	14,691	15.7	3.0	47	11
EPN	3	1,287	2.7	3,526	13,445	1.9	24,934	21
methomyl	39	10,500	3.8	39,664	4,720	1.2	5,509	34
m-parathion	23	7,535	3.0	22,974	0	0	0	17
PennCap-M ^{Rb}	12	3,691	3.3	12,062	9,051	1.0	9,113	16
Others	5	591	1.8	1,089	42	1.0	42	1
None	28	3,691	-	-	901	-	-	
Total				94,006			39,645	

^aAcres treated multiplied by number of applications.

^bEncapsulated m-parathion.