

New England Pest Management Network

Tomato Pest Management Tactics Survey Results Summary

Introduction:

In October 2002, 1197 surveys were sent Extension vegetable grower mailing lists acquired from each of the six New England states. The number of surveys sent per state was: Connecticut–60, Maine–197, Massachusetts–439, New Hampshire–422, Rhode Island–56, Vermont–23.

Of the 1197 surveys distributed, 357 (30%) were returned. Of these, 253 of the respondents were not growing tomatoes. There were 104 valid responses from respondents producing field or greenhouse tomatoes, or both. The survey was sent in a single mailing with no preparatory or follow-up mailings to increase response rate. The Dillman (Dillman 2000) method will be used in future surveys to increase response rate.

Only 29% (104/357) of the returned surveys were tomato growers. The low accuracy of the mailing lists is attributed to the fact that the lists used were for newsletters targeted at general vegetable production, not lists of tomato growers.

Of the 104 valid responses:
90 (87%) growers were producing field-grown tomatoes,
49 (47%) were producing greenhouse tomatoes,
36 (35%) were producing both field-grown and greenhouse tomatoes,
54 (52%) were producing field-grown but not greenhouse tomatoes, and
13 (13%) were producing greenhouse but not field-grown tomatoes.

Acreage and Production:

The 90 field tomato growers reported a total of 128 acres, for an average of 1.4 acres per grower.

Greenhouse tomato growers reported at total of 260,458 square feet, for an average of 5542 square feet per grower.

Only 31 growers responded to a question on production per acre of field tomatoes, and answers ranged from 60 to 4800, indicating that the question was misunderstood and making it impossible to calculate a meaningful sum and average. The same problem occurred with the per square foot production estimates for greenhouse tomatoes, for which 23 responses were received.

Responses from field and greenhouse tomato growers are combined in the following results summary.

Marketing:

By number of growers:

87% of growers sold tomatoes as fresh market pre-picked retail, 45% sold tomatoes as fresh market wholesale, 5% of growers sold tomatoes for processing, and 7% for other markets.

By portion of field-grown crop:

With responses weighted according to the number of acres they represented, and assuming equal production for acre, the percent of field-grown tomatoes sold through various channels was:

- Fresh pre-picked retail - 47%
- Fresh wholesale - 43%
- Processing - 3%
- Other sales - 7%

By portion of greenhouse crop:

With responses weighted according to the number of square footage they represented, and assuming equal production per square foot, the percent of greenhouse-grown tomatoes sold through various channels was:

- Fresh pre-picked retail - 70%
- Fresh wholesale - 29%
- Processing and Other sales - <1%

Horticultural Practices:

95 growers circled items on a list of horticultural practices.

Of those 95 respondents:

- 17% used fresh manure
- 42% used composted manure
- 78% used drip irrigation
- 26% used overhead irrigation
- 72% used staking.

Other horticultural practices reported were hay mulch, black plastic mulch, strings, raised beds, cages, bag culture, weaves, and trellis.

97 growers responded to a question about leaf analysis.

14% of those growers used leaf analysis to identify fertilizer needs. If we assume that growers who skipped that question did not use leaf analysis, then the percent of growers using leaf analysis drops to 13%.

Of the grower who did use leaf analysis, 2 (2%) did it more than once a year, 9 (9%) did it once a year, 0 did it every two years, and 1 did it every 3 years.

57 field tomato growers reported an average of 3928 plants per acre.

The question on planting density of greenhouse tomatoes was poorly worded which interfered with responses. In general however, growers reported 3 to 5 square feet per plant.

Pest Management:

75 growers answered a question about number of sprays for different types of pests.

68 growers reported an average of 6.4 sprays made for diseases each year.

62 growers reported an average of 3.4 sprays made for insects each year.

38 growers reported an average of 1.5 sprays made for weeds each year.

11 growers reported an average of 2.5 sprays made for mites each year.

If the growers who reported at least one type of spray, but did not provide a value for other types are assumed to have implied zero for those types of sprays, then the average number of sprays per year becomes:

5.8 disease sprays

2.8 insect sprays

0.8 weed sprays

0.4 mite sprays

Pest importance rankings

Categories - Routine, annual control; Occasional pest; Rarely a problem; Never a problem.

The table below shows the percentage of responses in each category. For pests having a lower number of responses, most of the 'missing' responses would presumably be in the 'Never' and 'Rarely' categories. With those votes not available, the percentages shown may be biased to overestimating the frequency of pests for which fewer responses were received. Future surveys have been designed to reduce uneven number of responses across pests.

To calculate average rating, each "Routine" is counted as 100 points, "Occasionally" as 67, "Rarely" as 33, and "Never a problem" as 0. The total number of points is divided by the number of responses. Thus, the most frequent pests have the highest average. Compared to the category percentages, the average rating should be less affected by 'missing' responses because presumably most of them would have been in the Never column with no effect on the point total, and those in the 'Rarely' column would have had only a minor effect on the point total.

Pests with an average rating of 50 or greater are highlighted. It is important to note however, that the importance of a pest to an individual grower can be site specific and does not depend on how highly it is rated by growers overall.

Pest (number of responses in parentheses)	% Routine	% Occasional	% Rarely	% Never	Average Rating (Rank)
Weeds (82)	77	9	7	7	85 (1)
Early Blight (89)	69	17	6	9	82 (2)
Late Blight (90)	43	26	16	16	66 (3)
Septoria Leafspot (77)	30	42	16	13	63 (4)
Tomato Hornworm (91)	31	34	19	16	60 (5)
Fruit Rot (79)	34	27	24	15	60 (5)
Anthracnose (78)	31	31	21	18	58 (6)
Col. Potato Beetle (84)	29	30	24	18	56 (7)
Blossom End Rot (87)	21	39	29	11	56 (7)
Powdery Mildew (78)	21	31	36	13	53 (8)
Sclerotinia Blight (69)	14	36	33	16	50 (9)
Blotchy Ripening (77)	6	42	38	14	47
Flea Beetle (82)	21	24	21	34	44
Aphids (82)	17	26	28	29	43
Cutworms (87)	10	32	32	25	43
Bacterial Canker (73)	11	30	27	32	40
Fusarium, Verticillium Wilt (77)	8	30	34	29	39
White Fly (77)	12	25	25	39	36
Tomato Fruitworm (78)	6	23	28	42	31
Twospotted Spider Mite (75)	11	16	29	44	31
Cabbage Looper (79)	9	19	25	47	30
Seed Decay - Damping off (78)	3	18	38	41	27
Cucumber Mosaic Virus (73)	7	12	36	45	27
Vertebrates (27)	7	15	30	48	27
Leafminers (77)	6	16	26	52	26
Tobacco Mosaic Virus (71)	1	17	38	44	25
Other insects (6) - stinkbugs, crickets, corn earworm, thrips, corn borer, squash beetle, striped cucumber beetle					
Other diseases (12) – bacterial speck (2), grey mold, phytophthora, leaf mold, rhizoctonia/pythium complex					

Pesticide selection

Pesticides used by 10% or more of respondents are highlighted in yellow.

To calculate average efficacy rating – each “Excellent” counted as 100, “Good” as 50, “Poor” as 0. No average is shown if there are fewer than ten ratings.

Insect and Mite Pests

Cabbage looper, Tomato fruitworm, Tomato hornworm: 52% of respondents treated for one or more of these pests in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
Bacillus thuringiensis kurstaki	16	10	3	1	82
methomyl (Lannate)	11	8	2	0	90
Bacillus thuringiensis aizawai	11	6	3	0	-
endosulfan (Thiodan 50WP)	10	4	3	0	-
esfenvalerate (Asana XL)	9	6	2	0	-
permethrin (Ambush)	6	4	1	0	-
spinosad (SpinTor 2SC)	2	1	0	0	-
azinphosmethyl (Guthion)	2	2	0	0	-
Lamba-cyhalothrin (Karate)	1	1	0	0	-
tebufenozide (Confirm 2F)	0	-	-	-	-
Nuclear polyhedrosis virus	0	-	-	-	-

Aphids: 35% of respondents treated for aphids in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
endosulfan (Thiodan 50WP)	13	8	4	0	83
methomyl (Lannate)	12	8	3	0	86
imidacloprid (Provado 1.6F)	10	6	3	0	-
insecticidal soap (M-Pede)	6	2	4	1	-
diazinon (D-Z-N)	4	1	2	0	-

Colorado potato beetle: 32% of respondents treated for CPB in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
Bacillus thuringiensis tenebrionis	16	4	4	0	-
endosulfan (Thiodan50WP)	15	0	5	2	-
imidacloprid (Admire 2F)	8	3	0	0	-
esfenvalerate(Asana*XL)	5	1	1	0	-
spinosad (SpinTor 2SC)	1	0	0	0	-
azinphosmethyl (Guthion)	1	0	1	0	-
abamectin (Agri-Mek 0.15)	0	-	-	-	-
azadirachtin (Neemix 4.5)	0	-	-	-	-

Flea beetle: 28% of respondents treated for flea beetle in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
endosulfan (Thiodan50WP)	18	6	7	0	73
Carbaryl (Sevin XLR+)	13	3	4	0	-
spinosad (SpinTor 2SC)	1	0	0	0	-
esfenvalerate(Asana*XL)	1	0	0	0	-
azinphosmethyl (Guthion)	1	0	0	0	-
cyromazine (Trigard)	0	-	-	-	-

Whitefly: 27% of respondents treated for whitefly in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
endosulfan (Thiodan 50WP)	8	2	1	1	-
imidacloprid (Provado 1.6F)	6	0	1	1	
esfenvalerate(Asana*XL)	5	1	2	0	
Lamba-cyhalothrin (Karate)	0	-	-	-	

Cutworms: 15% of respondents treated for cutworms in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
Carbaryl (Sevin XLR+)	11	5	1	1	-
esfenvalerate(Asana*XL)	1	0	0	0	-

Twospotted spider mite: 14% of respondents treated for TSSM in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
abamectin (Agri-Mek)	4	1	1	0	-
Dicofol (Kelthane MF)	4	1	2	0	-

Leafminers: 9% of respondents treated for leafminers in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
diazinon (D-Z-N*50 WP)	4	-	1	-	-
abamectin (Agri-Mek)	1	-	-	-	-
esfenvalerate (Asana*XL)	1	-	-	-	-
azadirachtin (Neemix 4.5)	0	-	-	-	-
dimethoate (Dimethoate 4EC)	0	-	-	-	-

Diseases (all diseases were combined for this question)

74% of respondents treated for diseases in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
chlorothalonil (Bravo Ultrex 82WDG)	62	12	21	1	66
maneb / mancozeb (Penncozeb, Manzate, Dithane)	45	12	11	3	67
azoxystrobin (Quadris)	32	10	7	0	79
cupric hydroxide (Kocide 4.5LF)	30	7	7	1	70
benomyl (Benlate 50SP)	14	0	5	1	-
mefenoxam plus manzate (Ridomil Gold MZ)	11	4	3	0	-
streptomycin (AgriMycin 17, Agri-Strep)	6	3	0	0	-

Cultural disease management

47 growers entered types of cultural practices for disease management.

As a group, cultural disease management methods were given an average efficacy rating of **66%**. (Same scale as used for pesticides)

Of the 47 respondents:

30% mentioned rotation

26% mentioned plastic or other mulch

23% mentioned spacing and staking for ventilation

15% mentioned drip irrigation

9% mentioned not handling crop when wet

6% mentioned variety selection

6% mentioned sanitation and culling

Weeds

Stale Seedbed: 32% of respondents used a stale seedbed strategy for weed management in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
glyphosate (Roundup)	20	11	1	0	96
paraquat (Gramoxone Extra)	7	4	0	0	-
pelargonic acid (Scythe 4.2)	1	1	0	0	-

Pre-emergence herbicides: 34% of respondents used preemergence herbicide in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
metribuzin (Sencor 75DF)	19	9	4	0	85
trifluralin (Treflan 4E)	9	1	4	1	
napropanide (Devrinol)	6	1	2	0	-

Postemergence herbicides: 36% of respondents used postemergence herbicide in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
metribuzin (Sencor75DF)	15	8	2	1	82
paraquat (Gramoxone Extra)	10	6	1	0	-
sethoxydim (Poast 1.53)	7	3	1	1	-
pelargonic acid (Scythe 4.2)	1	0	1	0	-
rimsulfuron (Shadeout 25DG)	0	-	-	-	-

Nonchemical weed management tactics: 91% of respondents used one or more nonchemical weed management tactics in 2001.

Pesticide	Percent growers reporting use	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
Cultivation	48	12	23	1	65
Mulching	35	20	9	0	84
Mowing	16	2	9	1	54

Vertebrate Pests

Pest and Techniques	Percent growers reporting as pest	Number of Excellent ratings	Number of Good ratings	Number of Poor ratings	Average Efficacy rating
Birds	35%				
Visual – balloons, tape		1	9	1	50
Sound – bird calls, shooting		5	4	4	50
Exclusion – netting, row cover, chicken wire		5	-	-	
Deer	32%				
Electric fence		5	5	2	63
8 foot wire fence		2	-	-	-
Fence – type not specified		1	3	-	-
Hunting		3	3	1	-
Repellants – hair, blood meal, spray, soap, urine		-	5	1	-
Harassment – dog, 4-wheeler, walking, noise maker		-	2	2	-
Voles or Mice combined	25%				
Voles individually	12%				
Mice individually	20%				
Poison bait		2	9	-	59
Traps		2	6	1	-
Rat terrier		1	1	-	-
Woodchuck or raccoon	16%				

Pest management decision making

Who collects pest monitoring information?

Weather factor (number of responses)	% Routine	% Occasional	% Rarely	% Never	Average Rating % (Rank)
Rain forecast (87)	58	16	4	9	81 (1)
Rain accumulation (79)	43	16	7	13	71 (2)
Temperature (84)	32	35	9	8	70 (3)
Humidity (79)	26	30	12	11	63 (4)
Leaf wetness hours (78)	26	27	11	14	61 (5)
Wind speed forecast (79)	28	23	11	17	60 (6)
Wind direction forecast (79)	16	19	25	19	47

Weather influence on pest management decisions

The question was: “How frequently do the following weather factors influence your management decisions, either directly or by their influence on predictive models?”

Note that these responses are from field and greenhouse growers combined, including 13 growers who only grew greenhouse tomatoes.

To calculate average rating, “Routine” is counted as 100%, “Occasionally” as 67%, “Rarely” as 33%, and “Never” as 0%. Weather factors rated 50% or greater are highlighted.

Weather factor (number of responses)	% Routine	% Occasional	% Rarely	% Never	Average Rating % (Rank)
Rain forecast (87)	58	16	4	9	81 (1)
Rain accumulation (79)	43	16	7	13	71 (2)
Temperature (84)	32	35	9	8	70 (3)
Humidity (79)	26	30	12	11	63 (4)
Leaf wetness hours (78)	26	27	11	14	61 (5)
Wind speed forecast (79)	28	23	11	17	60 (6)
Wind direction forecast (79)	16	19	25	19	47

Influences on pesticide selection

The question was: “What factors do you consider when choosing pesticides for use on your farm?” Possible choices as worded in the survey are shown in the table below. For the average rating, each “Very important” response was counted as 100 points, “Somewhat important” as 50, and “Not Important” as 0.

Pesticide selection factor (number of responses)	% Very important	% Somewhat important	% Not important	Average Rating % (Rank)
Effectiveness (how well it does the job) (89)	83	4	2	96 (1)
Phytotoxicity (potential for injury to crop)	76	11	2	92 (2)
Toxicity of materials available (to self, family, employees) (92)	71	18	3	87 (3)
Potential environmental impacts (93)	68	22	3	85 (4)
Impact on non-target critters including beneficial insects and mites (93)	60	30	3	81 (5)
Cost per acre/unit (91)	37	41	13	63 (6)
Safety of packaging (such as water soluble bags, etc.) (88)	34	38	16	60 (7)