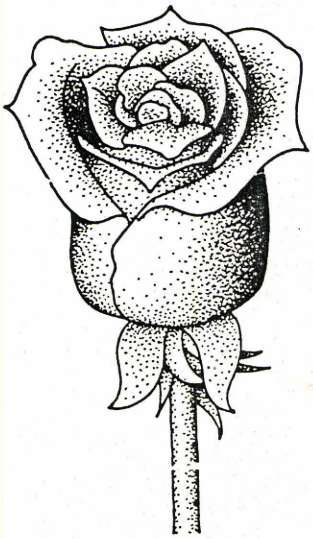
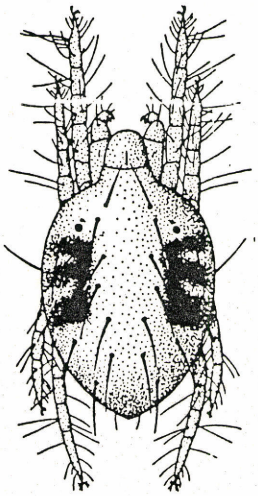
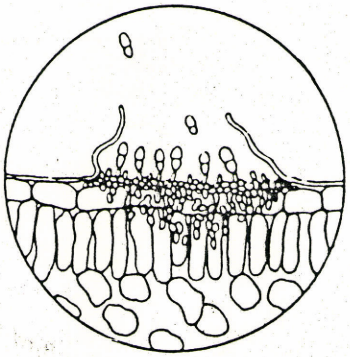
GREENHOUSE ROSES

A SURVEY OF PEST AND DISEASE CONTROL

N. A. MARTIN







ENTOMOLOGY DIVISION

Glasshouse Roses. A Survey of Pest and Disease Control

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SUMMARY

A survey of thirteen rose growers was conducted in order to discover the current practices and costs of pest and disease control. Each grower or manager was interviewed.

The survey provided information on a) the market and therefore the standard of pest control required; b) the physical environment of the crop; c) the lay out of the rose beds which can affect the ease with which the crop can be sprayed; d) the factors affecting the cost of spraying which were then used to estimate the annual costs for each property; e) an estimate by each grower of the success in controlling pests; f) sources of information on pest and disease control.

All growers were able to meet the quarantine standards of their main markets through a combination of pest control in the greenhouse and grading after harvest. However, there was considerable variation in the spray practices of growers, and this included the time taken to spray, the quantity of spray used, the rate of delivery of the spray and the frequency of application of fungicides, insecticides and miticides. This is reflected in the 10 fold difference in spray costs between different properties. Effective pest or disease control was not related to the amount of money spent or the frequency of spraying. There is considerable scope for improving spray application technique and for the more economical use of pesticides.

Data from the survey will be used to design next seasons trials with the two-spotted mite predator, Phytoseiulus persimilis. If these trials are successful this could eliminate miticide spraying.

July 1987

INTRODUCTION

The Horticulture Group of Entomology Division of DSIR has been studying pest control of greenhouse roses with the aim of developing an Integrated Pest Managment (IPM) system for the crop. The objective of IPM is to obtain the necessary standard of pest control with the minimum use of pesticides and to avoid the problems of pesticide resistance.

A survey of thirteen rose growers was conducted in order to discover the current practices and costs of pest and disease control. Each grower or manager was interviewed. The interview was based on a questionnaire (Appendix A). The data have been summarised so that details about a property remain confidential. The time taken to conduct the interviews and therefore the cost of telephoning, precluded inclusion of growers outside the Auckland area.

The survey provided information on a) the market and therefore the standard of pest control required; b) the physical environment of the crop; c) the lay out of the rose beds which can affect the ease with which the crop can be sprayed; d) the factors affecting the cost of spraying which were then used to estimate the annual costs for each property; e) an estimate by each grower of the success in controlling pests; f) sources of information on pest and disease control.

RESULTS OF THE SURVEY

Markets and Standard of Pest Control

The main markets for greenhouse roses were Canada and the local market (Table 1). These require less stringent pest control than Australia. The local market as a minor market is probably larger than that shown in Table

1 and reflects the way the question was asked. Growers achieved the quarantine standards for the Canadian Market by a combination of pest control in the greenhouse and grading in the pack house. No grower reported any rejections from New Zealand MAF or Canadian inspections.

Physical Environment

The number, size, and construction of the houses varied considerably (Tables 2-6). The ability to heat and ventilate adequately can greatly assist disease control.

Lay out of Rose Beds

This can affect the ease and effectiveness of spraying. If paths are too narrow or very long (Table 7) it is more difficult to handle spray lines and equipment. Any distraction while spraying can cause less thorough application and areas can be missed. Wide rose beds also mean that it is more difficult to get enough pesticide into the centre.

Spraying

All growers used high volume spray equipment, though one grower also used a fogger for applying insecticides. Some growers used the same quantity of spray and/or method of application for control of diseases, insects and mites (Table 8) while most growers combined two and sometimes the three types of pesticide in one application (Table 12). In the summer, sprays were applied at all times of day except early afternoon. After 5 pm was the most favoured time (Table 10).

Some spray equipment had not been calibrated for a long time (Table 9) and may not have been performing as expected. There was considerable

variation in the volume of spray, time to spray, rate of delivery and number of applications per year of fungicides, insecticides and miticides (Tables 13-16). Most growers used less spray after pruning though one grower increased amount of spray to above their normal quantity until flower buds appeared.

The application costs of pesticides for each property (Tables 18-20) were calculated based on a standard wage cost of $10 per hour and the cost of one of the commonly used and effective pesticides listed in Table 17. The cost of preparation and cleaning up were assumed to be the same irrespective of the size of property and these costs are shown separately (Tables 18-20). On average, growers are spending more on disease and mite control than insect control. However the most striking feature is the large variation in costs between properties. There is no apparent association between high expenditure on, for example miticides, and successful mite control. However there is a suggestion that high cost of a single application was connected with low annual cost and successful mite control. In Table 20, the two growers with the highest costs for a single application of miticide, $69.94 and $56.94 per 1000 square metres have mature crops and are not using Phytoseiulus. Both these growers only spray 4 or 5 times a year and yet get very satisfactory control of two-spotted mite. On the other hand there are several growers whose cost per spray is only $30 but who are spending over $1000 per 1000 square metre per year and still not achieving satisfactory mite control.

Two-spotted mite was the one pest mentioned by all growers. It was the pest that most growers found difficult to control and still caused them crop loss (Table 21). There are two solutions to the two-spotted mite problem. One is to improve spray technique and the second is to use a

predator to hunt out the pests in those places that the sprays are not reaching. The results of this survey show that some growers can obtain effective mite control. It should be possible to find out how they do it and what other growers are doing wrong. If there is sufficient interest then a field day could be organised to demonstrate spray methods and how to assess their effectiveness.

An effective mite predator could eliminate the need to use miticides. Preliminary studies with a predatory mite, Phytoseiulus persimilis, are showing promising results for the control of two-spotted mite on greenhouse roses. The initial hope was that the predator would be released into the crop once each season but our research has shown that it will have to be released throughout the greenhouse several times a year. The data from this survey will provide a guideline as to the annual cost of the predator that would be economic. This will then allow us to work out the number of predators to be used per release and the number of releases per year.

Sources of Information

A high proportion of the growers received information direct from Holland (Table 22) and almost half the growers trained in Holland (Table 23). The New Zealand growing environment, in particular how it effects pest and disease control, differs in some important respects from Holland. There appears to be a need for a local guide to pest and disease control.

During this survey growers made comments about pesticides (Appendix C) and about the susceptibility or resistance of different cultivars to pests and diseases (Appendix B). These comments need to be treated as guidelines only.

CONCLUSION

This survey has provided a useful picture of the economics of pest and disease control in Auckland. It revealed the tremendous variation both in the practice of growers and their costs of pest and disease control. It has also revealed a need for guidance on how to apply the sprays effectively and when and how often they should be used. The survey has also provided the basis for planning further experiments with the predatory mite, Phytoseiulus, and the development of an Integrated Pest Management system for greenhouse roses.

Acknowledgements

Thanks are due to the 13 growers for their time and the helpful way they answered all my questions.

Table 1. Market for the flowers

country	number of growers supplying each market: main market	minor market
Canada	11	0
Australia	0	2
Hongkong	0	3
Local	2	2

Table 2. Area of greenhouse roses on each property

	(square metres) 1-1000	1001-2000	2001-3000	3001-4000	4001-5000	5001-6000	9001-10000
number of growers	2	5	1	0	1	3	1

Table 3. Number of greenhouses on each property

	1	2	3	4	5	6	7	8	9
number of growers	4	3	2	2	0	0	1	0	1

Table 4. Type of constuction

	glass	rigid plastic	plastic sheeting
number of properties	8	1	4
number of houses	32	3	7

Table 5. Venting

	butterfly vents	simple ridge vents	forced air	other
number of properties	5	5	2	2
number of houses	19	18	2	3

Table 6. Heating

	heating	no heating
number of properties	9	4
number of houses	32	10

LAY OUT OF ROSE BEDS

Table 7. Lay out of rose beds

	width of beds (cm)		
	90-99	100-109	110-120
number of properties	6	5	2

	width of paths (cm)				
	50-59	60-69	70-79	80-89	90-100
number of properties	4	3	4	1	1

	length of continuous bed (metres) (length of house or to central passage way)						
	20-29	30-39	40-49	50-59	60-69	70-79	80-89
number of properties	3	3	3	3	0	0	1

METHODS OF SPRAYING

Table 8. Method of spraying for diseases insects and mites

	amount of spray		method of application	
	same	different	same	different
number of properties	7	6	6	7

SPRAY APPLICATION PARAMETERS

Table 13. Volume of spray used per 1000 square metres by each grower

litres per 1000 m2	fungicide	insecticde	miticide
pulse fogger	0	1	0
0-99	1	1	0
100-149	1	2	2
150-199	4	5	4
200-299	3	2	2
300-499	3	1	4
500-600	1	1	0
800-900	0	0	1

Table 14. Time taken to spray 1000 square metres by each grower

minutes per 1000 m2	fungicde	insecticide	miticide
3-4 (pulse fogger)	0	1	0
15	0	1	0
25-35	5	4	2
40-50	2	2	4
55-70	4	4	5
90-120	1	1	1
160	0	0	1

Table 15. Volume of spray delivered per minute by each grower

litres per minute	fungicide	insecticide	miticide
1.5-2.0	0	1	0
2.1-3.0	3	2	3
3.1-5.0	4	5	4
5.1-7.0	3	3	3
8.1-9.0	1	0	1
13 - 18	1	1	1

Table 16. Number of times a year each type of pesticide was used by each grower

number of times per year	fungicide	insecticide	miticide
3-10	1	2	4
11-20	2	2	2
26	1	3	0
36	4	3	3
45-50	1	1	1
52	4	2	3

Table 17. Cost of pesticides (at 31 march 1987) per 100 litres of spray and number of growers using each pesticide

fungicides	number of growers	cost ($) per 100 litres
Afugan	3	3.26
Bavistin	1	
Baycor	3	3.82
Bayleton	1	3.01
Benlate	8	3.10
Bravo	3	8.00-9.60
Calirus	1	11.41
Captan	4	2.18
Dithane (?)	2	
Dithane M45	2	1.44-1.92
Dithane Z78	1	3.00
Euparen	7	12.48-15.60
Maneb	1	2.88
Meltatox	2	
Nimrod	2	4.44-5.55
Ridomil	6	3.62
Ronilan	3	8.53
Rovral	3	8.32
Rubigan	6	1.81
Saprol	6	3.25
Topas	1	3.21
Topsin	2	2.60

insecticdes	number of groweres	cost per 100 litres
Ambush	1	3.74
Attack	4	3.09
Basudin	2	1.66
Carbaryl	1	2.89
Decis	5	5.30
Folidol	1	2.30
Imidan	1	2.33
Lannate	6	2.57
Malathion	1	2.28
Mavrik	2	3.00-6-00
Metasystox	1	2.48
Orthene	9	1.31
Phosdrin	3	2.97
Pirimor	2	1.31
Tameron	1	
Vapona	1	2.56
Vydate	1	6.48

miticides	number of growers	cost per 100 litres
Apollo	8	6.96
Kelthane	4	1.86
Neoron	7	7.90
Omite	2	5.19
Pentac	10	10.08
Peropal	1	4.16
Phosdrin	1	2.97
Plictran	9	4.79
Temik	1	
Torque	6	1.56
Vydate	1	6.48
Phytoseiulus	2	

APPLICATION COSTS ON EACH PROPERTY

Table 18. Fungicide application costs($) per 1000 square metres

wage cost per application *	fungicide cost per application #	costs per application +	cost per year +
5.20	6.02	11.64 +1.26	224 +20
7.20	12.48	19.68 +1.51	236 +18
25.76	37.27	63.03 +4.43	567 +40
7.20	12.48	19.68 +3.50	708 +126
5.60	14.56	20.16 +2.90	726 +105
4.64	20.38	25.02 +0.75	900 +27
4.80	13.89	18.69 +1.37	935 +68
9.60	29.12	38.72 +7.00	1162 +210
12.80	9.98	22.78 +4.30	1184 +223
16.80	16.64	33.44 +7.00	1739 +364
10.40	23.88	34.28 +1.26	1782 +65
10.40	26.87	37.27 +3.77	1938 +196
5.14	47.51	52.64 +5.00	2737 +260

*based on $10.00 per hour or 16 cents per minute

#based on $8.32 per 100 litres or 8.32 cents per litre

+fixed costs per application based on $7 (40 min) to fill spray tank and clean spray equipment.

Table 19. Insecticide application costs($) per 1000 square metres

wage cost per application *	insecticide cost per application #	costs per application +	cost per year +
			?(fogger)
7.20	1.97	9.17 +1.51	55 +9
5.20	0.95	6.15 +1.26	55 +11
2.40	1.31	3.71 +7.00	111 +210
5.14	7.48	12.61 +5.00	214 +85
8.64	2.36	11.00 +4.43	220 +89
5.60	2.29	7.89 +2.90	284 +105
7.20	1.97	9.17 +3.50	330 +126
4.80	2.42	7.22 +1.37	361 +68
10.40	3.76	14.16 +1.26	368 +33
12.80	1.57	14.37 +4.30	747 +223
10.40	4.23	14.63 +3.77	761 +196
16.80	2.62	19.42 +7.00	1010 +364

*based on $10.00 per hour or 16 cents per minute

#based on $1.31 per 100 litres or 1.31 cents per litre

+fixed costs per application based on $7 (40 min) to fill spray tank and clean spray equipment.

Table 20. Miticide application costs($) per 1000 square metres

wage cost per application *	miticide cost per application #	costs per application +	cost per year +
7.20	10.44	17.64 +151	53 + 5
12.80	8.35	21.15 +4.30	85 +17
25.76	31.18	56.94 +4.43	228 +18
4.80	11.62	16.42 +1.37	328 +27
10.29	59.65	69.94 +5.00	350 +25
6.94	7.54	14.48 +1.26	521 +45
7.04	25.54	32.58 +0.75	586 +13
7.20	10.44	17.64 +3.50	635 +126
5.60	12.18	17.78 +2.90	640 +105
10.40	19.98	30.38 +1.26	790 +33
16.80	13.92	30.72 +7.00	1597 +364
10.40	22.48	32.88 +3.77	1710 +196
9.60	24.36	33.96 +7	1766 +364

*based on $10.00 per hour or 16 cents per minute

#based on $6.96 per 100 litres or 6.96 cents per litre

+fixed costs per application based on $7 (40 min) to fill spray tank and clean spray equipment.

NB costs do not include wetters which may be required with some pesticides

Table 21. Ease of control and severity of pest problems

pest and number of growers naming pest	number of growers who classified each pest						
	easy to control		difficult to control		in between		
	no problem	problem	no problem	problem	no problem	problem	
two- spotted mite	13	4	0	2	4	1	2
aphids	10	10	0	0	0	0	0
caterpillars	10	8	1	0	1	0	0
thrips	4	3	0	0	0	1	0
whitefly	4	2	0	0	1	1	0
green vegetable bug	1	0	0	0	0	0	0

Table 22. Sources of information on pests and disease control

NZ Agrichemical Manual	2
Books from Holland	5
international and local magazines	3
NZ MAF	5
other growers	6
agents for pesticides	2
own experience	2
family in Holland	1
visits to Holland	1

Table 23. Education

Horticulture Diploma	2
training with flower grower in Holland	5
training with flower grower in NZ	2
high school	5
evening classes	1
University	2
Aalsmeer Technical school	1
B.Hort.Sci.(NZ)	1
correspondence courses	1
apprenticeship (horticultural)	1
apprenticeship (other)	1
technical college	1

APPENDIX A

The questionaire

Name of property.

Address.

Phone number.

Name of owner.

Name of interviewee.

Crop. Greenhouse roses.

Market for flowers.

Area in production.

Volume in Production.

Number of greenhouses with roses.

Type of greenhouses:

- Cladding (glass or plastic).
- Venting.
- Heating.

Lay out of rose beds in the greenhouse:

- Width of beds and passages.
- Length of beds.

Type of spray equipment used.

When was the sprayer last caliberated or nozzles last changed.

Do you spray in the same way for disease, insect and mite control.

- If not note any differences.

Size (area) of glasshouse used for answering questions on quantity of spray used.

Volume of spray when using miticides, insecticides, fungicides.

Time taken to spray when using miticides, insecticdes, fungicides.

Number of times per year use miticides, insecticides, fungicides.

Which types of pesticide are used together and how often.

Are there any changes in the way the crop is sprayed during the year.

Who does the spraying.

What time of day is spraying done.

Wage cost of spraying ($/hr).

What miticides, fungicides,and insecticides do you use.

What insect and mite pests do you have or are you trying to prevent infest your crop.

Which pests do you regard as easy or difficult to control.

Which pests do you regard as a problem.

Which pests caused loss of production this season.

Any rejection of export flowers this year by

a. N.Z. MAF inspecters.

b. NZ exporters.

c. Importers.

Any differences between cultivars in susceptibility to pests and diseases or in difficulty in controling pests and diseases.

Where do you get your information on pest and disease control.

What education have you had.

Do you use any additional methods of pest and disease control.

APPENDIX B

Notes on cultivars

These comments on cultivars by growers are the result of non-scientific observation and should be used with caution. They are provided as an exchange of information between growers and are not intended to provide any basis for recommendation as such.

Gabrielle
- very resistant to mildew
- easy to control mites and diseases
- downy mildew more difficult to control, mites easy to control
- downy mildew susceptible
- mites a problem on this cultivar
- resistant to mites

Samantha
- mite and whitefly were particuarly bad though this may have been due to position
- more susceptible to mites and diseases than Gabrielle
- powdery mildew starts on this cultivar
- powdery mildew more difficult to control
- rarely attacked by pests or disease

Ilona
- more difficult to contol mites and diseases than Gabrielle

Mercedes
- more difficult to contol mites and diseases than Gabrielle
- downy mildew susceptible

Veronica
- mites worst on this cultivar
- powdery mildew starts on this cultivar

- powdery mildew susceptible
- powdery mildew and mite suceptible

Goldie
- downy mildew starts on this cultivar
- sensitive to mildews

Sonia
- aphids first appear on this cultivar, susceptible to spring tip burn
- mite susceptible, slightly powdery mildew susceptible
- attracts biting insects

Caranbole
- black spot and mites a problem
- mite and powdery mildew susceptible

Darling
- mite susceptible

Bridal pink
- whitefly always a problem

APPENDIX C

Comments on pesticides

These survey results are provided as an exchange of information between growers and are not intended to provide any basis for recommendation as such. Comments expressed by growers in this survey are not necessarily endorsed by DSIR.

Afugan - can cause leaf burns

Appollo - used only after cutting back because of pink residue
- very effective
- phytotoxicity seen last summer

Attack - not so good

Benlate - no longer effective

Euparen - care needed when buds present especially in the winter
- use by itself because it can cause plant damage

Mavrik - gives good clean leaves

Neoron - effective and safe
- reported to slow bud burst
- phytotoxicity seen last summer

Orthene - the best insecticide, but can cause burns especially when mixed with afugan. Plant damage less when used late in day.

Plictran - burns leaves,need to be careful

- stopped using because of leaf burn
- hard on leaves
- do not use much because of damage to leaves

Ridomil - use in March before downy mildew shows then follow with euparen

Rubigan - effective on mildew

Torque - if mites are bad add a low concentration of phosdrin