Project title:	Managing ornamental plants sustainably (MOPS)
Project number:	CP 124
Work package title:	Assessment of the potential phytotoxic effects of several fungicides and insecticides on bedding and pot plants
Work package leader:	Dr G M McPherson MBPR (Hort)
Report:	Annual report, December 2015
Previous report:	None
Key staff:	Adam Ormerod – Trials Manager Amanda Hewick – Technical support
Location of work:	Stockbridge Technology Centre
Date work commenced:	7th July 2015
Date work completed (or expected completion date):	21st December 2015

The results and conclusions in this report are based on an investigation conducted over a one-year period. The conditions under which the experiments were carried out and the results have been reported in detail and with accuracy. However, because of the biological nature of the work it must be borne in mind that different circumstances and conditions could produce different results. Therefore, care must be taken with interpretation of the results, especially if they are used as the basis for commercial product recommendations.

AUTHENTICATION

We declare that this work was done under our supervision according to the procedures described herein and that the report represents a true and accurate record of the results obtained.

[Name]	Adam Ormerod
[Position]	Project Leader
[Organisation]	STCRF

Signature ..... Date .....

Report authorised by:

[Name]	Dr Martin McPherson
[Position]	Science Director
[Organisation]	STCRF

Signature ..... Date .....

CONTENTS

GROWERS SUMMARY

Headline

- Several novel fungicides and insecticides with excellent efficacy in a range of ornamental crops were short-listed for crop safety evaluation on a range of bedding and pot plant species and, in most cases, found to be crop safe.

Background and expected deliverables

The SCEPTRE programme has been very successful in identifying and evaluating novel conventional chemical fungicides and biopesticide products for pest disease and weed control in edible crops and offers considerable scope to fill gaps in the crop protection armoury as active substances and products are withdrawn. Whilst this is of some relevance through extrapolation to non-edible crops, including ornamentals, no work was conducted specifically on ornamentals as part of the SCEPTRE programme. The MOPS programme was established in response to growers concerns about potential losses of products in the ornamentals sector and in this regard is extremely important to the industry and sits alongside the minor use programme to ensure effective crop protection products remain available in the future.

The replicated trials outlined below expect to deliver useful information on the potential phytotoxicity of a range of novel crop protection products. Whilst the studies conducted at STC in year 1 of the project primarily focused on assessing the efficacy of products against powdery mildew in Aster and rust in Bellis these only made note of any incidental phytotoxicity. This year a trial was dedicated to assessing potential phytotoxicity on a number of bedding and pot plant species. It is particularly important in the ornamental sector to measure any phytotoxic effects of plant protection products which may be applied to a crop as any adverse effects on the foliage, flowers or vigour of the crop may have a profound impact upon their ultimate marketability. The actual approval of specific products remains the responsibility of the manufacturers and/or marketing agents (on-label approvals), the AHDB team (extrapolated approvals for minor use or EAMU) and the pesticide regulators (CRD) who ultimately authorize products for use in the UK. Unfortunately, in the ornamental sector this is quite difficult to predict as it is generally less supported than the edible crop sector.

Summary of the work and main conclusions

In the Summer and Autumn of 2015 replicated glasshouse trials were carried out at Stockbridge Technology Centre to assess potential phytotoxic effects of a range of experimental biological and conventional fungicides on bedding plants (Pansy and Petunia) and pot plants (Poinsettia and Cyclamen) at different crop stages i.e. propagation & flowering. For the bedding plant species two colour varieties of Pansy and three colour varieties of Petunia were used in the trials. For the pot plant species one variety of Poinsettia (Infinity Red) and seven different coloured varieties of Cyclamen were used to assess the potential for crop safety or phytotoxicity.

Pansy & Petunia – Five experimental fungicides and five experimental insecticides were applied to the crops at 1N and 2N rates to assess potential phytotoxicity. One application was made at the young plant stage to assess potential crop damage to sensitive young foliage. A later application was made to the same plants when in flower to assess any potential phytotoxic effects on open flowers and flowers in bud. Assessments were made at one, four and fourteen days post application. No phytotoxic effects were noted on the young bedding plants. Some 'bleaching' of colour from the flowers of blue Pansy and appleblossom and salmon Petunia were noted for two of the products tested.

Poinsettia and Cyclamen – Five experimental fungicides and five experimental insecticides (the same products as tested above) were applied to the crops at 1N and 2N rates to assess potential phytotoxicity. One application was made at the young plant stage (rooted Poinsettia cv. 'Infinity Red' cuttings and Cyclamen plug plants) to assess potential crop damage to sensitive young foliage. A later application (1N & 2N) was made to the same Cyclamen plants at flowering stage to assess any potential phytotoxic effects on open flowers of Cyclamen. A second crop of mature 'close to market' Poinsettia was subject to an application of the test products (1N & 2N) to assess any potential phytotoxic effects, especially on the coloured bracts of Poinsettia. Assessments were made at approximately one, five and fourteen days post application. No phytotoxic effects were noted for any of the products on the Cyclamen at the first or second application. Mild phytotoxic effects were noted for two products on the young Poinsettia primarily at the 2N rates but no phytotoxic effects were noted on the mature Poinsettia crop. Two products left slight visible residues on the mature Poinsettia crop at both 1N and 2N rates and this could potentially detract from marketability of the crop.

Action Points

The trials work conducted has demonstrated the majority of the products to be crop-safe in this study but, as different circumstances including crop species, cultivars, growth stage, environmental conditions and other factors could influence any crop responses, it is important to recognise that it is the user's responsibility to check the safety of any novel products, especially when used for the first time. As such, it is advisable that a few plants are tested in the first instance to provide an assurance that the product is safe in the particular circumstances it is to be used in.

SCIENCE SECTION

Introduction

Two replicated trials were conducted in autumn 2015 to evaluate the potential phytotoxicity of ten novel plant protection products (five fungicides and five insecticides)

Two applications of the test products were conducted per crop. The first application on young plants to assess any effect on tender young foliage and a second application was made on mature ‘close to market’ plants. At the point of the second application the crops were all in flower (fully red bracts in the case of Poinsettia) presenting soft petal or bract tissues at risk of crop damage.

Treatments of products applied are listed in Table 2. Details of the timings and rates of application and climate data are included in Tables 3 and 4.

Materials and methods

The young Poinsettias were sourced as plug plants from Henrik Nielsen at Young Plants Ltd and transplanted into 11cm pots and grown-on at STC. Mature 'close to market' Poinsettia were sourced from Russ Woodcock at Bordon Hill Nurseries. Cyclamen were sourced as young corms in modules from Steve Mills at Syngenta which were subsequently transplanted to 11cm pots and grown-on at STC. Pansy and Petunia varieties were sourced as seed, sown in modules by Coletta and Tyson and later transplanted into 6/packs for the trial at STC.

The trial was staged to allow two applications of the test products, an initial application to young plants and a second application to coincide with flowering in the case of the Pansy, Petunia and Cyclamen. The second application to the Poinsettia crop was coordinated to target plants at a mature 'close to market' stage when the bracts had reached their full colouration.

Assessments for leaf and foliar injury were conducted at approximately one, five and fourteen days post application (full details of assessment timings are presented in Table 5) and a vigour assessment was also conducted at each of the fourteen day assessments. At the second spray of the bedding plants the first assessment measured effects of the test products on flowers open at the point of product application. Affected flowers were then removed after this assessment so that subsequent assessments could measure any effects of the test products on flowers that were in bud at the point of application.

Crops were grown under glass; supplementary night heat being added to maintain a minimum night temperature of 15 ^{0}C from October onwards to provide suitable conditions for crop development, especially the Poinsettia crop. All products were applied using a calibrated Oxford precision sprayer with 01 F110 nozzles at 2 bar pressure.

Table 1. Test site and plot design information

Test location:	Stockbridge Technology Centre
County	North Yorkshire
Postcode	YO8 3TZ
Soil type/growing medium	Levington M2
Nutrition	Universol Blue (18-11-18 +2.5 MgO + TE)
Crop & Cultivar	Poinsettia 'Infinity Red' Cyclamen persicum (7 cultivars/colours) - 'Exp. Compact Bright Scarlet 2' - ' Exp. Compact White' - 'Winfall® Deep Rose' - 'Winfall® Pink Flame' - 'Winfall® Light Purple - 'Winfall® Wine' - 'Super Series® Verano Red' Pansy (2 cultivars/colours) - 'Matrix Blue True' - 'Matrix Yellow' Petunia (3 cultivars/colours) - Express Appleblossom - Express Blue - Express Salmon
Glasshouse* or Field	Glasshouse
Date of planting/potting	Poinsettia potted on 31/7/15 Cyclamen potted on 10/8/15 Pansy and Petunia potted on 8/9/15

Pot size	11cm (Poinsettia and Cyclamen) Plantpak MC6 6-packs (Pansy and Petunia)
Number of plants per plot	Pansy – 12 Petunia – 18 Poinsettia – 8 Cyclamen - 7
Trial design (layout in Appendix C)	Randomised block
Number of replicates	4
Plot size - total area (m²)	Poinsettia and Cyclamen - 0.52m^2 Pansy and Petunia – 0.32m^2

*Temperature and relative humidity settings are given in Appendix B

Table 2. Details of products tested

Product	Active substance	Manufacturer (if known)	Rate of use (product)	Water volume (L/ha)
Fungicides				
10	N/D	N/D	1.0 l/ha	500
25a	N/D	N/D	1.0l/ha	500
77	N/D	N/D	0.8 l/ha	500
47	N/D	N/D	0.025kg/ha (1^{st} 2 sprays) 0.05kg/ha subsequently	500
105	N/D	N/D	2.5l/ha	500
Insecticides				
59	N/D	N/D	0.2 – 0.4 l/ha	600
62	N/D	N/D	3.9 l/ha	600
130	N/D	N/D	1.8 l/ha	600
179	N/D	N/D	2.4 l/ha	600
200	N/D	N/D	0.313 kg/ha	600

Table 3. Application details for test products

Product name or MOPS code number	Application timing	Dosage rate (product/ha)	Spray volume (L/ha)
10	A1, A2,A3, A4	1.0 l/ha	500
25a	A1, A2,A3, A4	1.0l/ha	500
77	A1, A2,A3, A4	0.8 l/ha	500
47	A1, A2,A3, A4	0.025kg/ha (1^{st} 2 sprays) 0.05kg/ha subsequently	500
105	A1, A2,A3, A4	2.5l/ha	500
59	A1, A2,A3, A4	0.2 – 0.4 l/ha	600
62	A1, A2,A3, A4	3.9 l/ha	600
130	A1, A2,A3, A4	1.8 l/ha	600
179	A1, A2,A3, A4	2.4 l/ha	600
200	A1, A2,A3, A4	0.313 kg/ha	600
Application dates			
A1	27/08/15		
A2	16/11/15		
A3	24/9/15		
A4	21/10/15		

Table 4. Product application details

Application No.	A1	A2	A3	A4
Crop	Poinsettia and Cyclamen	Poinsettia and Cyclamen	Pansy and Petunia	Pansy and Petunia
Application date	27/08/15	16/11/15	24/9/15	21/10/15
Time of day [1]	PM	PM	PM	PM
Application method	Foliar spray	Foliar spray	Foliar spray	Foliar spray
Temperature of air – max/min (°C) [2]	23.88/10.6	22.36/7.9	20.7/8.9	23.8/6.7
Air temperature at application [3]	22.4	20.6	19.4	22.7
Relative humidity (%) [4]	53.6	55.2	46.6	49.3
Cloud cover (%) [5]	37.5	87.5	50	100
Crop growth stage – days post-transplant	35	41	48	56

[1] Applications were conducted between approximately 2pm and 4pm on the dates stated

[2] Air temperatures stated are derived from Priva Integro climate control data

[3] Air temperatures stated are the mean readings between 2pm and 4pm on the days of application derived from Priva Integro climate control data

[4] Relative humidities stated are the mean readings between 2pm and 4pm on the days of application derived from Priva Integro climate control data

[5] Cloud cover % readings derived from Met Office data from Station no 4086 – Cawood. G.R. SE 56158 37171

Table 5. Assessments

Poinsettia and Cyclamen Assessment No.	**Date**	**Growth stage (days post- transplant)**	**Timing of assessment relative to last application**	**Assessment types**
1	28/8/15	29	1 days post A1	Phytotoxicity
2	2/9/15	34	6 days post A1	Phytotoxicity
3	10/9/15	42	14 days post A1	Phytotoxicity & Vigour
4	17/11/15	Unknown*	1 days post A2	Phytotoxicity
5	19/11/15	Unknown*	3 days post A2	Phytotoxicity
6	30/11/15	Unknown*	14 days post A2	Phytotoxicity & Vigour
Pansy and Petunia Assessment No.	**Date**	**Growth stage (days post- transplant)**	**Timing of assessment relative to last application**	**Assessment types**
1	25/9/15	17	1 days post A3	Phytotoxicity
2	2/10/15	24	8 days post A3	Phytotoxicity
3	13/10/15	36	20 days post A3	Phytotoxicity & Vigour
4	22/10/15	45	1 days post A2	Phytotoxicity
5	27/10/15	50	6 days post A2	Phytotoxicity
6	3/11/15	57	13 days post A2	Phytotoxicity & Vigour

* These plants were bought-in from a commercial nursery close to point of sale. Exact no. of days from transplanting is not known

Table 6. Assessment scoring criteria

Phytotoxicity severity score	Symptom description
0	No symptoms
1	Very slight leaf discoloration
2	Slight leaf discoloration / scorch
3	Moderate leaf discoloration / scorch
4	Severe leaf discoloration / scorch
5	Very severe leaf scorch. Leaf necrosis.

Results

Poinsettia

After the first spray application on 27/8/15 no phytotoxicity was noted at the first and second assessments (one day and six days post application respectively). At the third assessment (fourteen days post application) mild phytotoxicity symptoms were noted for the test products 47 and 105 which were most noticeable at the 2N application rates. Symptoms for both products appeared as a darkening of the light green foliage in a pattern consistent with the spray application (see appendix F). Neither product had any effect on plant vigour.

After the second spray application on mature plants no phytotoxic symptoms were noted for any of the test products either in terms of foliar discoloration/damage or plant vigour. Products 77 and 200 both left visible residues on the leaf surfaces at both 1N and 2N rates which appeared to be relatively water-fast persisting after several overhead irrigation events (see appendix F)

Cyclamen

No phytotoxicity was noted in terms of foliar or floral discoloration/damage or plant vigour from any of the test products at either the first (young plant stage) or second (mature plants in flower stage) spray applications.

Pansy

After the first spray application to young plants on 24/9/15 no phytotoxicity was noted in terms foliar discoloration/damage or plant vigour for the three subsequent assessments.

After the second spray application to mature plants in flower on 21/10/15 no phytotoxicity was noted in terms foliar discoloration/damage or plant vigour. Product 179 caused bleaching and discoloration of the flowers of Pansy Matrix Series ‘Blue True’. This was accompanied by some curling at the petal margins; the effects being evident at the 1N rate but more severe at the 2N rate. The flowers of the Pansy cv. Matrix Series ‘Yellow’ also exhibited some flower distortion at the 2N rate only in the form of slight curling and ‘drying’ at the petal margins though there was no bleaching or other effect on the petal pigmentation. Product 105 again caused bleaching and discoloration of the flowers of Pansy Matrix Series ‘True Blue’ with the effects being evident at the 1N rate but more severe at the 2N rate. (see appendix F).

Petunia

After the first spray application to young plants on 24/9/15 no phytotoxicity was noted in terms foliar discoloration/damage or plant vigour for the three subsequent assessments. After the second spray application to mature plants in flower on 21/10/15 no phytotoxicity was noted in terms foliar discoloration/damage or plant vigour. Product 179 caused bleaching and discoloration of the flowers of Petunia Express Series 'Appleblossom' and Petunia Express Series 'Salmon' with the effects being evident at the 1N rate but more severe at the 2N rate. Product 105 again caused bleaching and discoloration of the flowers of Petunia Express Series 'Appleblossom' and Petunia Express Series 'Salmon' with the effects being evident at the 1N rate but more severe at the 2N rate. (see appendix F). The Petunia Express Series 'Blue' was unaffected by any of the test products.

Formulations

No problems were encountered during mixing or application of any of the product formulations under test.

Effect on non-target

No effects were observed on non-target organisms as a result of any treatment applied during the trial.

Conclusions

The majority of the products tested proved to be crop-safe and did not result in any phytotoxic symptoms in the crops tested and those symptoms which were noted were generally mild in nature. None of the products tested had any adverse effect on plant vigour. The two products which left visible foliar residues in the Poinsettia trial did not appear to leave any visible residues in the other crops tested, which may be in part due to the dark or highly coloured leaves and bracts of the Poinsettia making the residues more noticeable. Two products in the bedding plant trial had a marked phytotoxic effect on the open flowers of the Pansy Matrix Series ‘True Blue’ and the Petunia Express Series ‘Appleblossom’ and ‘Salmon’ and a far less severe effect on the Pansy Matrix Series ‘Yellow’. The Petunia Express Series ‘Blue’ remained unaffected by any of the test products. Also, importantly none of the flowers in bud at the time of the spray application were affected as these opened normally and remained unaffected. In the bedding plant sector it may be debatable as to whether plants would ever be sprayed at the full flowering stage as they would likely have already entered the supply chain on their way to market. The data obtained however may prove useful if future work looks at phytotoxicity across a broader range of ornamentals.

Appendix A – Study conduct

Stockbridge Technology Centre is officially recognised by United Kingdom Chemical Regulations Directorate as competent to carry out efficacy testing in the categories of agriculture, horticulture, stored crops, biologicals & semiochemicals. National regulatory guidelines were followed for the study.

GLP compliance will not be claimed in respect of this study.

Relevant EPPO/CEB guideline(s)	
PP 1/152(4)	Design and analysis of efficacy evaluation trials
PP 1/135(4)	Phytotoxicity assessment
PP 1/181(4)	Conduct and reporting of efficacy evaluation trials including GEP

There were no significant deviations from the EPPO and national guidelines.

Appendix B – Meteorological data

Location of the weather station	Cawood. G.R. SE 56158 37171
Distance to the trial site	425m
Origin of the weather data	Met Office Weather station nº 4086
Glasshouse temperature and humidity data derived from Priva Integro climate control system.	

Date	Mean daytime temp/ ^{0}C	Mean nighttime temp/ ^{0}C	Minimum temp/ ^{0}C	Maximum temp/ ^{0}C	Mean daytime RH/%	Mean nighttime RH/%	sunshine hrs
26/08/2015	21.4	15.1	14.6	26.4	62.1	76.0	5.8
27/08/2015	21.8	13.9	12.8	26.1	46.3	70.5	10.7
28/08/2015	20.9	14.7	11.3	24.2	51.6	72.7	10.1
29/08/2015	20.2	14.4	13.1	24.9	58.8	82.5	3.4
30/08/2015	20.9	16.4	11.7	25.6	54.6	80.0	2.0
31/08/2015	16.9	13.3	13.5	18.4	83.2	90.0	0.0
01/09/2015	19.1	12.4	11.6	24.5	57.9	81.1	5.3
02/09/2015	17.9	12.4	11.2	21.9	60.9	86.4	1.7
03/09/2015	15.0	12.4	10.4	18.2	62.9	76.9	0.0
04/09/2015	15.2	12.8	10.8	19.3	62.1	80.7	0.3
05/09/2015	15.9	9.5	8.8	19.6	54.5	79.2	3.6
06/09/2015	20.2	11.8	7.4	25.7	49.5	82.9	9.4
07/09/2015	18.4	12.6	8.9	25.6	63.2	83.2	4.1
08/09/2015	15.0	12.6	10.1	18.2	75.1	78.7	0.0
09/09/2015	16.7	11.9	11.5	20.8	69.8	90.7	0.0
10/09/2015	21.5	12.6	9.7	26.8	56.2	86.0	8.6
11/09/2015	20.1	14.2	11.0	24.2	63.3	87.2	6.8
12/09/2015	17.9	10.8	10.6	22.2	75.8	83.9	3.0
13/09/2015	17.5	10.9	9.0	22.7	60.5	83.1	4.1
14/09/2015	14.6	12.8	8.6	18.7	79.1	90.1	0.0
15/09/2015	17.1	10.3	10.1	21.6	73.7	85.3	3.2
16/09/2015	16.6	11.1	8.2	23.0	62.2	81.5	2.8

17/09/2015	16.7	11.5	8.3	23.0	59.9	82.9	4.4
18/09/2015	17.1	11.6	8.7	24.2	68.6	87.6	1.6
19/09/2015	20.0	12.1	9.1	25.2	58.9	87.2	8.1
20/09/2015	17.0	13.6	9.1	21.3	66.1	82.5	3.6
21/09/2015	16.2	10.6	10.4	19.5	80.9	88.5	0.8
22/09/2015	17.2	12.4	9.0	21.4	62.1	81.6	7.2
23/09/2015	16.5	12.9	10.1	19.6	64.0	89.9	3.0
24/09/2015	16.4	11.3	10.7	20.1	62.6	80.4	7.0
25/09/2015	17.5	9.8	9.5	21.2	57.0	83.9	8.8
26/09/2015	16.2	11.5	8.1	23.3	67.9	84.7	2.5
27/09/2015	15.7	10.4	9.1	21.5	72.3	86.8	3.4
28/09/2015	16.5	11.2	8.9	22.4	72.6	89.3	4.5
29/09/2015	17.4	10.7	9.3	24.8	68.3	86.0	5.3
30/09/2015	19.5	10.5	8.7	25.4	59.1	86.5	8.6
01/10/2015	17.2	10.3	8.8	23.3	70.8	88.2	6.9
02/10/2015	17.1	15.6	8.2	23.5	65.7	75.8	x
03/10/2015	16.6	15.3	12.0	18.9	73.1	77.7	x
04/10/2015	17.7	15.3	12.6	21.6	62.9	74.1	3.2
05/10/2015	16.3	16.3	14.9	17.4	89.7	96.2	0.0
06/10/2015	19.0	16.0	15.4	22.3	80.9	90.9	1.8
07/10/2015	16.3	15.5	13.3	18.4	86.5	77.8	0.0
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11/10/2015	18.1	15.4	13.1	21.8	61.9	75.2	5.1
12/10/2015	16.4	15.1	11.8	18.4	68.3	77.2	4.9
13/10/2015	15.7	15.2	11.5	17.9	73.5	74.8	0.4
14/10/2015	16.5	15.3	12.6	18.5	63.7	77.1	4.9
15/10/2015	15.8	15.4	13.1	18.9	75.8	82.2	0.8
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20/10/2015	16.7	15.3	11.9	18.4	66.7	80.9	3.1
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14/11/2015	17.9	16.2	15.8	19.2	70.6	85.7	0.0
15/11/2015	17.9	16.2	15.6	19.9	86.2	83.0	0.0

16/11/2015	18.4	16.2	15.8	21.2	66.6	75.5	0.0
17/11/2015	17.7	16.1	15.5	18.6	75.4	74.8	0.0
18/11/2015	17.9	16.1	15.5	20.4	79.0	73.4	0.5
19/11/2015	17.9	16.1	15.7	20.0	72.8	65.1	0.1
20/11/2015	18.1	15.9	15.5	20.9	69.2	60.9	1.8
21/11/2015	18.1	16.0	14.3	20.7	55.3	56.7	4.9
22/11/2015	18.2	16.1	15.7	21.8	59.6	56.7	2.2
23/11/2015	17.7	16.2	15.7	18.9	68.7	71.1	0.0
24/11/2015	17.7	16.1	15.8	18.5	69.0	63.0	0.0
25/11/2015	18.6	16.2	15.8	21.5	66.7	69.6	4.0
26/11/2015	18.4	16.2	15.5	21.4	71.6	79.5	0.6
27/11/2015	17.8	16.0	15.5	19.2	82.6	64.6	0.2
28/11/2015	17.7	16.1	15.5	18.7	67.3	68.1	0.0
29/11/2015	17.8	16.1	15.8	20.7	66.7	61.3	0.0
30/11/2015	17.7	16.2	15.7	18.3	64.6	64.4	0.0
01/12/2015	18.3	16.1	15.6	22.8	69.2	77.3	1.5
02/12/2015	18.2	16.2	15.5	21.7	75.3	83.0	0.3
03/12/2015	17.7	16.1	15.6	18.3	76.3	71.0	0.0
04/12/2015	17.9	16.1	15.6	20.1	75.7	78.4	0.8
05/12/2015	17.7	16.1	15.7	18.4	70.4	73.4	0.0
06/12/2015	17.6	16.1	15.8	18.8	71.9	72.9	0.0
07/12/2015	18.6	16.1	15.7	21.1	78.7	71.1	2.8

Appendix C – Agronomic details

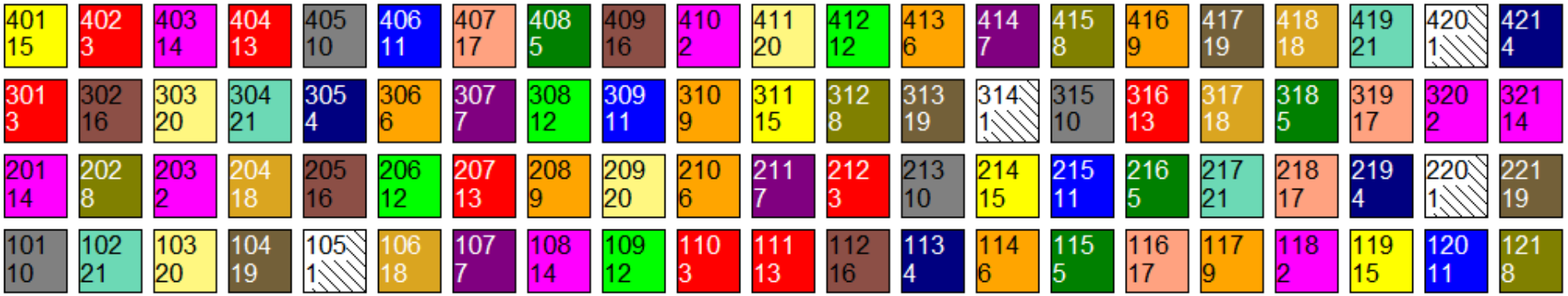
Fertiliser applied to the trial area

Date	Product	Rate	Unit
18/9/15 12/10/15 21/10/15 3/11/15	Universol Blue (18-11-18 +2.5 MgO + TE)	1	g/L

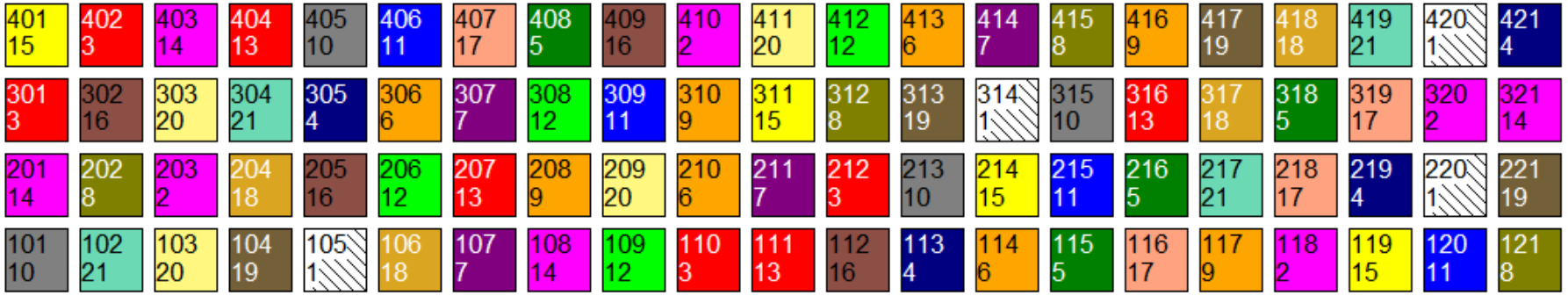
Type of irrigation system employed
Hand watering

Appendix D – Trial layout

MOPS Bedding plants (Pansy and Petunia)



MOPS Bedding plants (Poinsettia and Cyclamen)



Appendix E: Copy of the Certificate of Official Recognition of Efficacy Testing Facility or Organisation

Certificate of

Official Recognition of Efficacy Testing Facilities or Organisations in the United Kingdom

This certifies that

Stockbridge Technology Centre

complies with the minimum standards laid down in Commission Directive 93/71/EEC for efficacy testing.

The above Facility/Organisation has been officially recognised as being competent to carry out efficacy trials/tests in the United Kingdom in the following categories:

Agriculture/Horticulture
Biologicals and Semiochemicals
Stored Crops

Date of issue: 20 May 2011
Effective date: 1 April 2011
Expiry date: 31 March 2016

Certification Number
ORETO 291

Signature _____
Authorised signatory

HSE
Chemicals Regulation Directorate

Department of Agriculture and Rural Development

Appendix F – Photographs

Figure 1. Overview of the mature pot plant trial with Poinsettia & Cyclamen (24/11/15)

Figure 2. Overview of the mature bedding plant trial with Pansy & Petunia (3/11/15)

Figure 2. Phytotoxicity symptoms of Product 105 applied at 2N rate (10/9/15)

Figure 3. Phytotoxicity symptoms of Product 105 applied at 2N rate (10/9/15)

Figure 4. Close-up of phytotoxicity symptoms of Product 47 applied at 2N rate (2/10/15)

Figure 5. Visible spray deposits following application of Product 77 applied at 2N rate (25/11/15)

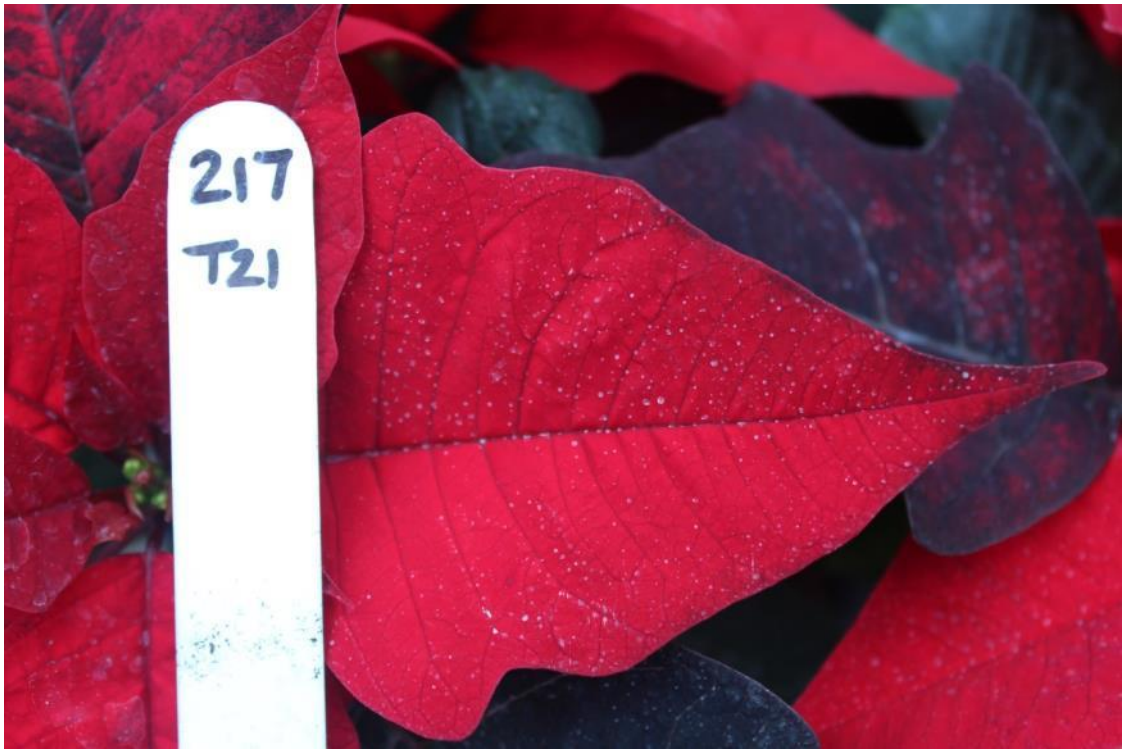


Figure 6. Visible spray deposits following application of Product 200 applied at 2N rate (25/11/15)

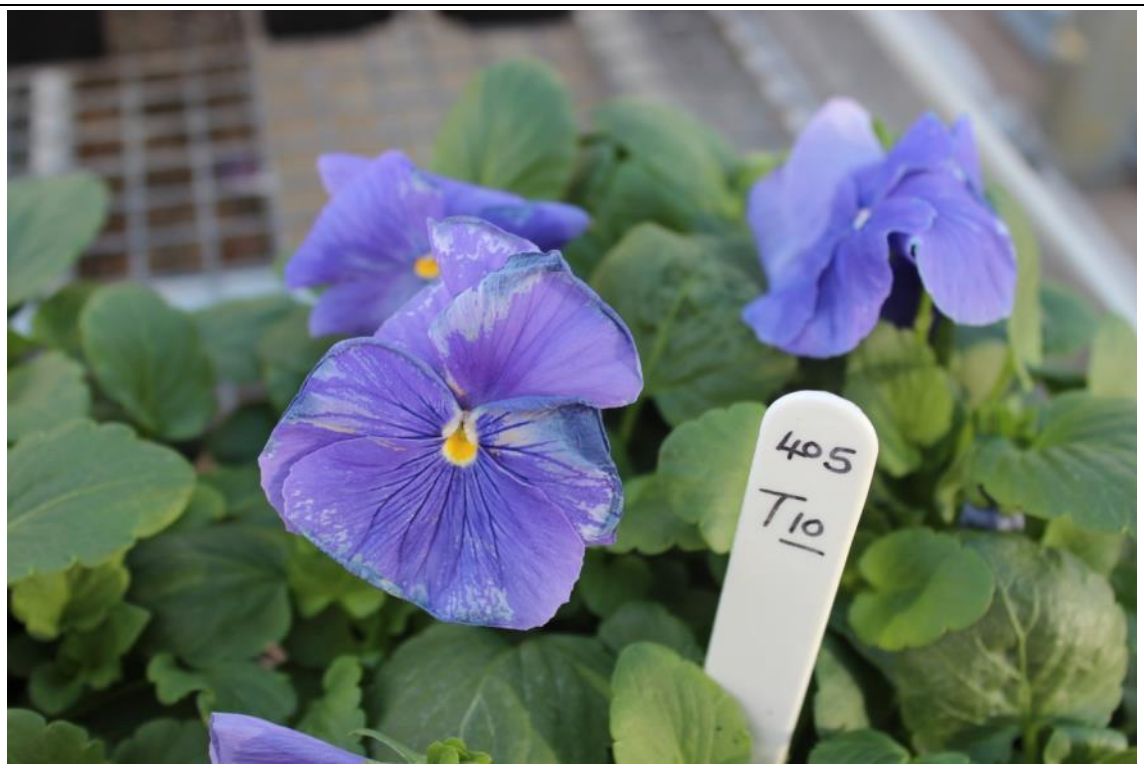


Figure 7. Discoloration and distortion of open flowers on Pansy Matrix Series ‘Blue True ‘from application of Product 179 applied at 1N rate

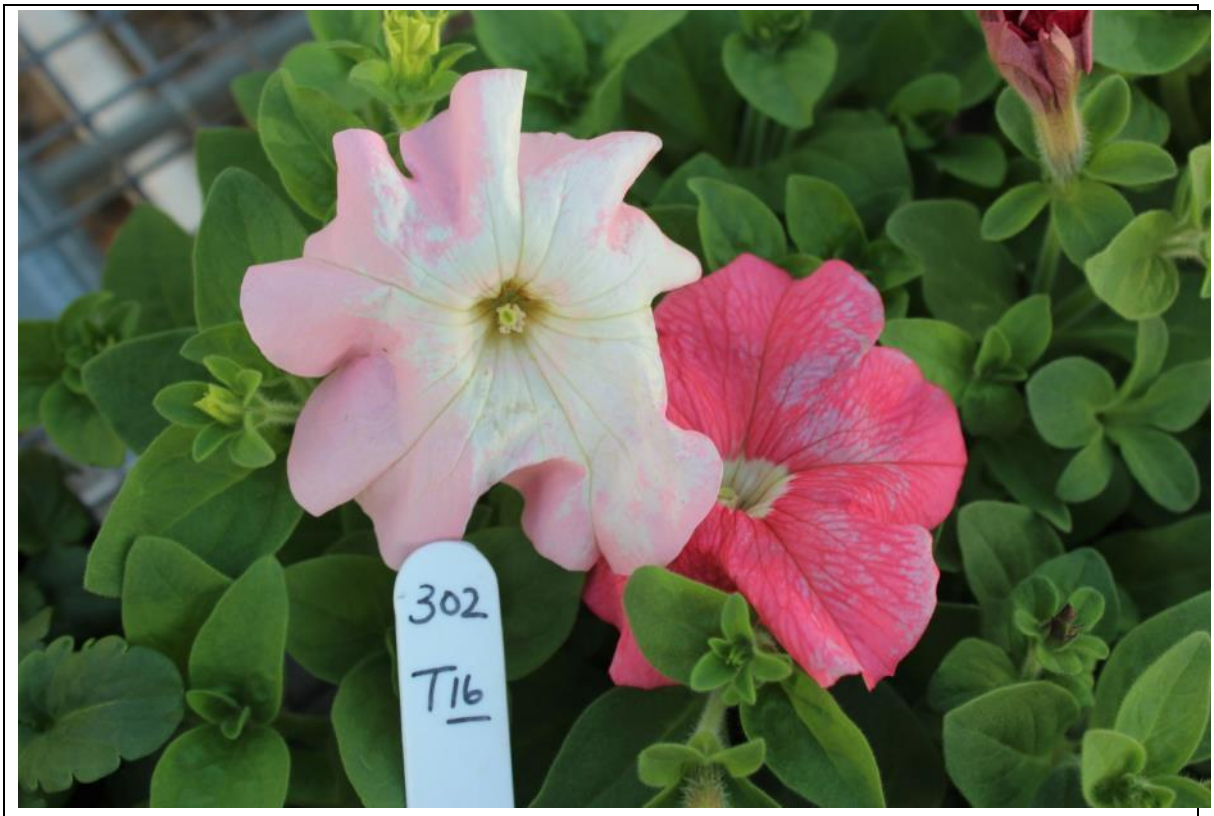


Figure 8. Flower discoloration in Petunia Express Series ‘Salmon’ and ‘Appleblossom’ following application of Product 105 applied at 2N rate

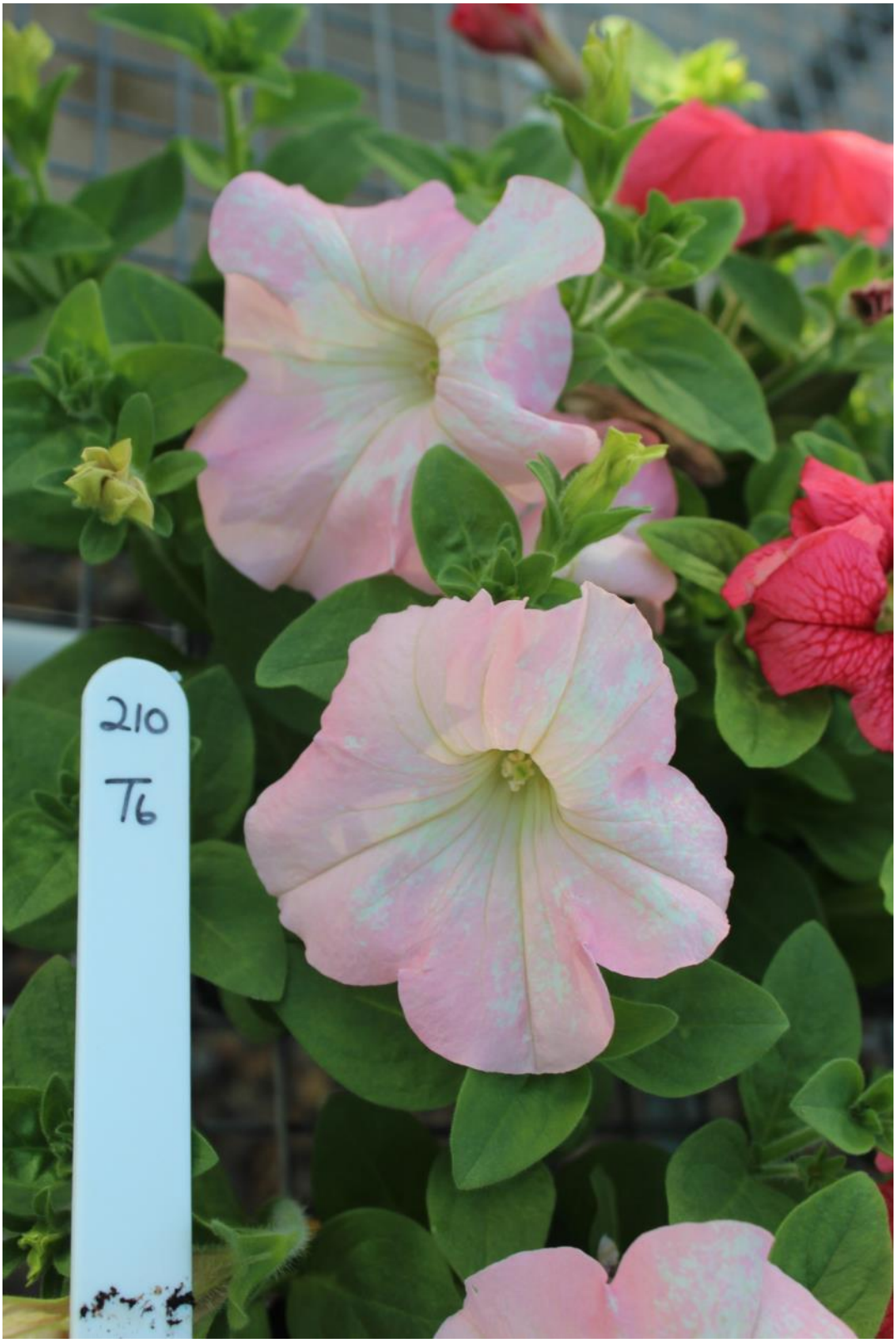


Figure 9. Flower discoloration of Petunia Express Series ‘Appleblossom’ following application of Product 105 applied at 1N rate