Report # ONZ18113

For

Onions New Zealand Inc.

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SUMMARY

A field trial was conducted to evaluate the crop tolerance and efficacy of registered fungicides for the control of downy mildew (*Peronospora destructor*) in onions. The trial was conducted in the Pukekohe district in the 2018/19 growing season.

Treatments were applied four times at 7-10-day intervals commencing when onions were at neck swell. ZAMPRO® was applied at 800 mL/ha, ACROBAT® MZ was applied at 2.0 kg/ha, INTUITY® at 1.2 L/ha and RANMAN® was applied at 200 mL/ha. Tank mixed with DITHANE™ RAINSHIELD™, VENTURA® was applied at 640 mL/ha, CONCORD® was applied at 550 mL/ha, REASON™ was applied at 300 mL/ha and ZORVEC® ENICADE® applied at 350 mL/ha. All treatments were applied in 400 L/ha water and had ACTIWETT® added at 35 mL/100L.

Applications of Zampro, Acrobat, Zorvec Enicade + Dithane and Reason + Dithane all provided significant and consistent downy mildew control.

Ventura + Dithane, Concord + Dithane, Intuity and Ranman had similar downy mildew incidence as untreated plots at 3 days after the third spray, however disease severity was significantly reduced.

There was no significant difference in downy mildew control between the fungicide treatments.

There was no visual evidence of phytotoxicity to the onion crop by any fungicide treatment under the conditions of this trial.

METHOD AND MATERIALS

Table 1 – Trial details

Trial identification	ONZ18113
Co-operator/Grower	D Fong
Location	Waiuku Road, Pukekohe
GPS coordinates	S-37.229866° 174.856051°
Soil type	Patumahoe clay loam
Crop Details	Onions, *PLK*, sown September 2018 in beds 1.6m apart with 8 rows per bed.
Trial design	Randomised block with 4 replicates. Plots 6m long x single bed.
Application method	CO_2 powered plot sprayer, 4 x 11003 fan nozzles at 220 kPa, 3.6 km/hr travel delivering 400 L/ha.
Application details	See appendix

Table 2 - Treatment details

	Treatment applied	Application interval	Active rate (gai/ha)	Product rate (mL or g/ha)
1.	Untreated	-	-	-
2.	Zampro	7-10 days	420	800
3.	Acrobat MZ	7-10 days	1380	2000
4.	Ventura + Dithane	7-10 days	160 1275	640 1700
5.	Concord + Dithane	7-10 days	165 1275	550 1700
6.	Zorvec Enicade + Dithane	7-10 days	35 1275	350 1700
7.	Reason + Dithane	7-10 days	150 1275	300 1700
8.	Intuity	7-10 days	300	1200
9.	Ranman	7-10 days	80	200

Actiwett added at 35 mL/100L all treatments

Table 3 - Formulation details

Product	Active Chemical
Zampro	300 g/L ametoctradin + 225 g/L dimethomorph suspension concentrate
Acrobat MZ 690	90 g/kg dimethomorph + 600 g/kg mancozeb water dispersible granule
Ventura	250 g/L metalaxyl emulsifiable concentrate
Concord 300SC	300 g/L cymoxanil suspension concentrate
Zorvec Enicade	100 g/L oxathiapiprolin oil dispersion
Reason	500 g/L fenamidone suspension concentrate
Intuity	250 g/L mandestrobin suspension concentrate
Ranman	400 g/L cyazofamid suspension concentrate
Dithane Rainshield	750 g/kg mancozeb water dispersible granule
Actiwett	950 g/L linear alcohol ethoxylate

Photo 1 – Trial site location

ASSESSMENTS

1. Crop tolerance

At each application and assessment timing, onion leaves in plots were inspected for signs of damage that may be attributed to spray application. Scores for such damage were to be used from the following EWRS (European Weed Research System) scale:

Rating	% Effect	Description of Effect
1	0	Healthy plant
2	0.1 - 2.0	Very mild symptoms
3	2.1 - 5.0	mild, clearly recognizable symptoms
4	5.1 - 10.0	More severe symptoms, no effect on yield
---------- Limit of commercial acceptability ----------		
5	10.1 - 18.0	Reduction in yield expected
6	18.1 - 30.0	
7	30.1 - 45.0	
8	45.1 - 70.0	
9	70.1 - 100	Heavy damage to total plant death

2. Disease control

Untreated plots were inspected at each application timing for downy mildew infection. When disease was present in the trial 50 leaves per plot were scored from the following scale and calculations made accordingly:

Scale	ref	Disease index (severity)
0 = no infection	(N_0)	
1 = 0-5% leaf area infected	(N_1)	$\frac{(0.05 \times N_1) + (0.25 \times N_2) + (N_3)}{\text{number of leaves sampled}} \times 100$
2 = 6-25% leaf area infected	(N_2)	
3 = 26-100% leaf area infected	(N_3)	

$$\text{Disease incidence} = \frac{N_1 + N_2 + N_3}{50} \times 100$$

Table 4 - Trial diary

Date		Interval	Activity
December	11	-	First treatment application
	18	7	Second treatment application
	28	10	Third treatment application
January	4	7	Fourth treatment application, disease assessment
	11	7	Disease assessment

STATISTICAL ANALYSIS

Where appropriate, data presented have been subjected to analysis of variance and if significance has occurred, subjected to Tukey's Test showing honest significant differences (HSD 0.05). Means showing uncommon letters are statistically significantly different. The Coefficient of variation (CV %) has also been calculated. All data were analysed using the statistical software in ARM 2019.2

RESULTS AND DISCUSSION

The trial site was positioned in a commercially growing crop of onions adjacent to an access track. Downy mildew was already present in the crop which had received a number of fungicides by the grower.

All grower-applied pesticides were excluded from the trial area for the duration of the trial and all treatments were applied in calm conditions at 7-10 day intervals.

Photo 2 – Downy mildew infection in untreated plot at 7 DAA3

Disease control

Downy mildew was present at the first and second applications, but incidence and severity were too low to allow accurate assessment.

Following a weather pattern of early morning dews, increased downy mildew activity by the third application showed 18% leaves infected and 4.3% leaf area infection in untreated plots. All fungicide treatments had fewer infected leaves and reduced severity compared to untreated plots. There was no statistical difference between fungicide treatments. However, Ventura + Dithane, Concord + Dithane, Intuity and Ranman plots had a similar number of infected leaves as untreated plots.

On 11 January (7 days after the last application) disease incidence and severity in untreated plots remained similar to the previous assessment. All fungicides showed a reduction in incidence and severity and were all providing equivalent and significant disease control.

Table 5 – Treatment effect on downy mildew incidence and severity

	Treatment	Product rate (g or mL/ha)	Mean % downy mildew			
			3 DAA3		7 DAA4	
			incidence	severity	incidence	severity
1.	Untreated	-	18.0 a	4.3 a	16.5 a	4.2 a
2.	Zampro	800	2.0 b	0.1 b	1.5 b	0.2 b
3.	Acrobat MZ	2000	0.5 b	0.0 b	0.0 b	0.0 b
4.	Ventura + Dithane	640 1700	7.5 ab	0.7 b	2.5 b	0.4 b
5.	Concord + Dithane	550 1700	3.5 ab	0.3 b	0.5 b	0.1 b
6.	Zorvec Enicade + Dithane	350 1700	1.0 b	0.1 b	0.0 b	0.0 b
7.	Reason + Dithane	300 1700	1.5 b	0.1 b	0.5 b	0.1 b
8.	Intuity	1200	7.0 ab	0.6 b	0.5 b	0.0 b
9.	Ranman	200	6.0 ab	0.6 b	0.5 b	0.0 b
	HSD 0.05 (abc)		9.61	1.51	8.19	2.36
	CV %		75	70	107	115
	Treatment Prob (F)		0.003	0.001	0.001	0.001

Crop tolerance

At each spray and assessment timing, onion plants were inspected for damage symptoms that could be attributed to application of treatments. There was no visual sign of leaf damage that could be attributed to spray applications under the conditions of this trial.

Product formulation

All fungicides were sourced from current commercially available packs. There was no noticeable mixing or spraying difficulties with any formulation.

ACKNOWLEDGMENTS

Peracto New Zealand Limited is indebted to D Fong for the provision of the trial site and to Rob Cox for arranging this site.

CONCLUSIONS

- Applications of Zampro, Acrobat MZ, Zorvec Enicade + Dithane and Reason + Dithane all provided significant and consistent downy mildew control.

- Ventura + Dithane, Concord + Dithane, Intuity and Ranman had similar downy mildew incidence as untreated plots at 3 days after the third spray, however disease severity was significantly reduced.

- There was no significant difference in downy mildew control between the fungicide treatments.

- There was no visual evidence of phytotoxicity to the onion crop by any fungicide treatment under the conditions of this trial.

Paul Munro
Managing Director
Peracto New Zealand Limited

APPENDIX

Application details

Application Number		1	2	3	4
Date		11.12.18	18.12.18	28.12.18	04.01.19
Time		0820	0730	0805	0750
Interval (days)		-	7	10	7
Growth Stage		neck swell	25 mm bulbs	40 mm bulbs	50 mm bulbs
Foliage (wet/dry)		dew	dew	dew	dew
Spray Volume (L/ha)		400	400	400	400
Pressure (kPa)		220	220	220	220
Nozzles		11003	11003	11003	11003
Air Temperature (ºC)		20.8	18.6	17.5	17.3
Relative Humidity (%)		58	67	77	70
Soil Temperature (ºC)		17.7	19.6	16.6	20.6
Soil Moisture		dry	moist	moist	dry
Wind (km/hr)		nil	nil	nil	nil
Cloud Cover (%)		50	10	10	60
Rainfall mm	7 days pre	8.4	8.4	151.6	0
	24 hrs pre	0	0	0	0
	24 hrs post	0	0	0	0
	7 days post	8.4	151.6	0	0