A COMPARISON OF THE PHYTOTOXIC EFFECTS OF MANCOZEB (COORDINATION COMPOUND) WITH MIXTURES OF MANEB AND ZINC

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SUMMARY

Two spray applications of three products containing the coordination compound mancozeb was applied to seedling tomatoes and cucurbits. Treatments were compared to two products found to contain maneb with zinc, one labelled as maneb + zinc and one labelled mancozeb. The three products containing coordination compounds did not cause phytotoxicity or reduction in seedling vigour. Both maneb + zinc treatments caused phytotoxicity and reduced plant vigour.

INTRODUCTION

A specific coordination compound, distinct from maneb and maneb mixtures with zinc compounds, was first locally documented in 1962 in N.Z. patent 131543 by Rohm and Haas Company, Philadelphia (Anon 1962). One documented advantage was increased safety to tender tomato plants. Maneb (with zinc sulphate added) was also introduced about 1962. At that time, chemical fungicide authorities unanimously accepted the integrity of active ingredients and the validity of labels, but all nations did not use the same systematic method of naming active ingredients.

For example one abstract described mancozeb as a mixture of zineb and maneb. Products identical to this mixture are quite different to mancozeb. Improved methods to identify the specific coordination compound mancozeb have been reported (CIPAC 1980). Two products showed "moderate to severe phytotoxicity in all tested vegetables, while Dithane M-45 showed little or no phytotoxicity in most vegetables" (Kang and Lee 1982).

METHOD

Four different registered 80% proprietary products were purchased through local retail outlets, and characterised by chemical analysis (Table 1). The active ingredient on the label of these four products was mancozeb. A similar 80% proprietary product labelled maneb "with a zinc salt added" was also purchased.

TABLE 1: Analysis of material used.

Trade name	Identification by chemical analysis	
	N.Z. (4)	U.S. (5)
"Dithane M-45" (1)	mancozeb	coordination compound
"Manzate 200" (2)	mancozeb	coordination compound
"Mancozeb 80" (3)	mancozeb	coordination compound
"Shell mancozeb 80"	maneb + zinc oxide	maneb plus insoluble zinc salt

- (1) Trade mark of Rohm and Haas Company, Philadelphia
- (2) Trade mark of E.I. du Pont de nemours, Inc., Wilmington, Delaware
- (3) Product identified as "Manzate 200" by analysis
- (4) Identified by E.G.R. Wallace (pers comm)
- (5) Chemical Analysis by Rohm and Haas Company, Philadelphia

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Two rates of each product were applied at 120 g ai and 240 g ai/100 litres respectively. Five replications were used, each of 10 plants. Two varieties of tomatoes, VF 145-B7879 and "Moneymaker", were selected to represent dwarf and tie-up forms as well as process and market crops. Rockmelons (Hales Best #45) and cucumbers (Hybrid #2) were selected to represent cucurbits.

Seeds were sown in potting mix under glass and emerged in 9-11 days. The first treatment was applied at the cotyledon to 2-true leaf stage of growth using a Cambrian CSP 15, and applying topical spray to run-off.

RESULTS

Plants were observed frequently to record aspects of seedling collapse and necrotic spot development. After 7 days a second application of chemicals was made. Surviving plants had all reached the 2-true leaf stage.

Three mancozeb coordination products caused no phytotoxicity in tomatoes or cucurbits. Only the results for Dithane M-45 are presented in Table 2. The positive control (maneb and zinc) and the maneb + zinc oxide ("Shell mancozeb 80") first showed necrotic lesions at the stem base. These increased in severity with the higher application rate and caused some tomatoes to collapse. Symptoms on tomato leaves appeared 3 days after treatment. "Moneymaker" appeared slightly more sensitive to damage than VF 145-B7879. Cucumbers and rockmelons were less sensitive than tomatoes.

TABLE 2: Mean assessments of phytotoxicity on tomatoes and cucurbits.

Treatment	Rate ai/100 litres	Tomatoes		Rockmelon	Cucumber
		% Dead 9 days*	% Damaged 9 days	% Damaged 9 days	% Damaged 9 days
untreated	-	0 c	0 d	0 d	0 b
mancozeb (Dithane M-45)	120 g	0 c	0 d	0 d	0 b
	240 g	0 c	0 d	0 d	0 b
maneb + zinc oxide	120 g	0 c	42 c	76 bc	95 a
	240 g	30 b	94 ab	90 ab	95 a
maneb + zinc (positive control)	120 g	1 c	79 b	68 c	100 a
	240 g	76 a	100 a	100 a	100 a
cv%		28.9	13.5	12.3	7.5

* Time elapsed since first treatment

TABLE 3: Plant vigour expressed as mean root length and wet weight of plants.

Treatment	Rate ai/100 litres	Tomatoes		Cucurbits	
		Root length (mm)	Weight (g)	Root length (mm)	Weight (g)
untreated	-	11.93 ab	4.57 a	7.83 ab	5.63 a
mancozeb (Dithane M-45)	120 g	12.43 a	4.61 a	7.71 ab	5.53 a
	240 g	12.20 a	4.74 a	8.10 a	5.47 a
maneb + zinc oxide	120 g	11.98 ab	4.58 a	7.76 ab	5.22 ab
	240 g	10.16 b	4.06 a	7.60 ab	5.21 ab
maneb + zinc (positive control)	120 g	12.53 a	4.63 a	8.16 a	5.22 ab
	240 g	3.58 c	2.67 b	6.97 b	4.45 b
cv%		11.9	14.1	9.6	11.2

Measurements of plant growth rates, root length, top length, and plant weight were carried out when the trial was terminated, immediately after the last rating (Table 3). The positive control and maneb + zinc oxide were the only treatments which significantly reduced plant vigour. There was no difference in plant vigour between the three coordination products and the untreated control.

CONCLUSION

Two application of products containing the coordination compound mancozeb did not cause any phytotoxicity or reduction in vigour of tomato or cucurbit seedlings. Maneb + zinc oxide caused phytotoxicity and a reduction in plant vigour.

ACKNOWLEDGEMENTS

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