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FEBRUARY 1994

PRICE £1.00

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COPPER-BASED FUNGICIDES AS POSSIBLE ALTERNATIVES TO ORGANOMERCURY FOR THE CONTROL OF BUNT (TILLETIA CARIES) IN WHEAT

by

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This is the final report of a five month project which commenced in February 1993. The work was funded by a grant of £1,650 from the Home-Grown Cereals Authority (Project No. 0085/1/91).

SUMMARY

Copper carbonate and copper oxychloride were used as seed treatments for the control of wheat bunt. In trials carried out in 1991/2 and 1992/3 no evidence of phytotoxicity was found with either copper carbonate or copper oxychloride. Bunt levels were assessed in the 1992/3 trial only. Copper oxychloride, applied as Cuprokylt L at 3.75 l/tonne of seed gave a significant reduction in the level of bunt recorded. Copper carbonate dust (at 2kg/tonne) or Maneb Flowable (2 litres/tonne) gave a less effective control of the disease. Organomercury (as Panogen M at 1 litre/tonne) gave 100% control.

INTRODUCTION

Bunt of wheat (*Tilletia caries*) was so well controlled by organomercury seed treatment that it became very rare in post war Britain (Marshall, 1960). The newer fungicides which have now replaced mercury are as effective but are expensive and farmers are tempted to save money by using untreated seed. Widespread adoption of this policy could result in a resurgence of bunt which can build up very rapidly and substantially reduce yield and quality of grain. Copper based treatments were in use for the control of bunt from the mid - 19th century until the Second World War (Yarham, 1992). In the 1920s & 30s the previously standard copper sulphate steep was gradually replaced by dusting with copper carbonate (Weston & Engledow, 1930). The use of other copper compounds was also investigated, including copper oxychloride which was sold in Australia as "Smutol" (Sutton, 1926).

This investigation evaluated copper based materials as seed treatments, as alternatives not to modern seed treatments, but to the use of untreated seed. Copper carbonate dust was compared with a modern liquid formulation of copper oxychloride and, in the second year, with maneb. Mercury (as Panogen M) was used as a standard control.

MATERIALS AND METHODS

Site: ADAS trial ground, Anstey Hall, Trumpington, Cambridge

Soil type: Sandy clay loam (Milton series)

Wheat stocks:

1991/2 Stock 1 cv Riband - from bunted stock
Stock 2 cv Riband - artificially infected

1992/3 cv Admiral taken from a stock known to have been bunt infected but found to have only 12 spores/gm seed. This natural infection was boosted to 11,500 spores/gm by artificial inoculation using bunt samples collected during the past few years and retained in the laboratory.

Plot size: 2 x 2.5m rows/plot

Trial design: Randomised blocks with five fold replication

Sowing date: 1991/2 16 December 1991
1993 4 February 1993

TREATMENTS

The chemicals used were as follows:

1. basic copper carbonate (51% Cu, Aldrich Chemical Co. Ltd)
2. copper oxychloride (Cuprokylt L; 20% Cu, e.c.; Universal Crop Protection Ltd).
3. 2-methoxyethyl mercury acetate (Panogen M 31.8g/litre l.s.; Embetec Crop Protection)
4. maneb (Unicrop Flowable Maneb; 80% s.c.; Universal Crop Protection Ltd).

	Rates expressed as for 1 tonne seed	
	1991/2	1993
1. untreated control	-	-
2. copper carbonate	1.6 kg	2 kg
3. Cuprokylt L	1.5 litres	3.75 litres
4. Panogen M	1.0 litres	1.0 litres
5. Maneb Flowable	-	2.0 litres

RESULTS

TABLE 1 Emergence counts (plants/metre of row)

	1991/2		1993
	Stock 1 24 Feb	Stock 2 24 Feb	15 April
1. Untreated	51.1	56.5	98.4
2. Cu carbonate	52.5	56.4	103.8
3. Cuprokylt L	53.7	56.0	101.0
4. Panogen M	53.1	55.9	98.2
5. Maneb FL	-	-	100.8
SED ±	1.43	1.41	8.44
CV%	4.3	4.0	13.3
P	0.330	0.958	0.963

No evidence of phytotoxicity was found with any of the materials used in either of the two years.

TABLE 2 Bunt infection 1993

	No of ears examined per treatment (ie in 5 plots)	No bunted ears/plot	% ears bunted
1. Untreated	2085	4.4	1.00
2. Cu carbonate	2074	2.4	0.60
3. Cuprokylt L	2067	0.2	0.05
4. Panogen M	2060	0.0	0.00
5. Maneb FL	2042	1.4	0.30
SED ±		0.17	0.636
CV%		64.1	59.8
P		<0.001	<0.001

DISCUSSION

Although not as effective as organomercury, copper oxychloride (as Cuprokylt L at 3.75 litres/tonne) gave a highly significant reduction in bunt levels. No phytotoxic effects were observed.

More information is needed on the effectiveness of the copper oxychloride on other seed-borne pathogens particularly Fusarium ssp.

It is not envisaged that copper oxychloride could offer a cut-price alternative to the effective seed treatments currently used on cereals. However, its use if it obtained approval would be better than that if no seed treatment.

Crystalline copper carbonate did not adhere well to the seed. The chemical might have given better results if an improved formulation had been used.

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