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FUNGICIDE TREATMENTS FOR CONTROL OF DUTCH ELM DISEASE,
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Summary

Results of Forestry Commission trials with the fungicide thiabendazole (TBZ) hypophosphite as a treatment for Dutch elm disease are summarised. Over the 5 years of trials 81% of treated trees recovered while all but 11% of the control trees died.

Introduction

1. The use of high volume low concentration injections of thiabendazole (TBZ) hypophosphite was pioneered in the USA and was examined experimentally by the Forestry Commission form 1978 to 1982. The chemical was first marketed in the UK as 'Ceratotect' and is know as 'Arbotect' in the USA and 'Ormagal' in France.

2. The fungicide is no longer produced under the trade name 'Ceratotect', but since September 1995 there has been approval for 'Off-label' use of 'Storite Clear Liquid' to be used for the control of Dutch elm disease (MAFF1995). Storite is applied at the same rates using the same techniques as previously recommended for Ceratotect.

3. This paper describes the results that have been obtained and outlines the procedure for treatment.

Experimental Trees

4. Forestry Commission trials involved specimen Wheatley elm (*U.carpinifolia* var *sarniensis*) and Huntingdon elm (*U. x hollandica* 'Vegeta') in Hove and Eastbourne, East Sussex.

Curative Treatment

5. Only trees with a small amount of disease, usually restricted to a single branch, which had resulted from infection via elm bark beetles were selected for treatment. Injection was done in the last week in July and first two weeks in August. The treatment was injected as a low concentration (0.3% active ingredient TBZ[1]) at a rate of 20 litres per 30cm stem circumference. Throughout the trials similar trees were left untreated as controls.

6. Table 1 shows disease symptoms were arrested in the majority of trees injected. By the end of the summer of treatment most trees appeared healthy, apart from the original diseased branch which was usually leafless. In contrast, the disease spread rapidly in the untreated control trees, most of which were virtually dead by early autumn of the year of treatment. Over the 5 years of the trials, 81% of the treated trees recovered while 89% of the control trees died.

[1] 300ml Ceratotect per 20 litres of water.

7. From the date collected during the experiments it is probable that a curative treatment of this sort gives some protection against new infection from the time of injection until the end of the following growing season.

Table 1 – Results from Curative Trials of Ceratotect 1978 – 82

	Ceratotect			Control		
Year of Treatment	**Total**	**Recovered**	**Died by 1983**	**Total**	**Recovered**	**Died by 1983**
1978	4	4	0	5	1	4
1979	11	8	3	12	1	11
1980	14	12	2	4	0	4
1981	8	5	3	2	0	2
1982	10	9	1	4	1	3
Totals	47	38	9	27	3	24
%		80.8%	19.2%		11.1%	88.9%

8. Limited curative experiments were conducted in which the same dose of fungicide (300ml of Ceratotect per 30cm stem circumference) were given in smaller volumes of water. The results were inconclusive although the amounts of fungicide detected in the twigs was the same for all treatments.

Protective Treatments

9. Because of the high cost of treatment, little attention has been given to protective injections. However, a small experiment in 1982 indicated that adequate protection for a single year could be achieved with both 100ml and 300ml of Ceratotect per 30cm circumference. In practice the higher dose is probably worth considering.

Rate of Uptake and Damage to Trees

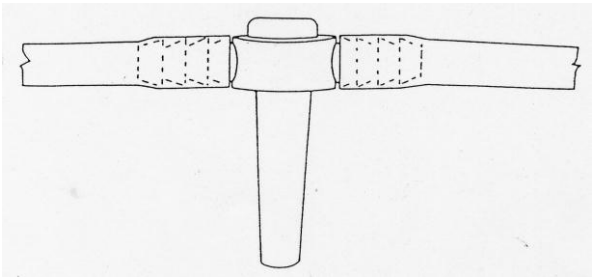
10. Uptake rates vary considerably between trees but on average it took 5 hours to take in the 20 litres per 30cm circumference used in the main curative experiment.

11. Damage to injected trees as a result of the chemical itself was noted but the severity was low and varied from year to year. The most common symptoms were leaf margin necrosis, leading in severe cases to leaf death and premature abscission. Pollarded Huntingdon elms were most severely affected, losing all leaves from some branches, but the branches refoliated normally the following year.

Injection Equipment

12. Most of the trials were carried out with the screw lances developed in the 1970's to inject the fungicide Lignasan. Spares are no longer available for this equipment. An alternative is to use plastic 'Tee-pieces' (Fig 1) in place of the screw lances on existing equipment, or to make up kits using polythene tubing connected to large volume press cylinders.

Figure 1.



Methods

13. As soon as symptoms appear, arrange for the tree to be injected. Curative injection is preferably carried out in July or early August. Later, autumn, treatments are less likely to succeed. The prescribed amount of the diluted chemical is fed under pressure through lances or tee-pieces inserted around the trunk at 15cm intervals. The nozzles are so aligned that the fluid is injected into the current year's growth ring.

The cost of Treatment

14. The chemical costs in the region of £110+VAT for a 5 litre pack (1996 prices). For curative treatment 300ml of chemical in 20 litres of water should be injected for every 30cm of trunk circumference (measured at breast height). The cost of the chemical for treating trees with girths of 1.0m and 2.0m will be £23.40 and £46.80 respectively. To this must be added the cost of labour for carrying out the operation.

Recommendations

15. Trees should only be injected under the following circumstances.

a) If the tree is more that 30m from other elms.
b) If disease symptoms have appeared after 1 July.
c) If the disease is at a very early stage (less than 5% of the foliage of the tree is yellowing).
d) If the wilting, yellowing and leaf fall is on twigs or branches at least 3m from the main stem.
e) If the tree is in an area where other diseased elms are absent or promptly removed, or are also receiving timely injection.

16. The smallest size of tree suitable for injection (because of the equipment used) is about 20cm girth at breast height.

17. THE INJECTIONS ARE UNLIKELY TO CONTROL THE DISEASE IF:

a) The symptoms appeared before 1 July (this would indicate that the tree was infected in the previous year and so the fungus would be too widely spread in it for control).
b) Much more that 5% of the foliage is showing symptoms.
c) The tree has been recently pollarded.
d) Symptoms have appeared on foliage within 3m of the main stem.
e) Infections have been from a neighbouring tree via the roots.

Conclusion

18. Experience to date suggest that the spread of DED within infected trees may be arrested by injections of thiabendazole (Storite Clear Liquid) provided that the disease is at a very early stage at the time of treatment and has resulted from beetle-initiated infection. No attempt should be made to treat severely diseased trees, trees infected through root transmission, or trees with carry-over infections form the previous year.

Before using a fungicide always read carefully the manufacturers instructions on the label (including any accompanying leaflet) and apply the chemical for the use, at the rate and by the method recommended paying particular attention to aspects of safety.

Reference

MAFF (1995). Notes of Approval 0990/95. *The Pesticide Register No. 8* p.37. Pesticides Safety Directorate, MAFF. HMSO, London)

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