A DISPOSABLE TRUNK AND ROOT-FLARE INJECTOR HEAD FOR LOW-PRESSURE INJECTION OF CHEMICAL SOLUTIONS INTO TREES

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ABSTRACT

A simplified, disposable, wooden injector head was developed for low-pressure (up to 20 psi) injection of water-soluble chemical compounds for the treatment of trees with Dutch elm disease. Field tests indicated that when the wooden injector heads were spaced at 6-in. (15.24-cm) intervals around the root flare the uptake rate was comparable to that of root-injected trees.

RÉSUMÉ

Les auteurs ont inventé une lance en bois, simplifiée, jetable aux rebuts ou ré-utilisable, autour de laquelle se bride le bout du tuyau d'un injecteur à basse pression (jusqu'à 20 psi), de composés chimiques en solution aqueuse pour le traitement des arbres atteints de la Maladie hollandaise de l'Orme (*Ceratocystis ulmi*). Les essais sur le terrain démontrent que lorsque les lances étaient espacées horizontalement de 6 po en 6 po (15.24 cm) autour du collet, le taux d'injection était comparable à celui de l'ancienne méthode (injections par les racines).

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COVER: Root-flare injection of mature elm employing wooden injector heads and a large-capacity injection reservoir.

INTRODUCTION

Various types of trunk and root-flare injector heads have been proposed and constructed for both high- and low-pressure injection of water-soluble chemical compounds for treatment of elms with Dutch elm disease (Schreiber 1969, Jones and Gregory 1971, Himelick 1972, Filer 1973, Helburg et al. 1973). To date, however, testing of most designs in the field has resulted in chemical leakage, injection of the chemical too deep into the sapwood, or excessive damage to the bark and cambium. It is essential that the chemical solution be introduced into at least the outermost annual growth ring to have any effect on *Ceratocystis ulmi* [Buism.] C. Moreau, the causal fungus of Dutch elm disease (Kondo and Huntley 1973). In this paper we describe a simplified injector head, made from a wooden dowel, which is disposable or reusable as desired.

DESCRIPTION OF CONSTRUCTION AND APPLICATION OF INJECTOR HEAD

Maple dowelling 3/8 in. (0.95 cm) in diameter is cut to lengths of 2½ in. (6.35 cm). A 5/32-in. (0.4-cm) hole (or larger) is drilled through the center of the dowel lengthwise, and both ends are slightly bevelled. The wooden injector heads are then sealed by dipping them into a paint sealer.

These simple disposable injector heads can easily be adapted to any type of injection reservoir by employing flexible plastic tubing attached with gear clamps. With proper-sized tubing and low injection pressures (10 psi) no gear clamp is required. For chemical injection into elms, a 3/8-in. (0.95-cm) hole is drilled to a depth of 2 in. (5.08 cm) into the xylem tissue. With live elm wood, a 3/8-in. (0.95-cm) drill makes a hole slightly smaller than the actual drill size, thereby ensuring a tight injector head fit into the drill hole. Care is taken to ensure that a smooth, clean hole is drilled. The injector head is then tapped into the hole with a hammer the full depth of the bark as shown in Figure 1. The dowel must not be tapped beyond this point, as it is essential that the chemical be introduced into the drilled "well" to ensure chemical distribution into the outer annual growth rings. A slight resistance will be felt when the end of the injector head reaches the outermost annual ring. In practice the injector heads become even more tightly held by the inner bark as the drill hole tends to shrink within a few minutes after being drilled. The plastic tubing is then clamped to the injector head. For adequate chemical coverage of the tree the injector heads must be spaced a minimum of 6 in. (15.24 cm) apart (Fig. 2) around the root flare of the tree. After chemical uptake is complete the injector heads are pulled out and the holes sealed with grafting wax. The injector heads can be reused or discarded.

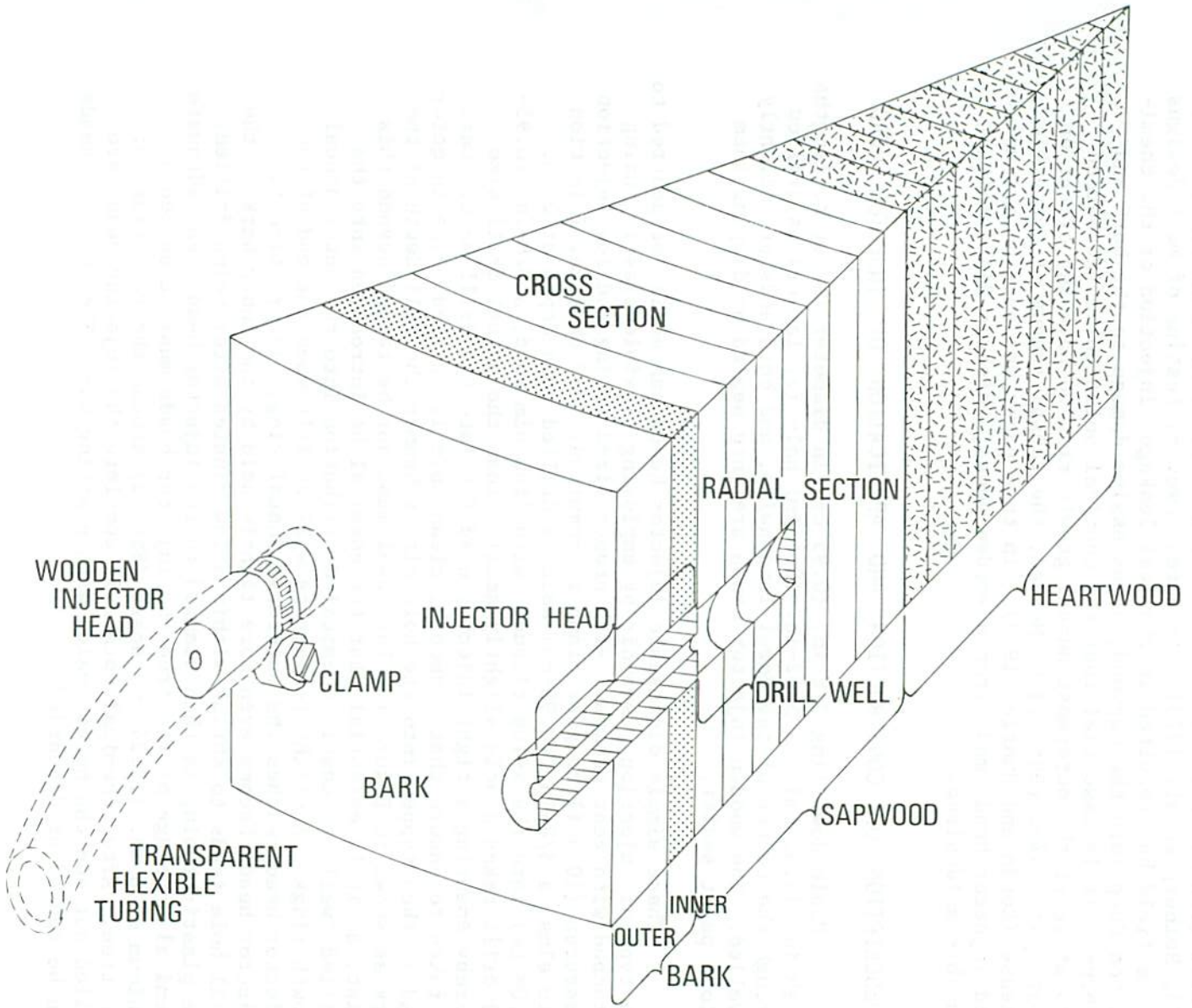

Figure 1. Radial section of portion of elm bark, sapwood and wooden injector heads showing position of heads with respect to the outermost annual growth ring.

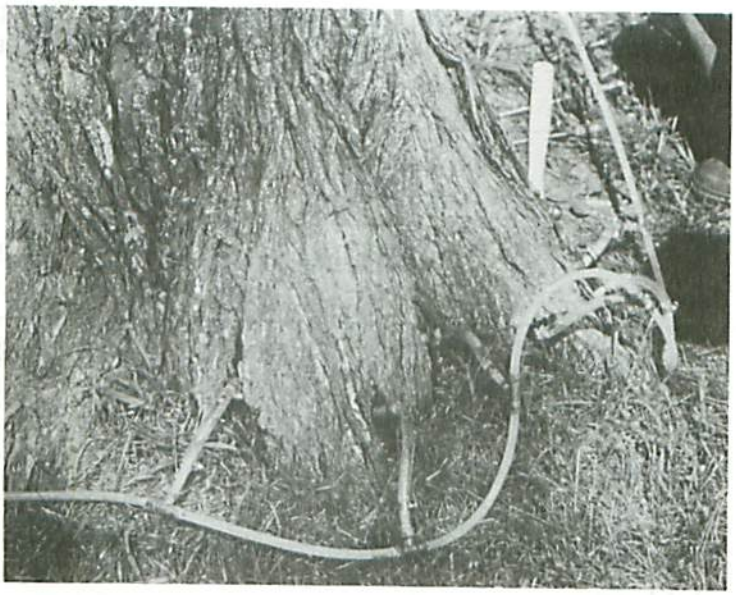

Figure 2. Closeup of root-flare injection employing wooden injector heads.

FIELD TESTS OF INJECTOR HEADS

The wooden injector heads have been field tested in approximately 250 trees, at injection pressures to 20 psi, without leaks. Normal injection pressure was 10 psi. The injection holes tend to heal more rapidly when wooden plugs are not inserted, the grafting wax providing adequate protection until callus tissue forms.

Initial observations indicated that, when the injection holes were spaced 6 in. (15.24 cm) apart, the rate of uptake for root-flare injection was comparable to the rate of uptake for root injection. This is illustrated in Table 1 where examples of elms of similar size, injected over equal periods of time with the two injection techniques, are compared. Studies are currently under way to determine whether chemical coverage with root-flare injection is comparable to coverage obtained through root injection (Kondo and Huntley 1973).

Table 1. A comparison of the rate of uptake of a 500 ppm MBC-P solution by a number of similar-sized elms using root and root-flare injection

DBH (cm)	Uptake rate (Liters/hour) Root injection	Root-flare injection (6-in.[a] spacing)	DBH (cm)
20.3	6.0	5.0	20.8
32.0	7.8	7.5	28.2
57.9	5.9	6.1	58.9
83.8	7.7	7.1	82.0

[a] 1 in. = 2.54 cm

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