THE WOUNDING EFFECTS OF MAUGET AND CREATIVE SALES INJECTIONS

by Arthur C. Costinis

Abstract. *This study evaluated the wounding effects of* Mauget and Creative Sales injection techniques in sugar maple. Wounds created by Mauget nutrient (Stemix) administered to the tree using either a drill technique or the insertion tool technique with injection sites at 4.5′ above ground level on the stem or at the stem/root buttress interface were compared. The injury resulting from the drill was less at both sites than the insertion tool. Medicap MD nutrient treatment had the highest wound rating. Selection of the correct injection site is critical to minimize the wound effect.

The use of systemic injection of chemicals into trees is being actively investigated (Anderson et al 1979, Campana et al 1979, Gibbs & Dickinson 1975). In a recent publication Shigo et al (1977) discussed internal effects of several Mauget products applied to the stem of the tree using the insertion tool method of injection. Wounds caused by the insertion tool alone induced negligible injury. This study sought to determine the difference in wounding effects that would result from the use of drill injection compared to an insertion tool. It further compared the wounding effects of the Creative Sales Medicap MD nutrient implant with the Mauget Stemix nutrient.

METHODS AND MATERIALS

Mauget Technology. *Drill Technique* — A battery powered drill with an 11/64″ diameter bit was used to make the injection hole 3/8″ deep into the xylem. A hollow aluminum feeder tube was inserted into the hole to which a capsule containing either Stemix (total nitrogen 0.7%, available phosphoric acid 1.0%, soluble potash 0.9%, copper 0.1%, iron 0.4%, manganese 0.1%, and zinc 0.4%) or distilled water was affixed. Treatments were about 5″ apart laterally either on the stem 4.5′ above ground or at the stem/root buttress interface at the soil line (Figure 1). Five trees were treated. Trees averaged 25′ tall, 6″ diameter and were about 25 years of age growing along an asphalt paved road.

Insertion Tool Technique — A feeder tube 3/16″ diameter was placed onto the penetrating pin of the insertion tool. The tube was then driven into the tree to a depth of 3/4″. A capsule containing either Stemix or distilled water was affixed to the tube. Hefferman (1968) published details of this method. Treatments were applied to the stem and root buttress area as described above. Five trees were treated. Trees averaged 25′ tall, 6″ diameter, and 25 years of age and were growing along an asphalt paved road.

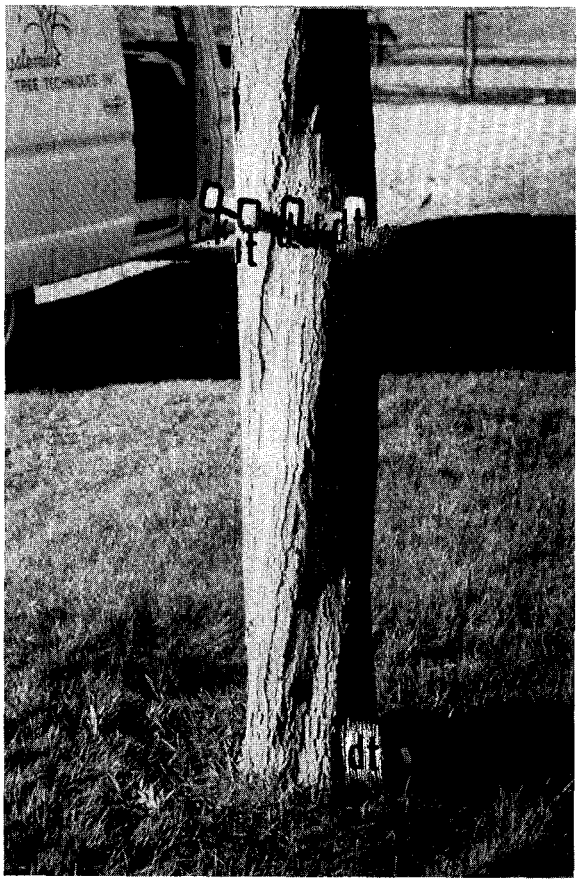

Figure 1. Experimental technique showing placement of treatments on each tree on stem at 4.5′ and at stem/root buttress interface. ICK = Insertion tool control; IT = Insertion tool treatment; DCK = Drill control; DT = Drill treatment.

Creative Sales Technology. A battery powered drill with a 3/8" diameter bit was used to drill a hole 1½" deep into the xylem. All treatments were conducted at the stem/root buttress interface spaced about 5" apart (Figure 3B). The following treatments were applied to each tree: (1) Medicap Experimental "T"; (2) Medicap Experimental "T" and Medicap MD (total nitrogen 12%, available phosphoric acid 4.0%, soluble potash 4.0%, iron 4.0%, manganese 4.0%, zinc 4.0%); (3) Medicap MD alone; (4) an empty Medicap capsule. Five trees were treated. Trees averaged 25' tall, 6" diameter, and 25 years old and were growing along an asphalt paved road.

All treatments were applied during May, 1978.

Wounds were rated 3 to 18 months after treatment by measuring the lateral death of tissues (LDT) involving phloem, cambium, and xylem. All results were the averages of two measurements taken at the edge of the cut surface measured at the widest points of lateral spread of discolored tissues.

1=LDT restricted to the diameter of drill bit or insertion tool.
2=LDT from 1-2 mm
3=LDT from 3-5 mm
4=LDT from 6-10 mm
5=LDT from 11-15 mm
6=LDT from 16-20 mm
7=LDT greater than 20 mm

The 18 month evaluation was made by actually cutting with chisels into the wounded area. Photographs of wounds were taken and selected specimens retained (Fig. 2).

RESULTS

Mauget Technology—Data are summarized in Table 1. The data demonstrated that the drill was less injurious to the tree tissue than the insertion tool whether the injection site was a 4.5' high or at the stem/root buttress interface. The average wound ratings for the drill and insertion tool with Stemix at 4.5' were 2.8 and 5.0 respectively. The wound rating at the stem/root buttress interface of the drill and insertion tool treatments with Stemix were 3.2 and 5.2, respectively. The wound rating of the drill and insertion tool techniques with water were 2.2 and 4.0 at 4.5' and 1.6 and 3.8 at the stem/root buttress interface, respectively.

Table 1. Wounds in sugar maples following treatment with Mauget technology.

Treatment[1]	*Wound rating*[3]	
Stem injection 4.5' above Soil Line	*3 Months*	*18 Months*
Stemix nutrient[2]		
Drill	*2.8*	*2.8*
Insertion tool	*5.0*	*5.0*
Water control		
Drill	*2.2*	*2.2*
Insertion tool	*4.0*	*4.0*
Stem/root buttress interface		
Stemix Nutrient		
Drill	3.2	3.2
Insertion tool	5.2	5.2
Water Control		
Drill	1.6	1.6
Insertion Tool	3.8	3.8

[1]Drill wound made with 11/64" diameter bit, 3/8" into xylem. Insertion tool wound made with 3/16" diameter steel rod driven to a depth of 3'4" into xylem.

[2]Stemix nutrient contains in a water base (total nitrogen 0.7%, available phosphoric acid 1.0%, soluble potash 0.9%, copper 0.1%, iron 0.4%, manganese 0.1% and zinc 0.4%).

[3]Wounds were rated on a scale of 1-7. 1=Lateral death of tissues (LDT) involving pholem, cambium and xylem restricted to the diameter of drill bit or insertion tool. 7=LDT greater than 20 mm. Average of 5 trees. (5 wounds/treatment. Total 40 wounds)

Creative Sales—Data are summarized in Table 2. The Medicap MD treatment caused injury with a wound rating of 6.0 (Figure 3-D). The Experimental "T" and Experimental "T" plus Medicap MD treatments had ratings of 5.2 and 5.4, respectively. The control wound had a rating of 3.8. In many of the Medicap MD treatments, 1/4 to 1/2 of the material remained undissolved in the capsule at the 18 month evaluation.

Table 2. Wounds in sugar maples following implants of Medicap MD.

Treatment[1]	*Wound Rating*[2]	
	3 Months	*18 Months*
Implant at stem/root buttress interface		
Experimental "T"	4.2	5.2
Experimental "T" and Medical MD	4.4	5.4
Medicap MD	5.0	6.0
Control (Empty Medicap MD Capsule)	2.8	3.8

[1]Creative Sales implants were made using a 3/8" diameter drill to a depth of 1.5" into the xylem. Medicap MD contains in dry formulation (Total nitrogen 12.0%, available phosphoric acid 4.0%, soluble potash 4.0%, iron 4.0%, manganese 4.0% and zinc 4.0%).

[2]Wounds were rated on a scale of 1-7. 1=Lateral death of tissues (LDT) involving pholem, cambium and xylem restricted to the diameter of drill bit or insertion tool. 7=LDT greater than 20 mm. Average of 5 trees. (5 wounds/treatment. Total 20 wounds)

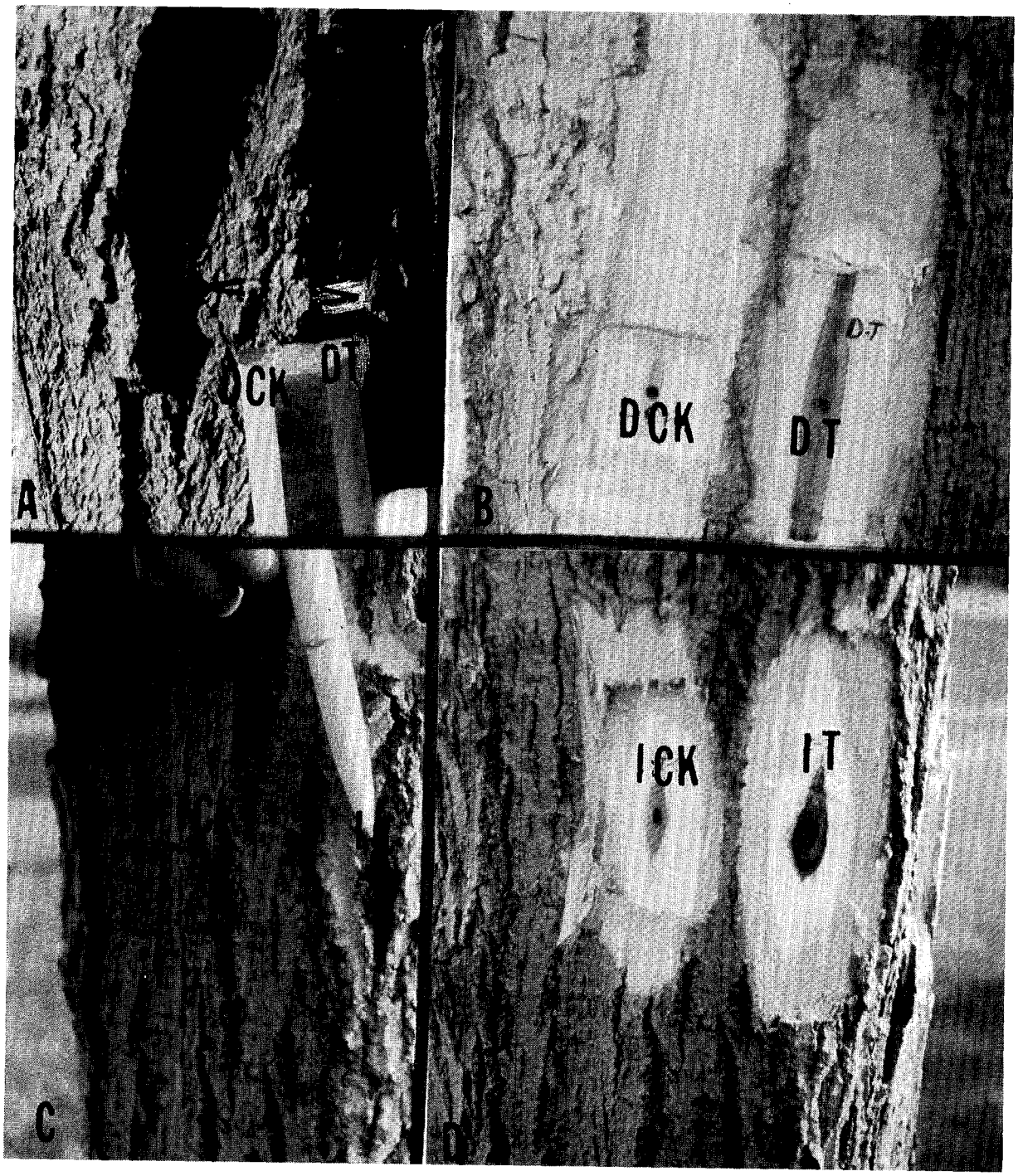

Figure 2. Effects of treatments 18 months later showing the external (A and C) and the internal (B and D) effects of the treatments made by either the insertion tool (C and D) or the drill (A and B). DCK = Drill control; DT = Drill treatment; ICK = Insertion tool control; IT = Insertion tool treatment.

DISCUSSION

Drill and insertion tool technology—Shigo et al (1977) reported that the insertion tool wound alone created negligible damage to the tree. The addition of chemicals into the wound, however, increased injury. There was also an increase in the amount of injury recorded in this study, whether the drill or insertion tool was used, when Stemix or MD was introduced into the wound, compared to the water control. It is postulated that the increase in injury resulted from the amount of contact time of the undiluted chemical with the tissues at the injection site. In a recent study (Costonis, 1979) it has been shown that the absorption of Stemix from the stem/root buttress interface was about ten times as rapid from a drill wound as from the insertion tool wound. Any technique that reduces contact time will reduce the injury. The drill cuts a clean shallow hole exposing evenly cut vessel ends which can absorb and rapidly translocate the chemical away from the injection site. The insertion tool displaces tissue by a compressing action which tears and ruptures the tissue which partially plugs the wound. This increases the time the undiluted chemical is in contact with the tissues at the wound site, resulting in more injury. The amount of injury created by the drill was about one-half that created by the insertion tool. The drill allows the technician to control depth of the wound and observe the vitality and composition of

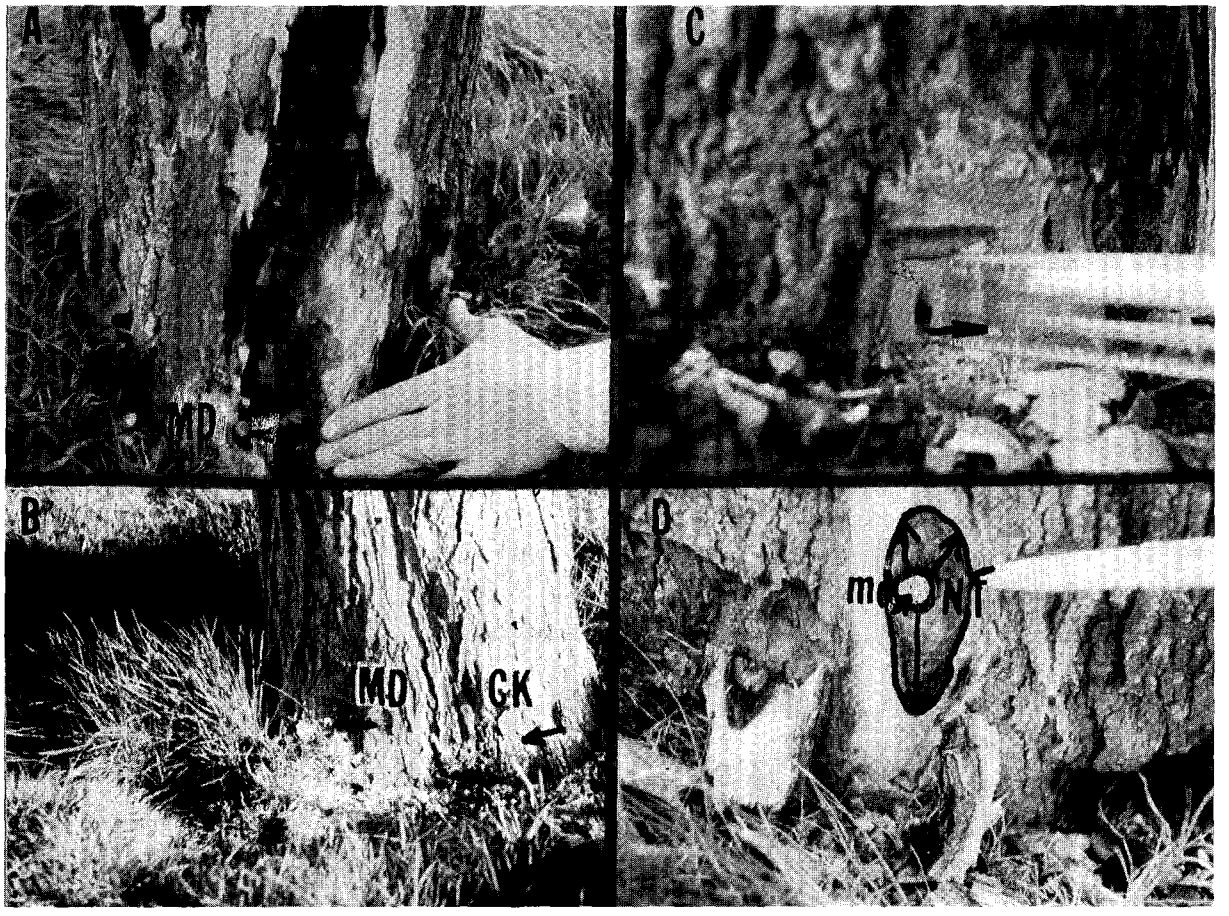

Figure 3. Effects of Creative Sales MD nutrient treatment. A. After treatment. MD capsule placed in weak tissue accelerated death and increased injury. B. Onset of treatment. MD capsule in place. C. New wood laid down 18 months after treatment. Approximately 1.5′ of new south wood. D. After treatment. Necrotic tissue (NT) emanating away from capsule of MD fertilizer.

the tissues into which the bit penetrates. This is not possible with the insertion tool because as the tool is driven into the tree all tissues are displaced into the tree.

Comparison of Stemix and Medicap MD treatments. The elements in the Mauget water based formulation of Stemix are less concentrated than the Creative Sales Medicap MD. The wound rating of the Creative Sales treatment is about twice that of the Mauget drill treatment; 6.0, 3.2, respectively. The area of tissue involved is less with the Mauget drill method in which a smaller wound is created. The injury following Mauget treatment ceased at 3 months while the Medicap MD injury continued to increase through the 18-month test period.

More injury resulted from the Creative Sales technology because of the overall size of the initial wound and the high concentration of the elements in the Medicap formulation. The plastic capsules themselves which are left in the tree can lead to effective infection sites for bacteria and/or fungi when the wounds remain exposed (Figure 3-D). Another two growing seasons will be required before a final evaluation can be made on the wounds created by this technique.

Correct injection technique — If a weakened portion of the tissue is selected for the injection site, the death of that tissue is greatly accelerated as a result of the treatment. The extent of the increase in necrosis will be a function of the chemical, its concentration, and its formulation. It is possible to cause more injury to the tree with improper treatment than would result from the problem being treated (Figure 3-A). Several investigators have discussed the injurious effects of improper technique and chemicals injected into trees (Anderson 1979, Campana 1979, Shigo et al 1977).

The Mauget Stemix fertilizer was tolerated by the tree's tissues as evidenced by complete closure of the wounds when correct injection techniques were made in sound wood. As much as 1.5" of new wood has been produced over many injection sites in the 18 month test period (Figure 3-C). If injections such as these are spaced over a three- to five-year period, there should be little concern for injury resulting from these injections.

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