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INJECTION SITE WOUNDING WHEN USING PLANT GROWTH REGULATORS[1]

by John A. Bieller

Abstract. Based on results of field examinations of over 800 trees injected with plant growth regulators, this utility has decided not to include plant growth regulators in our line clearance tool kit. Although the chemistry appears to be generally effective at growth regulation, delivery system side effects show damage to the tree which outweighs derived benefits from use of these materials.

Résumé. Basé sur des résultats d'examens sur le terrain de plus de 800 arbres injectés avec des régulateurs de croissance, cette entreprise de service public a décide de ne pas inclure de régulateurs de croissance dans notre équipement de dégagement des réseaux électriques. Bien que la chimie semble être généralement efficace dans la régulation de la croissance, les effets sur la source du système de distribution montrent des dommages à l'arbre qui pèsent plus que les bénéfices dérivés de l'utilisation de ces matériels.

Studies in recent years by chemical companies and utilities have shown that plant growth regulators (PGR) should be considered as a possible means to reducing the cost of right-of-way maintenance. While cost and product effectiveness have been demonstrated, little study on how the trunk injection method of chemical delivery may be of greater detriment to the health of the tree than derived cost: benefit has been offered. Field studies show that acceptance of the trunk injection method of chemical delivery may be in direct conflict with studies of recent years demonstrating wound compartmentalization of trees.

Materials and Methods

Plant growth regulators used by Union Electric in field studies were: paclobutrazol (Clipper®), uniconazol (Prunit®), and flurprimidol (Cutless®). Arborchem 3-point injectors were used for all injections.

Based on the species and size of tree involved, a specified number of holes were drilled in the tree to accomodate the injector nozzles or probes. This is somewhat similar to the Mauget system ex-

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cept the holes are deeper and the material is forced into the tree with CO_2 pressurization. These holes were drilled at a 45° angle to a depth of about 2½". The injection probes were inserted and the product pressurized into the tree. Typically, the process takes less than 5 minutes for a tree of about 15" dbh.

All products are labeled for trunk injection with the same process used for each.

Results and Discussion

Five years of testing PGR's have shown that although we are getting close to accurate on dosage and injection timing, the trunk injection process itself may not be the best delivery system. Problems observed externally and internally at the injection site have included wound weeping where drilled, trunk splitting above and below the injection site, wound compartmentalization extending from root flare to crown, and ring shake or internal separation of the growth rings. Problems not associated with the injection process itself have been unpredictable growth of occasional sprouts in a treated tree (also called fly-aways or escapes) and delayed bud break that could cause a problem aesthetically.

The problems of uncontrolled growth on sprouts and late bud break can possibly be resolved with additional time and study, leaving only the injection method for concern. Five trees cut down and examined at the University of Missouri School of Forestry indicate that the trees were wounded from the injection site down into the root flare and up into the crown. The compartmentalized wood was directly attributed to the drill wound and subsequent PGR injection. Trees compartmentalize in response to an injury. Inability to determine the boundaries of the wound during future re-injections will assure damage to some of the compartmentalized areas, resulting in a spread of the decayed/rotten wood.

Trunk splitting above and below some injection sites indicate that the cambium is somehow being injured during the injection process. These splits may become quite large as tree circumference expands in successive years. Close attention was paid to angle, depth of hole and lack of drill movement in considering the injection process. To assure that tolerances were maintained all work was done by Union Electric foresters or chemical company representatives.

Weeping or fluxing was observed at the site of the injection holes of several of the treated trees. Some have continued to weep for two or three seasons following treatment. One obvious drawback is aesthetic in nature, since the weeping stains the trunk a lighter color. The other problem with fluxing or weeping is that in order for a tree to do this, bacteria are usually present. Although we have not cultured for bacteria, this type infection would serve to weaken the tree, reduce its longevity, and offer the possibility of drills and probes vectoring the bacteria from tree to tree.

Ring shade (internal separation of growth rings) was noted on 2 of the 5 trees cut down. The separation of wood appears to have been caused by the injection process either due to pressure or liquid volume. It is not known how extensive this problem is, but field observations should now include ring shake as possible injection damage.

Although the visible problems were not present on a large percentage of the treated trees, they do exist with a persistent regularity. Our studies indicate that the problems exist in a large percentage, if not 100%, of the treated trees. The use of PGRs to effectively reduce the cost of line clearance operations is a goal worthy of continued study. Systematic, intentional wounding of trees to achieve this goal is not the direction Union Electric has chosen.

Future studies of PGRs should include exploration of alternate, non-invasive delivery systems that will allow chemical delivery with no adverse physiological damage to the tree. The addition of a qualified, neutral third party, to collect and evaluate field results would assure standardized, observed field data. The current process of having only the utility and chemical companies involved does not allow for direct, unbiased data collection.

Clipper® is a registered trademark of Imperial Chemical Industries PLC.
Prunit® is a registered trademark of Sumitomo Chemical Company Ltd.
Cutless® is a registered trademark of Elanco Products Company.

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