in inducing lateral branching and controlling vegetative growth, resulting in an attractive, compact plant. Use of mefluidide in a potted hibiscus production program could overcome the need for hand-pinching and growth retardant application.

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Trunk Injected Ethephon as a Potential Harvest Aid Mechanism for Pecans

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Additional index words. *Carya illinoensis*, ethylene, shuck disorders

Abstract. **Ethephon was trunk injected into the transpiration stream of pecan trees 10 to 21 days before shuck split in an attempt to expedite shuck opening in 1983. Ethephon concentrations were based on the estimated amount of water flowing through the tree per day. At College Station and Hondo, Texas, a 10 ppm injection significantly increased shuck opening. Leaf drop was only 35% at 10 ppm compared to much higher leaf drop in previous research. There was no difference in number of nuts set and the extent of limb dieback between the control trees and those trunk injected with 10 ppm ethephon. At Ft. Stockton and Midkiff, Texas, injections of 10, 20, and 40 ppm increased nut opening and early leaf drop, but reduced fruit set in the following year (1984). There was no limb dieback at these locations. Injections of trees in El Paso failed to cause shuck opening.**

A shuck disorder known as "sticktights" causes serious problems in pecan orchards throughout Texas. The sticktight phenomenon is a condition in which the kernels are healthy, but the shucks fail to open. Sticktights should not be confused with shuck dieback, a physiological disorder associated with 'Success' (2), or stem end blight, a fungal disease caused by *Botryosphaeria ribis* (7). Sticktights have been reported to occur from early August through November. Nuts affected early in the season drop from the tree. Nuts affected later remain on the tree and fail to form abscission layers at the shuck sutures.

Studies using foliar ethephon have shown erratic amounts of abscission and response time after treatment (5, 8). Abscission is dependent on the environmental and physiological conditions at the time of ethephon application (1, 4, 6). Ethephon activity accelerates in warm weather and decreases in cool weather (1). Field trails with foliar treatments in Texas have resulted in both leaf and fruit abscission with no apparent separation of the 2 responses. However, according to Kays et al. (3) pecan tissue exposed to exogenously applied ethylene varied in sensitivity to the gas. Shuck opening was most sensitive, followed by leaf abscission, then fruit peduncle (3).

Lavee and Martin (5) have suggested that the uptake and effect of ethephon has been rather erratic or unpredictable with limited translocation and localized responses to the chemical. This poor response could be because most applications have been made foliarly.

Ethephon might be used as a harvest aid to avoid this shuck disorder. Trunk-injected ethephon also could be used to control harvest dates, facilitate mechanical harvest, and avoid freeze injury of the shucks surrounding the nuts on the tree. Freeze damaged shucks do not respond to endogenous abscission stimuli.

An attempt was made to induce early shuck opening on pecan without leaf abscission and to avoid uptake problems. Ethephon was placed in the transpiration stream by injection into the secondary xylem. Evaporation data from the National Weather Service was used to estimate the amount of water moving through the trees on the day of injection. An ethephon concentration of 10 ppm was injected into the trunks.

Bearing pecan trees with a canopy of 4.6 to 6.7 m and a cross sectional trunk diameter of 15.24 to 17.78 cm were used in this study. Four 7.9 mm diameter holes, evenly spaced around the tree, were drilled 38 to 50 mm deep in to the trunk 102 to 152 mm above the soil line. Plastic trunk injection trees attached to a polyethylene hose and a hand operated spray pump delivered the ethephon solution in one to 3 hr. Treatments were made 10 to 21 days prior to normal shuck opening. Nontreated nuts opened about 3 weeks after treatments were made. Treatments were evaluated for number of shucks open (the number of shucks out of 100 tagged nuts that were open), percentage of leaf drop (visual subjective rating of each tree), return set,

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and limb dieback in 1984.

Trunk injections of ethephon made to 5 single tree plots, 2 at Hondo and 3 at College Station, at 10 ppm, significantly increased shuck opening over the control trees (Table 1). Control trees set more nuts in 1984 than did treated trees but not significantly more. Limb dieback was proportional to the concentration of ethephon injected. Nut quality was similar for all samples.

Injections then were made to trees at Fort Stockton and Midkiff, Texas, 400 to 650 miles west of the first treatment area. Concentrations were reduced due to severe leaf drop at high concentrations. At 10, 20, and 40 ppm, 97% of the shucks opened. Leaf drop was higher on treated trees than on control trees. Control trees set more nuts in 1984 than did treated trees: however, no limb dieback occurred at any of the injection rates.

Injections at El Paso, Texas, failed to cause shuck opening. The lack of shuck opening in El Paso may be the result of higher altitude than the other test areas which allows lower night temperatures. Leaf drop, however, occurred proportional to the ethephone concentration used. At El Paso the injections were made before the shuck had separated completely from the nut. It is thought that this separation must be complete prior to ethylene injection in order for early shuck opening to occur.

Further work will be needed to determine safe concentrations of ethephon, volumes of water to use as a carrier, and injection dates relative to shuck/nut development.

These results show promise toward using trunk injected ethephon as a pecan harvest aid mechanism.

Table 1. The influence of trunk injected ethephon on pecan trees[z] in 1983 at College Station and Hondo, Texas.[y]

Treatment (ppm)	Shuck opening (%)	Leaf drop (%)	Return set in 1984 (%)	Limb dieback in 1984[y] (%)
0	28.0 b[x]	0.0 b	16.0 a	2.6 a
10	85.2 a	35.0 a	2.0 a	5.8 a

[z]Mean of 5 single tree plots, 2 at Hondo and 3 at College Station.
[y]One-two m dieback in the top of the tree.
[x]Means separated by Duncan's multiple range test, $P = 0.05$.

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Preemergence Herbicides for Radishes Grown on Organic Soils

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Additional index words. *Raphanus sativus*, weed control

Abstract. **Three studies were conducted to evaluate preemergence herbicides for weed control efficacy and crop tolerance in radishes (*Raphanus sativus* L.) grown on organic soils. Herbicides evaluated were CDEC, metolachlor, alachlor, pendimethalin, thiobencarb, propachlor, metribuzin, and pronamide. Control of both broadleaf and grass weed species was provided by most herbicides evaluated with little or no apparent visual loss in crop vigor except mebribuzin. Weed control efficacy was reduced during the 2nd study due to excessive rainfall. Weedy and hand-weeded checks consistently produced some of the highest yields, indicating possibly some toxicity to the crop due to herbicide treatment or an apparent lack of weed competition. Chemical names used: 2-chloroallyl diethyl-dithiocarbamate (CDEC); 2-chloro-*N*-(2-ethyl-6-methylphenyl)-*N*-(2-methoxy-l-methylethyl)acetamide(metolachlor); 2-chloro-*N*-(2,6-diethylphenyl)-*N*-(methoxymethyl)acetamide (alachlor); *N*-(1-ethylpropyl)-3,4-dimethyl-2,6-dinitro benzenamine (pendimethalin); *S*-[(4-chlorophenyl)methyl] diethylcarbamothioate (thiobencarb); 2-chloro-*N*-isopropylacetanilide (propachlor); 4-amino-6-tert-butyl-3-(methylthio)-as-triazin-5(4H)-one(metribuzin), and 3,5-dichloro(*N*-1,1-dimethyl-2-propynyl)benzamide (pronamide).**

About 55% of the radishes marketed in the United States from Oct. 1983 to June 1984 were produced in Florida (1). The crop value during that time was estimated to be greater than $25 million (1). Florida radishes are exclusively produced on high organic matter or muck soils. No herbicides are currently available for use in radish production, although weed control is thought to be a major problem. The situation is complicated because the activity of preemergence herbicides is very often reduced by increased organic matter content of the soil (5).

Limited information is available on weeds, competition, or chemical weed control in radish production. Producers consider some weed control necessary because weeds act as hosts for diseases and insects as well as interfere with machine-harvesting procedures. Hand removal is expensive and impractical. The objectives of the present studies were to determine: 1) the efficacy of selected preemergence herbicides for controlling weeds in radishes produced on muck soils; 2) the possible toxicity of these herbicides to radishes; and 3) the optimum herbicide rates for maximum weed control and radish yields on muck soils.

Three experiments were conducted during 1981-1983 in Belle Glade, Fla. Radishes were planted each year on Pahokee muck, a euic hyperthermic lithic medisaprist, according to grower practices (6). The cultivars 'Red Prince' and 'Red Devil' were planted in 1981 and 1982, and 1983, respectively. Plots were

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