cally. Use of arsenical compounds on citrus other than grapefruit could complicate the enforcement of the arsenical and maturity laws by the Florida Department of Agriculture.

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A COMPARISON OF HERBICIDE, MECHANICAL TREE HOE, AND FLAMING TREATMENTS IN A 2-YEAR WEED CONTROL EXPERIMENT

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ABSTRACT

A weed control experiment was conducted for 2 years on 3-year-old 'Duncan' grapefruit trees growing on Lakeland fine sand. The methods compared were flaming, mechanical tree hoeing, and herbicide treatments including different rates of diuron, terbacil, paraquat, dichlobenil, and trifluralin.

There were no significant differences in trunk circumference growth between treatments even though the range of average weed control varied from 29% for the mechanical tree hoe to 84% for dichlobenil at 3 lb/A. No significant differences between treatments existed in fruit yield and juice quality.

Generally, flaming was the most expensive method of weed control while the mechanical tree hoe was the least expensive. Estimated cost per treated acre per year (excluding supervisory and intergrove transportation costs) ranged from $21.00 for the mechanical tree hoe to $152.00 for the flame hoe at 2 mph.

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INTRODUCTION

The first herbicides evaluated and recommended for use in Florida citrus were diuron and simazine for the preemergence control of broadleaf weeds and annual grasses and dalapon for the control of perennial grasses (1, 2). The substituted uracils, terbacil, and bromacil were evaluated by Ryan (3) and were found to give satisfactory control of perennial grasses. At present, there are 6 preemergence herbicides recommended for use. These are diuron, simazine, terbacil, bromacil, dichlobenil, and trifluralin.

The 2-year experiment reported here was designed to evaluate 4 of the above herbicides, namely, diuron, terbacil, dichlobinil, and trifluralin and 2 other weed control methods, mechanical hoeing and flame hoeing, the latter described by Whitney (5). The objective of this study was to compare the effectiveness of different chemical

and nonchemical methods of weed control as determined by:

1. The frequency of application necessary to maintain a satisfactory level of weed control.
2. The tolerance of the various weed species present.
3. The existence of any toxicity effects or physical damage to the tree.
4. Effects on tree growth, fruit yield, and quality.
5. The estimated cost of each treatment.
6. The overall feasibility of each treatment in terms of a commercial weed control program.

Materials and Methods

The experiment was initiated in 1968 in a grove of 3-year-old 'Duncan' grapefruit trees on rough lemon rootstock planted in a 25 foot by 25 foot spacing on Lakeland fine sand. Fourteen treatments were replicated 4 times with 4 trees per plot and one buffer tree between plots.

The treatments (Table 1) compared were flame hoeing at 2 and 3 mph at 2 application frequencies; diuron at 6 lb./A and 3 lb./A; diuron at 3 lb./A + paraquat at 0.5 lb/A; terbacil at 4 lb/A and 2 lb./A; terbacil at 2 lb./A + paraquat at 0.5 lb./A; dichlobenil at 6 lb./A and 3 lb./A; and trifluralin at 1 lb./A and 0.5 lb./A. The trifluralin rates were increased to 1 and 2 lb./A after the second application. Both dichlobenil and trifluralin were mechanically incorporate into the soil. Treatments were applied in continuous strips 5 feet wide on both sides of the trees.

Equipment used included a 5 foot in-and-out mechanical hoe, a flame hoe, and a commercial Myers applicator delivering 114 gpa at 2 mph and 40 psi nozzle pressure.

Plots were evaluated at 1-month intervals for weed control on the basis of percent of bare ground present (0=no bare ground; 50—50% bare ground; and 100=100% bare ground). At monthly intervals, a check was made on the weed species present, noting particularly any changes in the prevalence of particular species following treatment. In general, treatments were reapplied whenever bare ground ratings fell below 70%.

Tree trunk circumferences were measured 4 inches above the ground at the start of the experiment and then after the first and second year as a record of tree growth.

Tree foliage was observed periodically for signs of herbicide toxicity symptoms and the trunks were examined for any physical damage caused by the equipment.

In the final year of the experiment, limited data were recorded on fruit yield, percent Brix, percent acid, and Brix/acid ratio.

Costs of each treatment were estimated by using the present cost of the materials, the fixed and variable costs of the equipment, and the current labor charges.

The following species were recorded in the experimental area during the period of the experiment: common ragweed (*Ambrosia artemisiifolia*); Spanish needles (*Bidens bipinnata*); horseweed (*Erigeron canadensis*); cudweed (*Gnaphalium* sp.); camphorweed (*Heterotheca subaxillaris*); pepperweed (*Lepidium virginicum*); nutsedge (*Cyperus* sp.); spurge (*Euphorbia* sp.); bermudagrass (*Cynodon dactylon*); crabgrass (*Digitaria* sp.); Florida beggarweed (*Desmodium tortuosum*); evening primrose (*Denothera* sp.); Florida pusley (*Richardia scabra*); black nightshade (*Solanum nigrum*); blue toad flax (*Linaria canadensis*); jerusalemoak (*Chenopodium botrys*); lambsquarters (*Chenopodium album*); pigweed (*Amaranthus* sp.); and teaweed (*Sida acuta*).

Results and Discussion

Weed control and tree growth.—Effects of the treatments on weed control and on tree growth are shown in Table 1. Based on the F test (.05 level) from a statistical analysis, there were significant differences in percent weed control between treatments. However, no significant differences (.05 level) in percent tree growth existed between treatments.

Comparisons in weed control between the flame hoe (Treatment 1) and the mechanical hoe (Treatment 3) are shown in Figure 1. A total of 36 applications was made with a flame hoe, while the mechanical hoe was used only 6 times, which was less than the number actually desired because of the difficulties encountered in securing the equipment. The mechanical hoe applications produced drastic reductions in weed population for a short period, whereas the flame hoe applications held the weed population at a more constant level. The average percent weed control with the mechanical hoe was significantly less than that for all other treatments (Table 1). The flame hoe provided satisfactory weed control