Cultivar Desirable 0.4 47.2

Gloria Grande 125 80.6

Table 1. Freeze injury of pecan trees in the nursery and in the orchard as a function of trunk type, Voigt Nursery, Waycross, Georgia, winter 1976-1977.

Trunk type Cultivar No. of trees examined Trees with freeze injury (%)
Juvenile Gloria Grande 125 Nursery 0.8
Non-juvenile " " 106 47.2
Juvenile Sumner 700 0.4
Non-juvenile " " 211 80.6
Juvenile Desirable 33 Orchard 6.1
Non-juvenile " " 115 46.9

*At the soil line.


Glyphosate Injury Symptom Expression in Citrus

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Abstract. Citrus trees to which glyphosate (N-phosphonomethylglycine) was intentionally applied at 1.7, 3.3 and 6.6 kg/ha exhibited varying degrees of toxicity depending on tree age, location on tree sprayed, tissue maturity, and application rate. Symptoms included defoliation, twig dieback, malformed regrowth and callus inhibition around wound areas sprayed with glyphosate. While translocation from sprayed limbs was minimal, it was quite marked in citrus seedlings. (5). The formulation, containing 359 g/liter of the acid glyphosate, has the trade name Roundup. All rates are reported as the acid equivalent. In addition to the required efficacy, residue, and other pertinent supportive data, extensive phytotoxicity information has been gathered in support of registration. A clear understanding of such phytotoxic effects is essential for the safe and effective glyphosate use in citrus weed control. This paper reports observations made during tests conducted to determine the range of symptom expression on citrus arising from foliage, branch, and fruit exposure to herbicidal concn of glyphosate. In greenhouse tests the lower 15.0 to 20.0 cm of citrus rootstock seedlings (30.4 to 45.7 cm height, 0.6 cm diam) of rough lemon (C. jambhiri Lush.), sour orange (C. aurantum L.) and ‘Carrizo’ citrange (C. sinensis L.) Osbeck x Poncirus trifoliata Raf.) were sprayed with glyphosate at 1.7 and 3.3 kg/ha. Twelve seedlings were used for each treatment including the unsprayed controls. Leaves that developed following treatment were abnormal, exhibiting strap- and sometimes cup-shaped form, demonstrating translocation of glyphosate in the plant (Fig. 1). While some yellow veining on the foliage and twig dieback occurred in the ‘Carrizo’ citrange seedlings, no such symptoms appeared on the others. Many lower leaves of all seedlings receiving the spray, especially the 3.3 kg/ha rate, abscised. Buds of ‘Pineapple’ sweet orange were inserted 9.0 cm above ground level into 24 similar size rough lemon seedlings, the stems of 12 having been sprayed with glyphosate at 3.3 kg/ha one week previously. Within a period of 7 to 10 days gum was observed exuding from under the budding tape in all treated seedlings, while the unsprayed seedlings displayed no such reaction. After 3 weeks buds were unwrapped. The majority of buds in the sprayed plants were discolored or dead and showed no callus formation between the bud and stock. Growth from surviving buds was stunted and the leaves malformed (Fig. 2). Similar observations were made on seedlings budded 1 day or 1 month following spraying. Buds on all unsprayed seedlings exhibited normal development. To determine the response of citrus
Glyphosate at 3.3 and 6.6 kg/ha was applied to single whole limbs of 3-year-old ‘Valencia’ orange trees with 9 replicate trees. At 7 and 14 days after treatment, sprayed limbs were removed at their point of origin from 3 trees for each treatment rate while limbs from 3 trees were left intact. As in previous tests, the toxicity was related to the application rate and tissue maturity. Observation over a 12-month period showed that there was little or no appreciable glyphosate movement into adjacent areas of the trees from limbs remaining intact or those removed at either time interval. Leaves on new growth from sprayed limbs were abnormally shaped indicating glyphosate movement into the terminal bud.

To determine the extent of glyphosate uptake by roots based on foliage symptom expression, the herbicide was applied to 3 separate groups of young bearing orange trees 3 times over an 18-month period at 3.3, 6.6 and 13.5 kg/ha respectively as 19 liter soil drenches. During and following the treatment period the trees showed no glyphosate toxicity as expressed by abnormal foliage development, and no reduction in the growth flush frequency.

Careless sprout removal on nursery stock and young grove trees frequently results in ruptured bark on the stock parent. Glyphosate’s influence on callus formation around such wounded areas was determined by applying the herbicide at 3.3 and 6.6 kg/ha to the trunks of 3-year-old orange trees from which 4.0 cm² bark patches had been removed above the bud union. Each rate was applied to wound areas on opposite sides of 4 trees at periods of 0, 24 and 72 hr following bark removal in March, 1976. Control trees were wounded in a similar manner but received no glyphosate. Trees were observed for wound callus development and rated 5 months later. The area within the patch which remained free of callus development was measured in mm². All treatments resulted in significantly less wound callus development than the unsprayed controls (Table 1). While callus development was inhibited initially on sprayed trees, it formed more rapidly with time as the influence of glyphosate declined. The time of spray application after wounding was also significant, with the greater inhibition of callusing
Effect of Fall-applied Boron Sprays on Fruit Set and Yield of ‘Italian’ Prune

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Abstract. Boron sprays applied in the fall to ‘Italian’ prune trees (Prunus domestica L.) not deficient in boron resulted in a significant increase in fruit set and yield the following year. Analysis of midshoot leaf tissue the August following treatment showed no differences in boron content. These data indicate a possible transitory need for boron during the floral development and fruit set processes in ‘Italian’ prune which cannot be diagnosed by traditional leaf analysis.

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Erratic fruit set has historically been a problem on the ‘Italian’ prune in Western Oregon resulting in a serious decline in the industry. In an attempt to overcome poor fruit set due to blossom blast in pear, Batjer and Thompson (1) applied boron sprays during the bloom period which resulted in reduced blossom blast and increased fruit set. In a later report Batjer et al. (2) indicated that this response was due to the prevention of incipient boron deficiency and that both fall and spring sprays were equally effective in reducing blossom blast. Blossom blastlike symptoms have not been observed in the ‘Italian’ prune in Oregon and erratic set occurs in trees with adequate levels of boron nutrition. Thompson and Liu (4) found that erratic set in ‘Italian’ prune was due to genetically determined sensitivity to