

## The Effects of Selected Herbicides on Propagation of Chestnut Oaks in Containers.

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Chestnut oak, *Quercus prinus*, is a medium-sized tree native to poor, dry, upland, and rocky soils from southern Maine to South Carolina and Alabama. The acorns are sweet and highly prized for wildlife food, while the bark is rich in tannin (Dirr, 1983). With the introduction of deep containers for tree production the trend has shifted to seed propagation in containers. Propagation in containers allows year-round production and reduces transplanting shock when transplanting to the field.

Because of increasing hand labor cost, many people are using herbicides to control weeds in seed beds. South (1984) reported nurseries in the past have relied upon fumigation with methyl bromide for weed control. Herbicides are an alternative to soil fumigation.

Graunke and Goun (1983) tested several herbicides with mixed results on northern red oak, black walnut, loblolly pine, dogwood, and tulip poplar. Devrinol and Modown applied in combination reduced population and growth of dogwood and tulip poplar, and Ronstar reduced population and growth in tulip poplar. Geyer and Long (1991) tested several herbicides on the seeds of black locust, honeylocust, and Kentucky coffee tree. Lasso, Lorox, Surflan, and Dacthal were not harmful to Kentucky coffee tree. Only Lasso, Dacthal, or the combination were safe on black locust

In a similar test (Warmund, et al., 1980) with the same 3 species in containers, the following herbicides were evaluated Lasso, Dacthal, Enid, EPTC, Devrinol, Surflan, and Ronstar. EPTC and Ronstar caused reduction in survival of Kentucky coffee tree and reduced the survival and growth rate of honeylocust. Black locust survival and growth rate was affected by Lasso, Enid, Devrinol, and Surflan.

Little information is available on herbicide use with container trees grown in a soilless potting medium. The objective of this study was to evaluate the effect of several herbicides on germination and growth of chestnut oak in tree containers.

### MATERIALS AND METHODS

Chestnut oak acorns were gathered on 24 October 1990, placed in plastic bags and maintained at 38°F. On 12 December acorns were sown in 3 5/8 × 6 in. band tree pots 1 1/2-in. deep in a pine bark-sand potting medium (6:1, v/v), amended with 5 lb of dolomitic lime and 1.5 lb of Micromix per cu yd.

Plants were treated with 9 herbicides at their recommended rates: Southern Weed Grass Control 2.68G, Ronstar 2G, Rout 3G, Gallery 75DF, Devrinol 5G, Devrinol 50WP, Snapshot 2.5TG, Dimension 1G, and Treflan 5G.

These herbicides were applied at three different stages of growth. The first application was before emergence of the seedlings (preemergence, 17 December); second application was after oak emergence when the first true leaves began to unfold and expand (early postemergence, 22 January); and the third application

was when the first true leaves had matured (late postemergence, 21 February). Mature leaves were defined as fully expanded, with a waxy cuticle, and reduced leaf pubescence. Granular herbicides were applied with a hand-held shaker, Devrinol 50WP and Gallery 7SDF were applied with a CO<sub>2</sub> backpack sprayer at a rate of 20 GPA.

The experimental design was a randomized complete block with 5 replications of 5 plants each. Trees were grown in a double polyethylene greenhouse and watered as needed. Beginning 26 January 1991, all trees were fertilized once a week with 150 ppm N using a Peter's 20-20-20 fertilizer.

Trees were evaluated at 30, 60, and 90 days after treatment (DAT) for phytotoxicity and growth rate. At 30 DAT the seedlings were counted to establish germination percentage. Herbicide injury ratings were made at 30, 60, and 90 DAT. Trees were rated on a scale of 1 to 5 with 1=healthy and 5=dead. Root fresh and dry weights were taken at 60 and 90 DAT on the preemergence treatments, 30 and 60 DAT on the early postemergence treatments, and 30 DAT on the late postemergence treatments. Only the fresh weight data is presented. Primary, or tap roots, and secondary roots were weighed separately.

## RESULTS AND DISCUSSION

### Preemergence Treatments.

*Germination* Only Devrinol 50WP suppressed germination when applied before the germination of the oak seedlings. Average germination of the control treatment was 80%, while the Devrinol 50WP treatment had 50% germination (data not shown). The granular formulation of Devrinol did not cause any suppression of chestnut oak germination.

*Growth Rate.* Several herbicides affected the growth rate of the germinating seedlings. The new herbicide from Monsanto, Dimension 1G (currently being marketed for use on turf) caused the greatest suppression of height growth during the first 30 days following treatment (Fig. 1). Pots treated with Dimension 1G had about 1/3 the growth of most other treatments. Devrinol 50WP and Snapshot 2.5 TG caused slight suppression compared to the control; however, during the following 30 days (60 DAT), these 2 treatments were among the 3 treatments with the greatest growth rate. At 90 DAT, the plants' initial growth flush had slowed and no differences occurred among treatments.

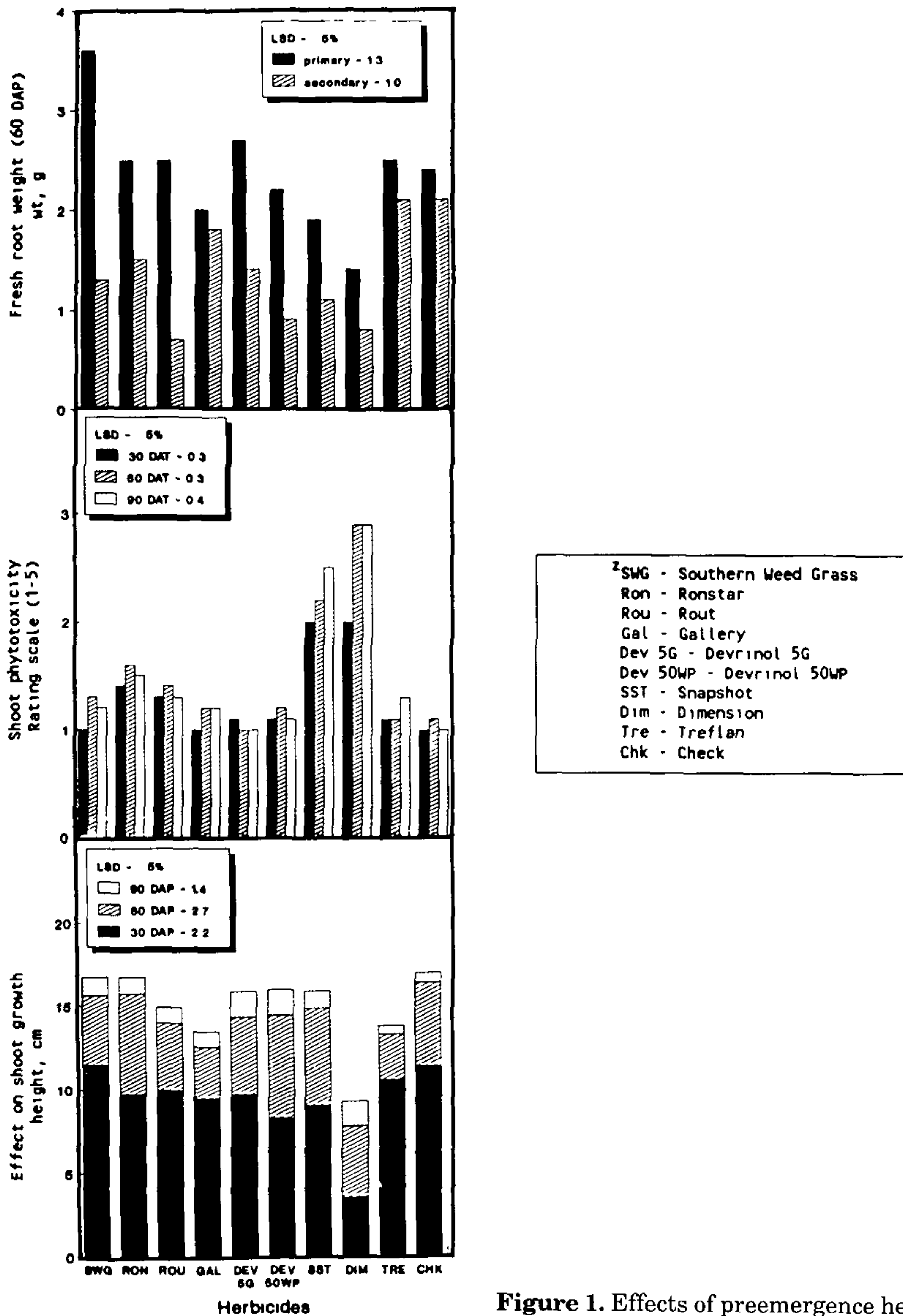
*Phytotoxicity* The greatest injury in the preemergence treatments occurred with Dimension 1G and Snapshot 2.5 TG (Fig. 1). Foliar burn and leaf distortion in these two treatments were evident throughout the study. Ronstar also caused slight leaf distortion throughout the study; however, plant growth was not affected.

*Root Growth* Dimension 1G herbicide suppressed both shoot and root growth when applied preemergence to oak seedlings (Fig. 1). Separating the root system (primary or tap root vs. secondary roots) showed that Rout 3G, Devrinol 50WP, and Dimension 1G suppressed secondary root development at 60 DAT. At 90 DAT there were no differences in root fresh weight.

Results of the preemergence portion of this study show that Dimension 1G, Snapshot 2.5 TG, and Devrinol 50WP caused unacceptable injury to germinating chestnut oak seedlings. Rout and Ronstar caused minor injury, which the plants quickly outgrew. Devrinol 50WP also suppressed germination.

**Early Postemergence.**

The early postemergence treatments were applied at 30 days after potting when the first true leaves began to unfold and expand. Therefore, no germination effects occurred. None of the herbicides affected growth rate when compared to the control plants.



**Figure 1.** Effects of preemergence herbicides on chestnut oak

*Phytotoxicity.* Herbicide application during leaf expansion caused herbicide injury in several treatments. Sixty days after potting, or 30 DAT of the postemergence application, Rout, Gallery, Southern Weed Grass, Ronstar, and Snapshot 2.5 TG caused minor foliar injury or leaf distortion (data not shown). Except in the Ronstar treatment injury from these herbicides persisted throughout the duration of the experiment. This injury did not affect the growth rate or tree height at the end of the study.

One major difference between the two methods of application was the response with Dimension 1G and Devrinol 50WP. If applied after germination these herbicides had no negative effects. From a practical standpoint, this information can help growers fit these herbicides into their weed control program.

*Root Growth.* Ronstar, Gallery, Devrinol 5G, and Snapshot 2.5 G suppressed secondary-root growth about 50% compared to the nontreated plants (Fig. 2).

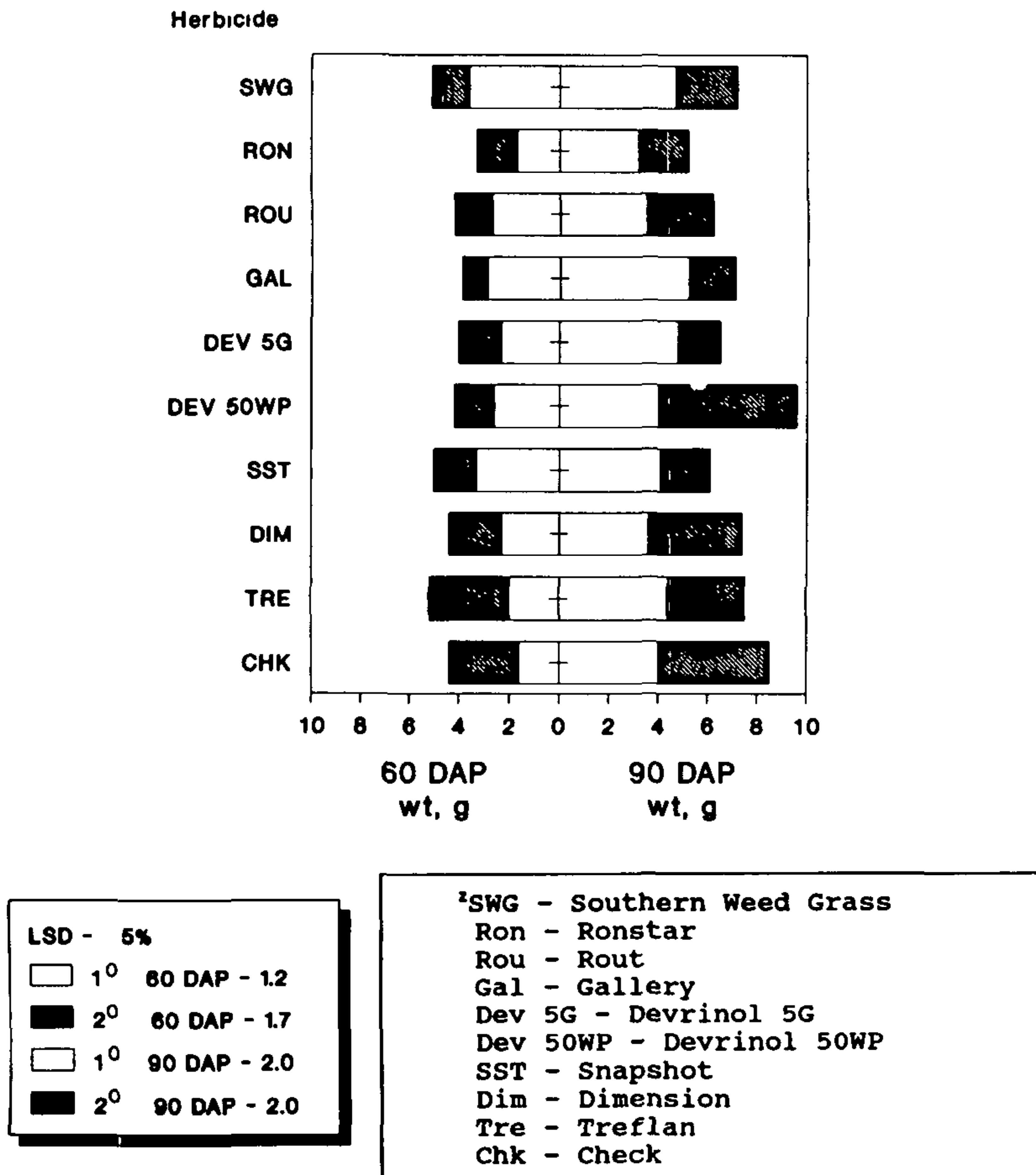


Figure 2. Postemergence herbicide effects on fresh root weight

Secondary roots are important in the establishment and growth of transplanted seedlings since they function primarily in the absorption of water and minerals (Gilman, 1990) These herbicides should be carefully evaluated before applying them at the early postemergence stage of container-grown seedlings.

**Late Postemergence.** Treated plants did not differ from controls at either 30 or 60 days after treatment.

This study shows that for maximum safety, herbicide application to container-grown chestnut oak seedlings should be delayed until the leaves have matured. If herbicide application before this time is necessary, the herbicide should be carefully evaluated with each tree species to avoid injury.

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