Weed control in nonbearing CITRUS

A. H. LANGE · B. B. FISCHER · G. SUTHERS

Weed control in citrus nurseries is one of the most expensive cultural practices in citrus tree production. Earlier research has shown Simazine (Princep), diuron (Karmex), bromacil (Hyvar X), terbacin (Sinbar), and paraquat can be used effectively around bearing citrus. However, very few herbicides are usable on the 67,000 acres of young non-bearing citrus in California. The object of the studies reported here was to evaluate several herbicides for pre- and post-emergence weed control in citrus nurseries.

Study series

A series of studies (pre-and post-plant incorporated, pre-emergence, and post-emergence tests) were initiated, starting in the spring of 1964 in Kern, Orange and Fresno counties, and continuing into the spring of 1968 in Riverside and San Diego counties. Uniform rows of recently planted Troyer citrange, trifoliate orange, Cleopatra mandarin and Citrus macrophylla liners (in often heavily weed-infested nurseries) were treated with a number of herbicides and with different combinations of herbicides.

The nursery soils studied ranged in organic matter content from 0.3 to 2.3 per cent. The soil particle size distribution varied: sand from 46 to 89 per cent, silt from 8 to 32 per cent, and clay from 4 to 28.5 per cent. Herbicides were applied pre-plant in small plots, or post-plant as directed sprays down the liner row, wetting the lower 4 to 6 inches of the newly planted seedlings and wetting a 33 to 36-inch band of weeds down the liner row. Irrigation was by furrow, flood-furrow and sprinkler.

Fresno County tests

The feasibility of using a number of selective herbicides in citrus seedbeds was clearly demonstrated in a number of trials in Fresno County. Most herbicides effectively controlled weeds when sprayed on the soil and sprinkled in after seeding. Both bromacil and terbacin effectively controlled weeds. However, a large percentage of the seedlings treated with bromacil died and survivors were severely retarded. Veinal chlorosis was also observed on the young Troyer citrange seedlings treated with terbacin, but most recovered and developed normally.

Trifluralin and bensulide were highly selective in controlling grassy weeds without causing injury to the citrus. They controlled annual grasses (crabgrass, barnyardgrass and diffuse lovegrass), but they failed to control red clover and wild lettuce. This was true whether herbicides were incorporated prior to planting, or whether they were surface-applied and sprinkled-in after planting. A slight temporary abnormality in leaf development was observed on seedlings growing where treated with trifluralin at 1 lb. per acre.

DCPA (Dacthal) and bensulide (Prelar) applied on the soil surface and sprinkler-irrigated, gave good weed control and had no adverse effect on a stand of direct-seeded Troyer citrange.

Trifluralin and nitratin incorporated prior to planting gave good weed control at 1 and 2 lbs per acre on young Troyer citrange liners with no effect on growth. Both were weak on a number of species of weeds such as red clover, datura (tollguach), groundsel, wild lettuce, black mustard, pineapple weed, red muids and shepherds purse.

Orange County tests

The herbicides generally gave good early control of winter annuals; however, the test area was also heavily infested with bindweed. Although the ratings of annual weed control were not high, competition from annual weeds was reduced by most of the herbicides with the exception of EPTC and the low rates of DCPA. Bindweed was noticeably stunted and exhibited slight chlorosis in the high rates of DCPA and terbacin. Bindweed was relatively unaffected by any of the other herbicide treatments.

San Diego County tests

The herbicides simazine and terbacin controlled winter annual weeds including mustard, London rocket, groundsel and pigweed. Competition from weeds severely reduced liner growth in the untreated check plots. Trifluralin was weak on London rocket, groundsel and some other weeds. It was applied in granular form and was not incorporated with sprinkler irrigation until later in the season. The effectiveness of herbicide combinations depended on the amount of simazine and terbacin used. The dichlofenil gave good control with no plant injury.

Riverside County tests

Varying degrees of spotted spurge control were achieved at 157 days after application. The most effective herbicide was DCPA. Terbacin was markedly weak especially when incorporated pre-plant. Since the area had a very sandy soil, large amounts of irrigation water were used which may have leached the terbacin from the shallow layer of soil in which spotted spurge germinated. The 2-lb rate of trifluralin gave good spurge control when
perennial weeds, and showed considerable
ever the margin of safety appeared nar-
mentioned) accompanied by noticeable
cations for the control of perennial weeds
resulted in trunk burn (as previously
dylic acid would be expected to be more
toxic herbicide after the first spray-
were semidormant; consequently, caco-
Cacodylic acid was more toxic than para-
certainly, cacodylic acid would be expected to be more
toxic during rapid growth, although this
Parquat at ½ lb per acre controlled
young standing weeds with no significant
effect on young growing seedlings; how-
argin the safety appeared nar-
Parquat the first season even while the liners
MSMA was effective in controlling
Johnsongrass, nutsedge and several other
 perennial weeds, and showed considerable
safety on young citrus at the 4-lb-per-acre
There was, however, some injury at
Parquat at 16 lbs per acre. Since repeated 4-lb
applications for the control of perennial weeds
are effective on non-crop land, it will be
necessary to test MSMA further with
smaller repeated applications and
shields Sprays for maximum safety in
citrus.
The herbicide treatment yielding the
best post-emergence annual weed control
with the greatest safety, was diuron plus
non-phytotoxic oil. This combination is
also being tested further to confirm these
results.
Low rates of simazine, diuron and
terbacil have given selective weed control
in citrus nurseries in these tests, some of
which were conducted in very sandy soils
under flood irrigation. One test conducted
in desert sands resulted in no injury even
though great amounts of water were
flooded over the treated areas during
irrigation.
Weed competition, both annual and
perennial, was severe in the early stages
of citrus seedling growth in some trials.
Pre-emergence herbicides, supplemented
with early applications of post-emergence
herbicides therefore offer the citrus nurs-
eryman the possibility of a new inexpen-
sive experimental tool to control weeds in
citrus.
Judging from the injury produced by
high rates of the post-emergence herbi-
cides used in these trials and by pre-emer-
gence herbicides in these and other tests,
it is clear that applications of chemicals
for weed control in young citrus must be
made with precision.
Several additional uniform weed con-
trol trials are now underway in citrus
nurseries in a number of different envi-
nvironments throughout California's citrus
belt. Results from these trials should offer
sufficient information for the formu-
lation of weed control recommendations
for citrus nurseries, when labels become
available. Information discussed in this
article is not to be considered a recommenda-
tion of University of California. Local farm
advisors should be consulted for specific
herbicide recommendations.

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old Kempen, Dean Halsey, Bob Russell,
Karl Opitz, and Bob Platt.

### Table 1. The Effect of Six Pre-emergence Herbicides on Weed Control and Growth of Trolly Citrange Liners as Measured by Visual Ratings and Height and Diameter Measurements

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<th>Herbicide</th>
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<tr>
<td></td>
<td>1</td>
</tr>
<tr>
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<td>3</td>
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<tr>
<td>Simazine</td>
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<tr>
<td></td>
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<td>Dicamba</td>
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<tr>
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</tr>
<tr>
<td>Atrazine</td>
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<tr>
<td></td>
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</tr>
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<tr>
<td>Trifluralin (incorp)</td>
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<tr>
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<tr>
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<tr>
<td>EPTC (incorp)</td>
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<td>EPTC (incarp)</td>
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<tr>
<td>Check weaky</td>
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<tr>
<td>Weeded check</td>
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L.S.D..05 (S) NS Coef. of Var. 7.2% 7.7%

**Average of four replications; ratings made on the basis of 0 = no weed control, 10 = 100% weed control.
† Average of four replications (13 trees per plot)
** These rates of terbacil, trifluralin and DCPA showed a degree of bindweed control approaching commercial
tolerance.
Soil: Sand = 54%, Silt = 24.0%, Clay = 22% and OM = 1.1%

### Table 2. The Effect of Five Post-emergence Herbicides on Weed Control, Vigor and Growth of Trolly Citrange Liners as Measured by Visual Ratings and Height and Diameter Measurements

<table>
<thead>
<tr>
<th>Herbicide</th>
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<td>Cacodylic acid (y)</td>
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<td>Cacodylic acid (y)</td>
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<td>Check weaky</td>
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<tr>
<td>Weeded check</td>
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</table>

L.S.D..05 (S) NS Coef. of Var. 12% 19%

**Average of four replications; ratings made on the basis of 0 = no weed control, 10 = 100% weed control.
* Annual, BW = Bindweed.
Soil (see table 1)
(y) = not sprayed during second season because of severe injury the first season.

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