

RECENT ADVANCES IN PERENNIAL GRASS CONTROL IN AVOCADO ORCHARDS

L. S. Jordan, B. E. Day and R. C. Russell

Department of Horticultural Science, University of California, Riverside, California

Until recently, annual weed growth in California orchards was a problem of equal importance to both the avocado and citrus grower. Along with citrus, a large proportion of the avocado acreage is now under a program of noncultivation, and annual weeds are being successfully controlled with either of two soil-acting herbicides: monuron and simazine (1).

A remaining problem of more vital concern to many avocado growers has been the encroachment of perennial grasses, particularly bermudagrass and Dallisgrass, in sprinkler-irrigated orchards. Under conditions where bermudagrass has become predominant as a permanent sod, two methods of management are now commonly practiced. These are mowing and spraying with weed oil.

A number of herbicides found to either control or eradicate bermudagrass have unfortunately proven hazardous to avocado trees. Dalapon and amitrole, both foliar-systemic herbicides effective in controlling bermudagrass in a repeated spray program, have been shown to cause injury to avocado trees both in greenhouse tests and under field conditions. A newer group of soil-acting herbicides, the uracils, are now being used to control bermudagrass in citrus orchards. However, field tests with these herbicides in avocado orchards have resulted in injury to the trees at rates of the chemical necessary for controlling bermudagrass (2).

A relatively new herbicide paraquat, has recently received regulatory approval for use in avocado orchards. Paraquat, like weed oil, is a contact herbicide toxic to plant parts wet by the spray. Like other contact herbicides, paraquat is largely non-systemic and has no significant effect upon the plant by absorption from the soil through roots.

Paraquat has shown some promise in seasonal control of bermudagrass in a repeat-spray program. In field tests conducted in an orchard in San Diego county, paraquat applied with a surfactant to a solid stand of bermudagrass turf in a repeat-spray program was equal in effectiveness to treatments with weed oil applied in a similar program of treatment. Good topkill of bermudagrass is obtained when paraquat is applied at rates of from 0.5 to 1 pound per acre of the herbicide in from 100 to 200 gallons of water. A suitable nonionic surfactant should be used at the rate of 8-16 ounces per 100 gallons of spray solution. Spray volume and the rate of herbicide will vary with respect to the height and density of the grass. Best results are obtained when applications are made to bermudagrass under 6-inches tall. An initial application to a heavy stand of grass may require as much as 1 pound of paraquat per acre in a spray volume of as much as 200 gallons per acre to assure good wetting of the foliage.

Subsequent treatments to regrowth generally require 0/5 pounds of herbicide per acre and a lower volume of spray.

Paraquat is temperature and light sensitive. There is a slow kill during cool weather and low light intensity, and a more rapid kill at higher temperatures and high light intensity.

The time interval between treatments for effective seasonal control of bermudagrass varies with respect to local environmental conditions. As with the use of weed oil, the spacing of retreatments should be based on plant regrowth. Tests by McCarty, Day and Jordan (3) have shown that for maximum effectiveness, weed oil applications should be scheduled initially on the basis of 20 percent regrowth of the original stand of bermudagrass. This same means of determining a treatment schedule can be applied to the use of paraquat.

Paraquat is useful as a directed broadcast spray for a solid ground cover of bermudagrass or for spot treatment of small infestations. Reasonable care should be exercised in keeping the spray off tree foliage. Excessive drift or careless spraying can severely injure the skirt foliage of trees. Since paraquat is relatively nonselective, it is effective on nearly all orchard weeds. The effect of this herbicide on a few weeds, however, is limited by their resistance to wetting. Waxy, narrow-leaved plants are often water-repellent, and as a result are largely immune to water-base sprays. These weeds may often be controlled by increasing the concentration of wetting in the spray solution. Dallisgrass is extremely resistant to wetting and its occurrence in mixed stands with other weeds throughout the orchard may require supplemental spot treatments with weed oil.

A foreseeable use of paraquat is in new avocado plantings, either in strip treatment of the tree row or in broadcast treatment throughout the entire orchard. Paraquat can be used with greater safety than weed oil to control bermudagrass and other weeds growing around the base of young trees with reduced risk of girdling the young tree trunk.

The bark of trees is impregnated with waxy materials that serve as waterproofing agents. Since these materials are oily in nature, they offer no barrier to the penetration of oil. Thus water sprays such as paraquat may be used for close spraying around tree trunks in situations where weed oil would be hazardous. However, immature, (green) bark on twigs and young tree trunks prior to the development of mature bark is subject to injury by both kinds of sprays.

Tolerance tests on orchard trees and residue studies of the fruit from trees in treated plots have given every indication that paraquat is safe to use in avocado orchards under normal practice.

The commercial liquid concentrate of paraquat is a toxic material and should be handled with extreme caution to avoid exposure to the eyes, skin and clothing. As a diluted spray, the herbicide is less hazardous, but reasonable care should be exercised to avoid breathing the spray during application.

Dallisgrass, Johnsongrass, and nutsedge are perennial weeds of only limited occurrence in California avocado orchards, yet, these weeds are serious problems where they have become firmly established. Successful results have been obtained in experimental programs in controlling these weeds in non-orchard areas with two organic

arsenical herbicides, MSMA and DSMA. Tests have shown that Johnsongrass can be nearly eliminated in one season with treatments of either MSMA or DSMA applied repeatedly when plant regrowth has reached the 6- to 12-inch stage. Four or five treatments during the growing season effectively destroy the plant's rhizome system and prevent regrowth.

Successive sprayings with MSMA and DSMA have proven effective in controlling yellow nutsedge, with virtual elimination of the weed in some test areas and moderate to good control to regrowth in others. Treatment programs for control of purple nutsedge have been less effective, with the best results obtained in cooler coastal areas.

Preliminary tests indicate that Dallisgrass is quite susceptible to MSMA and DSMA. Several re-treatments may be required for a complete kill of the plant.

Sufficient studies have been carried out to indicate the safety of avocado trees to the organic arsenical compounds when properly used. However, these herbicides have not yet been registered for use in avocado orchards and, therefore, cannot be recommended at the present time.

LITERATURE CITED

1. Day, B. E. and McCarty, C. D., 1958. Chemical Weed Control in Avocado Culture. Calif. Citrog. 43; pp 150, 174-178.
2. Day, B. E., Jordan, L S., Mann, J. D. and Russell, R. C. 1904. Uracil Herbicides for Weed Control. Calif. Citrog. 49: pp 371, 380 and 382.
3. McCarty, C. D., Day, B. E. and Jordan, L. S. 1902. Control of Bermudagrass in Avocado Orchards. Calif. Avocado Soc. Yearbook 46: pp 100-108.