

CONTROL OF BERMUDA GRASS IN AVOCADO ORCHARDS

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Bermuda grass is the most serious perennial weed infesting California avocado orchards. Numerous systemic herbicides have been tested, but so far these materials have proven toxic to the trees as well as the grass. Dalapon, an excellent herbicide for use against Bermuda grass, has caused injury to avocado trees at concentrations of one ppm in the soil. Amitrol, another systemic herbicide effective against Bermuda grass, has injured avocado trees at soil concentrations of two ppm (1).

Cultivation, while effective in controlling weeds, causes the destruction of soil tilth. Compaction from the weight of tillage equipment, breakdown of soil particles, plowsole formation, and the destruction of avocado roots in the cultivated area are factors against cultivation.

Mowing will control, but not eliminate, weed growth. Upright-growing weeds are destroyed, but mowing creates an environment in which Bermuda grass thrives to the point where it forms a solid turf. Mowing does not reduce the moisture requirement of the grass, and during periods of water shortages the trees will suffer since Bermuda grass is the more efficient competitor.

Several promising herbicides are being tested in the weed control research program, but there is little chance that any of these will soon be available to the grower. Federal and state laws governing the registration and use of herbicidal materials have reached a state of complexity so that it takes several years to clear a chemical for agricultural use.

The present recommended procedure for the control of Bermuda grass in avocado orchards is repeated oil spraying. During 1958 and 1959 a series of tests were carried out to determine the effectiveness of oil spray in controlling Bermuda grass. The weed oil used was a commercial grade which contained 70 per cent aromatic constituents without fortifying or emulsifying agents. Plots were evaluated by visual ratings of control, made weekly by three or more independent observers. These evaluations were averaged to obtain a single control rating. Except where height of the grass was one of the factors being studied, the turf was mowed to maintain a height of two to four inches.

Regrowth of the grass, following a single oil treatment, was most rapid during August and the first part of September when temperatures were at their highest. Regrowth was slower during the spring and late fall. A single spraying with weed oil had a "renovating" effect on the grass in that regrowth was vigorous and rapid and when recovered more luxuriant and greener than grass in the untreated control plots.

It is evident that a consistent retreatment program is necessary to control Bermuda grass with oil. A series of plots were established where the grass was sprayed at intervals of one, two, and three weeks. Duration of the program ranged from two to 12 weeks and the number of applications ranged from two to six at weekly intervals, two to six at two-week intervals, three applications three weeks apart, and four applications four weeks apart.

Up to a point, control efficiency increased as the time between treatments increased. Seven weeks after the final application, six treatments at weekly intervals gave 45 per cent control, while the same number of treatments spaced two weeks apart gave 85 per cent control. Four treatments at three-week intervals gave 75 per cent control. As a result of these tests, the following conclusions were drawn: (1) The first oil spraying kills the foliage but does little damage to roots and rhizomes. (2) Regrowth following an oil spraying uses food stored in underground plant parts. (3) For maximum efficiency, each successive spraying should be made when regrowth has depleted root and rhizome food reserves to a maximum, and before new foliage can manufacture food to replenish these reserves. (4) Once a control program is begun, retreatment must be carried out with regularity to assure beneficial results.

A treatment program of this type depends on "starving out" the grass by forcing it to use its food reserves without allowing it to manufacture and store more food. If a spraying is missed, or delayed too long, the grass grows to a point where it sends more food into the root system than the plant is using, and the food reserve is rapidly replenished. Conversely, if treatments are spaced too closely together, the newly sprouting grass is killed before it depletes the food reserve to a maximum, and it will take a greater number of treatments to destroy the grass.

Because of different environmental conditions, the rate of regrowth will vary in different locations, so that a definite time interval between treatments cannot be established which can be applied to all areas. Tests indicate that the rate of regrowth following the first oil spraying can be used as an index to determine the time interval between treatments. When approximately 20 per cent regrowth of the original stand has occurred, the second treatment should be made. The period between the first two applications establishes a time interval adjusted to local conditions which can be used as an interval between subsequent sprayings.

Oils which contain 50 per cent or more of aromatic compounds make good contact weed killers. Oils low in "killing power" may be "fortified" to increase their toxicity by the addition of oil-soluble dinitro compounds. Highly toxic oils may be emulsified with water to produce a larger volume of spray to spread the oil over a larger area. Little is gained by making emulsions of oils of low or medium toxicity as they must be used at full strength to obtain a satisfactory kill.

Weed oil should be toxic enough to kill when applied as a light film. Drenching sprays are not necessary although enough volume should be used to allow the oil to creep between the leaves which sheath the growing points.

Tests carried out by Day and Jordan (2) showed that the amount of liquid required to wet Bermuda grass to the point of "run off" varied considerably according to the condition of the grass. Using water plus vatsol as a wetting agent, they found that

coarse stubby grass of low vigor three inches in height retained 247 gallons per acre, while vigorous grass seven inches tall in a lush growing condition retained 536 gallons per acre.

Spraying a mowed stubble is just as effective and more economical than spraying a tall stand of grass. Therefore, mowing might be of value just before starting an oil treatment program. However, the stubble must not be covered by a protective layer of clippings.

LITERATURE CITED

- (1) Day, B. E., et al, unpublished.
- (2) Day, B. E., and Jordan, L. S. Spray Retention by Bermudagrass Weeds 9: No. 3, July, 1961, pp 351-355.