

SOIL FUMIGATION FOR AVOCADO REPLANTS

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INTRODUCTION

Replanting avocados in soil where old avocado trees have been growing has not been the common practice in the avocado industry to date. Recently, however, there has been an increased interest in the removal of poor trees not infected with avocado root rot disease, and replanting with new vigorous ones. Experience in the past has been that some young avocado trees planted in old avocado soils have not grown well. This poor growth condition occurs with other crops. Citrus is a good example of poor growth and reduced yields when a replant tree is placed in old citrus soils without fumigation. Harmful soil organisms and toxic materials make it difficult for the young tree to grow properly. In Ventura County (1) retardation in growth of avocado trees was noted when they were planted in old walnut orchard soils without first fumigating the soil.

In March of 1959 a preliminary field trial to determine the value of soil fumigation prior to replanting young avocado trees in soils where old avocados had been was begun in El Cajon (2). Results of these preliminary trials showed the trees treated with Mylone and Vapam made superior growth compared with untreated trees. In March of 1961 two test plots were established in two orchards, in Fallbrook. In both cases the orchards were heavily infected with the sunblotch virus. In one, the Lee Garmes orchard, the number of trees removed was approximately 500. This was a complete removal of trees. In the other, the Al von Norman orchard, individual trees were taken out of the orchard so the replants were interplants.

This progress report will be on the von Norman orchard where the interplant area was fumigated prior to setting in of new trees.

PROCEDURE AND METHODS

In March of 1961, the test plot was established on the von Norman property. Approximately 78 ten-year old Fuerte avocado trees infected with the sunblotch virus disease, were removed. Prior to soil fumigation, soil tests were made to determine the presence of nematode and the avocado root rot fungus, **phytophthora cinnamomi**. The results of these tests indicated the presence of some nematodes but not in concentration which would seriously affect young avocado trees. The tests for the cinnamon fungus were negative.

The number of trees included in the test were divided equally into five categories, one for each chemical treatment and the remainder where no fumigant was used, as checks. Four chemicals were used; Telone, Mylone, Nemagon, and Methyl Bromide.

Each treatment had between thirteen and sixteen trees.

The various materials used were applied in different ways and dosages. Telone and Nemagon were injected into the soil with the use of a weed gun. Injections were made approximately every eighteen inches over a ten by ten foot square area. Telone was used at a rate of forty gallons per acre and Nemagon was used at five gallons per acre. Methyl Bromide was injected into the soil under a polyethylene tarp which was left in place for twenty-four hours with a dirt seal completely around the edges of the tarp. The dosage used was two pounds per ten by ten square foot area. Mylone, being a powder, was dusted on the surface of the ground at a rate of 11/2 pounds per ten by ten square foot area and then watered in with a subsequent irrigation so that the material would be taken into the soil to a depth of at least two feet.

One month after fumigation, the new avocado trees were planted. Trees were grown at a local nursery and appeared to be very good trees. In Figure 1, picture A, a young tree (3 months at the time the picture was taken) may be observed. Shortly after the trees were planted, three measurements of the individual trees were made. One was six inches above the bud union which measured the circumference of the trunk in centimeters, and the other two were the height and width of the tree, measured in inches. Six months after planting, a visual observation was made of each tree and a rating given to each on the basis of growth and color. The ratings were excellent, very good, good, fair, and poor. In May of 1962, the second measurement of the trunk circumference, the height, and width of each tree was made. Also at this time a visual observation and another rating was then given the trees. In the latter part of June 1962 another visual observation was made and the trees rated and recorded. In November of 1962, the trunk, height, and width measurements were taken.

RESULTS

The results after twenty-six months can be summarized in the following tables.

TABLE I

Treatment	Good	Poor	Total Trees
Telone	15		15
Methyl Bromide	12	1	13
Mylone	11	5	16
Nemagon	3	11	14
Check	3	11	14

In Table 1, the good and poor trees have been listed as found in the various treatments. All trees that were good, very good, and excellent, have been put under the good column, and the trees rated as fair or poor were placed in the poor column. Evaluating the visual observation ratings, there is no question that trees in the plots fumigated with Mylone, Telone, and Methyl Bromide were better than the checks and the Nemagon treatment.

TABLE 2
INCREASED GROWTH

Treatment	Trunk Circumference (cm)	Height (in.)	Width (in.)
Telone	15	81	84
Methyl Bromide	15	83	77
Mylone	14	79	79
Nemagon	10	55	61
Check	8	47	45

It can be seen from the figures in Table 2, that the visual observations and the actual measurements coincide.

An interesting observation was noted with the use of Nemagon. At the beginning most of the trees treated with Nemagon did not grow and the foliage was quite yellow. Additional nitrogen was applied to these trees which helped green up the leaves. As the trees began to grow, and with each visual observation, the Nemagon-treated trees seemed to pick up in growth and improve in color. However, they have not the growth nor do they have the healthy appearance that has been noticeable on the other trees which were chemically treated. The measurements indicate that this chemical was able to increase growth only slightly above the checks. It is not known why they were affected by this material. Toxicity of the chemical to the tree could be a cause.

The accompanying photographs show the progress the trees have made since the soil was fumigated and the new trees planted. The growth which took place in fourteen months is indicative of the type growth that the treated trees throughout the plot have made. Mr. Earl Marsh, field assistant, San Diego Extension office, who assisted in this work, stands beside the trees as a point of reference.

In December 1962, a root and soil sample was taken from representative trees in each of the treatments. Tests were made to determine the nematode population and for the presence of the cinnamon fungus under each tree. Low populations of a parasitic nematode, *Xiphinema americanum*, were found in the untreated (checks) tree sites. The treated tree sites were free of parasitic nematodes, except for one site which had a low population count of *X. americanum*. The cinnamon fungus tests were negative.

DISCUSSION

At the present time it is not known just what has caused these trees to respond so favorably to soil fumigation. Since the nematode population, for all practical purposes, is nil and there seemed to be no detrimental fungi in the soil, there are only two other possibilities why this response has taken place.

First, there may be toxic materials in the soil which have not been identified. This is considered a possibility with other crops in the replanting phase and there is no reason to not believe that it can happen with avocados. The other possibility is that there is a root pruning action by the chemicals on the surrounding large trees and on the possible root regrowth from root system of the tree removed. This would permit the young trees to get better established without the competition of large trees. Observing neighboring trees, there did not seem to be any damage from the chemicals used.

CONCLUSIONS

On the basis of this preliminary report, the evidence indicates that fumigating old avocado soil prior to replanting new avocado trees would be beneficial when used in orchards with conditions similar to the test orchard. The three materials, Telone, Methyl Bromide, and Mylone, seem to do an equally good job. The decision as to which one to use would be based upon the grower's preference. This would involve; (1) which is the least expensive, (2) which can be handled the easiest and is the safest to the applicator, and (3) which one can the grower use if he is to apply it himself.



A
Fumigated—March, 1961
Planted—April, 1961
Picture Taken—June, 1961



B
Nemagon Treatment
14 months old



Mylone Treatment
14 months old

FIGURE I



A
Check
14 months old



B
Check (foreground)
Telone Treatment (background)
14 months old

FIGURE II



C
Telone Treatment
14 months old



A
Check
14 months old



B
Mylone Treatment
14 months old

FIGURE III



C
Methyl Bromide Treatment
14 months old

FIGURE IV
TREES

19 months old



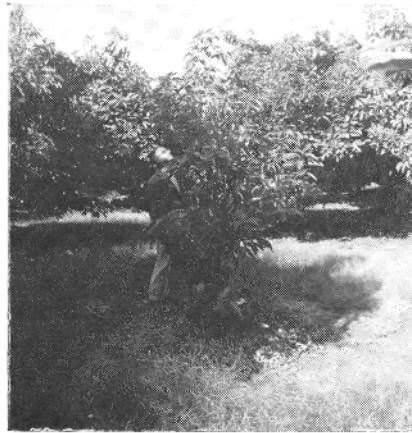
A — check — 14 months old
A — Check



B — Nemagon



C — Methyl Bromide



D — Mylone



E — Telone

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