Causes of Poor Water Penetration in Soils Studied - - Conclusions Discussed

M. R. Huberty

Many soils which in their native condition were of good tilth, of low density, and highly permeable to water, have lost their fine structure and have become compacted when placed under cultivation.

The cause of this condition may stem from such cultural practices as excessive cultivation, the unreasonable use of some fertilizer or soil amendment, irrigating with water which has a disproportionate amount of sodium, and failure to maintain a favorable organic matter content in the soil.

In some soils the rate of water entry is so fast that it is difficult to irrigate them without excessive loss of water through deep percolation.

The term, infiltration rates, is used to denote the rate at which water enters the soil. This is what is often referred to as, water penetration. Penetration, however, should refer to the depth of wetting rather than to the rates of wetting.

Cause of "Cultivation Pan"

Cultivating soil excessively, especially when the soil moisture content is high, causes a compacted

Applications of organic matter increased more than tenfold the infiltration rates on a sandy loam soil in a potato field in Kern County.

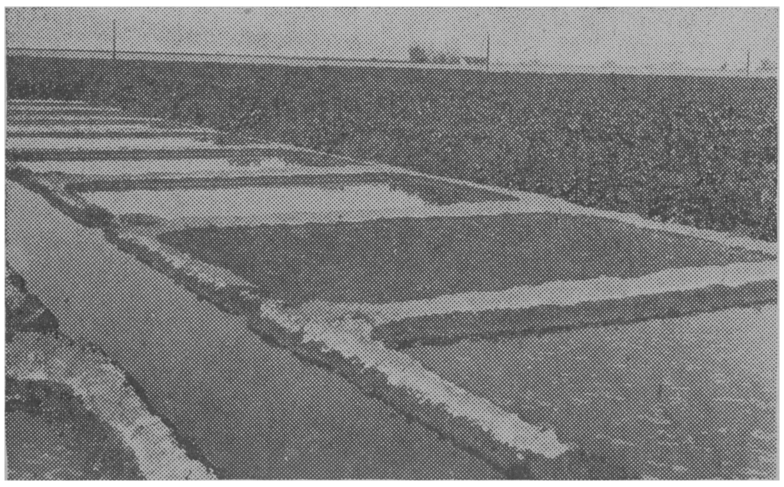
Observations made in a citrus orchard at Riverside and in plots at the University of California, Los Angeles, show the beneficial effect of organic matter of various kinds upon infiltration rates.

Salines Effect Soil Structure

Soils are often of poor structure when certain salines are present. Should sodium be present in a high proportion in comparison to calcium and magnesium, the soil is likely to be hard when dry and very sticky when wet.

The beneficial effect of gypsum when added to these soils was demonstrated in the investigations in Kearney Park and throughout the San Joaquin Valley.

When gypsum is added to a soil that has an unfavorable sodium content, the calcium in the gypsum replaces the sodium, which is attached to the surface of the clay particles in the soil. The sodium then goes into solution and can be leached out



varieties, better cultural practices, and greater use of lime and commercial fertilizers.

Volume of Agricultural Exports

From 1914 to 1919 the value of our agricultural exports increased threefold; from 1938 to 1946 they also increased threefold.

Last time the peak of exports came in 1919, the first full year following World War I; this time the peak of exports will likely be 1946. the first full year following World War II.

Agricultural exports may hold up somewhat better in 1947 than they did in 1920, when they dropped 17 per cent below those of the previous year. Some decrease in 1947 as compared with 1946, however, is in prospect, in view of the probable improvement in foreign supplies and the lapse of UNRRA.

Domestic Demand for Agricultural Products

While large export outlets for such commodoties as cotton, tobacco, wheat, and dried fruits will be necessary, if drastic downward adjustments in these acreages are to be avoided, it is even more important from the standpoint of our agricultural economy as a whole to have large and expanding domestic markets. The great bulk of farm products produced in this country are consumed here.

Towering above all other considerations on the economic front, is the need for maintaining continuous high-level production and employment in industry and trade.

The products which gain most from large consumer incomes are fruits, vegetables, meat, eggs, and milk. All of these loom large in the agriculture of California.

Financial Position of Farmers

Between 1940 and 1946 the farmers in this country reduced their farm-mortgage debt by one and one-half billion dollars and their non-real estate debt by 150 million dollars. In addition, they added nearly 15 billion dollars to their holdings of liquid assets—bank deposits, currency, and war bonds.

Between 1914 and the end of 1920 farm mortgage debt increased from

(Continued on page 3)

Effectiveness of DDT in Livestock Industry

(Continued from page 1)

which contribute to the breakdown or weathering or DDT on an animal are as yet not clearly understood. Under one set of conditions a treatment may remain effective for approximately five weeks, while under other conditions the same treatment is effective for only a week or two. At the present time a spray made up with a wettable powder to a final DDT concentration of two and one half per cent is recommended, this will undoubtedly be altered in the future to conform with the results of experimental work being conducted.

At the present time there is no evidence to indicate that DDT will control horseflies, deerflies (the large black biting fly and the smaller varicolored biting [illegible]y) or warbles, or horse bots.

Mosquitoes, which are often serious pests of livestock, are reported to have been controlled by a DDT suspension of two and one half per cent, as used for horn flies and stable flies.

There is every indication that the sheep "tick" or ked so common in parts of California may be controlled by sprays or dips containing DDT. Before it can be generally recommended however, the proper time and method of application as well as the desirable formulation and concentration of the spray or dip must be worked out.

Screwworms and Wool Maggots

DDT holds little promise against the larval stages of the blowflies and screwworms. Recent work in England, however, indicates that sheep may be protected from wool strike by sprays or dips containing DDT. For protecting wounds from screwworm attack, DDT is apparently no more effective effective than other materials which are in use.

Lice

Removal of DDT Residue From Pears, Apples Successfully Accomplished By Washing

W. M. Hoskins

One of the important undertakings of the Division of Entomology and Parasitology during the past three years has been a detailed study of the use of DDT (dichloro, diphenyl, trichloroethane) for control of codling moth under the various conditions that exist in pear orchards of the state.

At the special request of pear growers and packers a study of methods for removing DDT from pears was undertaken during 1946. The Bean-Cutler Company of San Jose loaned a fruit washer for experimental work and packing-house managers cooperated for tests under practical conditions.

Fruit washers are essentially long tunnels through which the fruit moves on a belt or on a number of walking beams which roll it over and over while a flood of water pours down from openings in a tank above.

Wash water containing one per cent hydrochloric acid removes lead arsenate, unless excessive amounts have been used in the sprays. A few experiments showed that this does not remove DDT and, perhaps, this result may be expected since DDT is not soluble in water or in water containing an acid.

Everyone is familiar with the use of soap to remove foreign materials from various surfaces and it was natural to think of it first for removing DDT from pears. However, fruit coming into the commercial packing plants may have been sprayed with lead arsenate or with both lead arsenate and DDT and hence it was necessary to find a cleansing material that could be used in the ordinary acid bath. This cannot be done with soap for it forms a sticky curd and becomes useless.

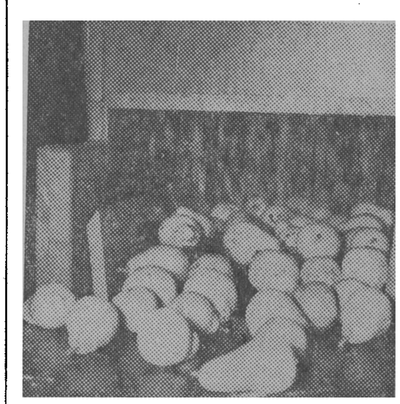
Detergents Successful

Within recent years a large number basis several more materials were disqualified.

Those remaining gave varying results with DDT-sprayed pears, but no one alone was satisfactory with heavily laden fruit. Eventually it was found that certain combinations of two materials gave excellent results. These detergent mixtures consisted of one which was very soluble in water and one which was freely soluble in oil but only slightly soluble in water. Their efficiency together probably was due to the circumstance that the oil-soluble one came into very close contact with the particles of DDT, and perhaps even dissolved some of them, while the water-soluble one of the pair was active in detaching these particles and holding them dispersed in the wash water.

Recommendations

Whatever the reason for their success, the result was that these mixed detergents reduced the residue of



End view of fruit washer, showing pears entering the tunnel and wash water pouring down upon them.

DDT below the tolerance limit whenever it was applied in accordance with recommendations of the University entomologists. These recommendations called for use of DDT as a water

a thin and nonthrifty appearance.

At this stage, and often preceding it, more or less rotting of smaller feeder roots is seen. Later rotting of larger roots can be found. Often an unusually large crop of fruit will set on trees in the early stages.

Following the early manifestations of trouble, in a minority of cases, all of the leaves may suddenly wilt and the leaves die on the tree. This stage is spoken of as "collapse" and because a tree may go rather quickly from an apparently healthy state into collapse, the name "Quick Decline" came into being.

No Complete Recovery

Small trees under four or five years frequently die after showing the collapse stage. Older trees sometimes die but commonly survive and slowly develop new foliage which is somewhat stunted and unthrifty in appearance.

The usual reaction of quick decline trees is not the sudden collapse but a gradual yellowing and bronzing of the leaves accompanied by defoliation.

No cases of complete recovery, once the tree definitely shows decline, have been noted.

Quick Decline Not Readily Identifiable

Trees in the various stages of quick decline are often comparable in appearance to gophered trees or to trees affected with scaly bark (psorosis), oak root fungus, or waterlogging, and it is necessary to rule out these causes before a definite diagnosis of quick decline can be made.

Most, if not all, of the top symptoms are referable to root rotting. The first stages of the disorder are characterized by an unusual amount of feeder root rotting. Larger roots then become affected and in the final stage of collapse most of the root system has rotted.

Research Studies

Because of the baffling nature of this disease and its rapid spread, an intensive and broad program of research was initiated in the fall of 1944.

(Continued on Page 3)

Research Findings On E[illegible]ectiveness of DDT In the Livestock Industry in California

James R. Douglas

The recent flood of publicity concerning DDT has resulted in such widespread misconceptions of its proper use that it is desirable to review here what may be expected of this insecticide and discuss some of the livestock pests against which it may be employed.

A primary consideration in the utilization of DDT is the selection of the type of material best suited for the particular job. There are five general types of product containing DDT available commercially, as follows: (1) solutions in kerosene or similar solvent; (2) dusting powders; (3) wettable powders to be mixed with water; (4) emulsion concentrates to be mixed with water; (5) aerosol "bombs" for space spraying.

DDT Solutions

Solutions of DDT in kerosene are usually made up in strengths of three to five per cent and are usually designed for application as surface sprays. In this type of application the solvent evaporates and leaves a toxic residue on the surface. Under ideal conditions the residue will remain effective for several months. Solutions of this type are particularly adapted for treating the interior of homes where the spotting or other preparations would be objectionable. They are rather expensive for large scale application such as in a barn, and are no more effective for this purpose than the less costly wettable powders or emulsions. Straight oil solutions of DDT are readily absorbed by the skin, and are not recommended for use directly upon animals.

Dusting Powders

Dusting powders for use on animals should contain about ten per cent DDT. They may be used for flea control as well as for lice and cockroaches. DDT powder should not be applied to cats, because these animals may lick off enough of the powder to cause serious disorders or even death.

Wettable powders contain a wetting agent in addition to the DDT and inert carrying material. They are compounded with from twenty to fifty per cent DDT. For use they are diluted with water as desired. This is the type of product which will find greatest use in the barn and on livestock. A wettable powder containing fifty per cent DDT is considerably cheaper to use than one containing only twenty per cent DDT.

Emulsions

Emulsion concentrates usually contain about twenty-five per cent DDT dissolved in a solvent such as xylene, plus an emulsifying agent. They are diluted with water to the desired concentration.

Aerosol Bomb

An aerosol "bomb" is a container which holds the insecticide dissolved in a liquified gas under pressure. When the value is released the insecticide is dispersed as a fine mist. An effective formula for aerosol is one containing about three per cent DDT plus pyrethrum extract. Aerosols are most effective as space sprays and should be used only in enclosed or semi-enclosed areas. They should be used only against the flying stage of such insects as flies, gnats, and mosquitoes. While they will kill bedbugs, cockroaches, ants, and other crawling insects, their use for this purpose is wasteful and not as effective as other more economical methods.

In Paints and Sprays

In addition to the standard types of preparations discussed above, DDT is available in water and oil paints and on wall papers. While these products undoubtedly have some insecticidal value such use is not considered feasible nor as satisfactory as residual spr[illegible]ing.

DDT is m[illegible]efective when used as a residual [illegible]y. It follows therefore that, [illegible] certain limits, the duration [illegible]ectiveness will be proportional to the amount of DDT placed on the surface. Much of the criticism of DDT may be attributed to the use of an insufficient quantity. When applying a DDT preparation to a surface for the control of flies or mosquitoes, for example, it requires about one quart of a two and one half per cent DDT water base spray for each 100 square feet. On most surfaces this is the amount necessary for thorough wetting without drip or runoff. When oil base sprays are used the amount required to wet the surface is less than half, ordinarily one quart of a light oil such as kerosene will wet about 250 square feet. In order to secure satisfactory results the DDT content of oil spray must be about five per cent.

Uses and Limitations

While a great deal of work remains to be done on perfecting formulations and methods of application of DDT to livestock, sufficient information is available to indicate where it will find effective use and also where it should not be used.

Flies In Barns

The results of many trials have demonstrated that DDT is an effective material for the control of flies when applied as a residual spray in a barn. Recommendations on the optimum concentration of DDT for this purpose have varied from one tenth per cent to five per cent. Under California conditions consistently good results have been obtained with a two and one half per cent suspension in water.

Flies Attacking Livestock

DDT has been found to be quite effective in controlling horn flies and stable flies on livestock. Here again recommendations on the concentration of DDT have varied considerably. The period of efficacy of various treatments has been found to vary, partly owing to the concentration of DDT employed. The factors

(Continued on page 2)