Ant Control Program

modern insecticides correctly applied achieve indoor and outdoor control

A. E. Michelbacher

In ant control, the new insecticides—as important as they are—have not displaced the necessity for knowing the ant, its nesting site and habits.

Of the newer insecticides, the most important ones tested in ant control have been DDT, DDD, methoxychlor, toxaphene, benzene hexachloride particularly as lindane, chlordane and, more recently, dieldrin.

Of this group chlordane has shown the most promise. It is followed by benzene hexachloride, whose unpleasant odor can be avoided largely if the lindane form is used. DDT is effective against a number of species of ants, but usually fairly large dosages are necessary.

Preliminary investigations with dieldrin have produced promising results and this insecticide seems as good if not better than chlordane.

Control measures with these insecticides are still very largely in the formative stage. None of them has as yet withstood the test of time.

Most of the chlorinate hydrocarbons are available as: *1,* dusts; *2,* wettable powders for sprays; *3,* emulsions; *4,* solutions; *5,* aerosols.

For outdoor treatment, dusts, wettable powders or emulsions are most generally used.

For indoor applications, solutions and emulsions are best, although dusts or wettable powders can be used for treating basements or other areas underneath buildings.

Outdoor Treatments

Because of the many hazards, the chlorinated hydrocarbons should be used with great care when applied out of doors.

Consideration must be given to the effect the treatment will have on the soil, plants, beneficial insects, and wild life. Large and excessive dosages of some chlorinated hydrocarbons applied to the soil or plants have resulted in plant injury.

When applied to plants, a number of these insecticides have caused a marked increase of some normally unimportant pest. Occasionally an application has resulted in the killing of birds and other wild life. Benzene hexachloride has on many occasions imparted an off flavor to vegetables and fruit.

An area should never be treated unless there is some justification. Where outdoor treatment is necessary dosages, formulations, and methods of application should be chosen to insure satisfactory control. It usually is a good practice to use the lowest dosage that will give effective results. Thorough coverage will make frequent applications unnecessary.

Where a woody shrub or tree is infested and there is danger of causing plant injury or an increase in some other pest, the plant itself should be sprayed with pyrethrum or a similar product; the chlorinated hydrocarbon should be limited to spraying the ground and the trunk of the shrub or tree.

Effective dusts for outdoor application usually contain 1% to 10% of active material. Dusts such as DDT, DDD, toxaphene and chlordane usually contain 3%, 5% or 10% of active ingredient. Benzene hexachloride or lindane dusts generally have 1% to 3% of the gamma isomer. Frequently, dusts containing a combination of materials are used, for example, DDT and benzene hexachloride or DDT and toxaphene. While dusts are most useful in the control of insects attacking agricultural crops, they can be employed in ant control and are effective when injected into the nests of such species as carpenter ants.

Wettable powders are useful in outdoor ant control. They usually contain from 20% to 50% of active insecticide.

The amount of actual material used per 100 gallons of water ranges from one-half to 1½ pounds where sprays are applied to plants, or where there is likelihood of serious plant contamination.

Emulsions generally contain about 25% of actual material. Where used on plants, the amount of active material per 100 gallons of water should be the same as for wettable powders. If there is any question concerning plant injury a wettable powder should be used, because they are less likely to cause injury than emulsions.

Repeated and heavy general applications of chlorinated hydrocarbons in the garden should be avoided, because there is danger that these insecticides may accumulate in the soil to a point where they might injure certain susceptible plants. This situation is more likely to result when DDT is used than when the more volatile materials such as chlordane and benzene hexachloride are applied.

In treating ant hills or nests in a garden, wettable powders or emulsions can be used at a much higher concentration than for spraying plants. With some species of ants it is desirable that the insecticide be applied directly to the nest. A small amount of the concentrated spray should be poured into the nest and the remainder of the garden treated with the dilute spray.

Investigations made elsewhere in the control of the cornfield ant showed that in applying chlordane to the nest, the killing action of the insecticide is most rapidly lost where it is fully exposed and not watered into the nests. It also was shown that the loss of the insecticide is materially reduced where it is applied as a coarse rather than a mist spray.

Indoor Applications

For indoor use, because plants are not involved, the insecticides can be applied at higher concentrations and by so doing a longer residual action can be obtained.

Chlordane solutions have one advantage over DDT solutions—they do not leave a crystalline residue. Solutions usually contain 2% to 10% of active insecticide depending on the particular chlorinated hydrocarbon. For long residual action they can be used without diluting, although solutions containing more than 5% active ingredient can be cut with a suitable solvent when a more dilute mixture is desirable.

Proper application is all important if effective control is to be expected. Within buildings the insecticide should be placed along runways and other places ants invade such as under cabinets, and along baseboards of closets and pantries. It is important to treat pipes, inside foundations and other paths of entry into structures.

Reasons For Failure

The following points may be responsible for poor ant control with chlorinated hydrocarbon insecticides:

1. Some insecticides are effective against more species of ants than others. Materials such as chlordane, dieldrin, and

Continued on next page

ANT

Continued from preceding page

benzene hexachloride are very effective on nearly all species, while DDT and toxaphene are not.

2. Use of improper formulation of an effective substance. For example, against some species of ants a wettable powder applied as a spray or watered into the nest will result in satisfactory control while the same insecticide applied as a dust would not be effective.

3. Chlorinated hydrocarbon insecticides should not be used in combination with materials having an alkaline reaction such as certain fungicides and emulsifying agents.

4. Improper compounding of effective insecticides. On occasion products are poorly prepared. The wrong solvent may be used or the grinding of the technical product may have been faulty or insufficient active ingredient may have been added due to wrong calculations.

5. Improper application. Particularly with volatile materials, a coarse rather than a mist spray should be used. Insecticides may not always be applied to areas where ants are breeding or to the primary source of annoyance.

6. Use of the wrong type of equipment for application. An aerosol machine may have been used, instead of a type of applicator that would insure thorough wetting of the treated areas.

7. Insufficient dosage. Even the most effective of the chlorinated hydrocarbon insecticides will not give adequate control unless used at a sufficiently high dosage. If plants are not involved, the materials can be used at a higher concentration than recommended for application on plants. In most cases a concentration should be employed that will have some prolonged residual value.

8. Application under unfavorable weather conditions. In the presence of high temperature and light, chlorinated hydrocarbon insecticides decompose more rapidly than in cool weather. Particularly with the more volatile materials, dissipation may be so rapid that satisfactory control may not result when the insecticides are applied during periods of extremely hot weather, and where there are strong air currents to carry away the vapors of the insecticide.

A. E. Michelbacher is Assistant Professor of Entomology in the University of California College of Agriculture, Berkeley.

FORAGE

Continued from page 6

The test at Anderson was set up in February 1949. One cutting was made in June. The plots were grazed during the summer and a second cutting made after a growth period of six weeks in the fall.

Phosphate fertilization—treble superphosphate applied at the rates of 112, 225 and 450 of P_2O_5 pounds per acre—caused a large increase in growth, and an increase in the proportion of ladino clover in the forage.

The grasses grown in the pasture mixture were obviously stimulated since the yield increases were much greater than could be accounted for by the increased proportion of ladino clover.

Chemical analyses of ladino and grass fractions again showed that the phosphorus content of both grass and legume was increased by phosphate fertilization, and that again the grass was somewhat higher in phosphorus values than the legumes. The protein content of the whole forage was increased by fertilization. Part of this increase was due to a larger proportion of high-protein ladino in the mixture and part to an actual increase in the protein content of the grass.

An evaluation of the nutritional significance of changes in plant composition using chemical analysis alone, assumes that any increase in a nutritionally important constituent is beneficial.

Fundamentally, such an interpretation is probably valid, but may not be reflected by animal response under practical feeding conditions because of several reasons:

1. The percentage of a constitutent which may be changed by fertilization may already be adequate for animal needs.

2. Other dietary constituents may be limiting the growth or well-being of the animal.

3. Supplemental feeding of concentrates may overcome apparent deficit in the forage.

The crude protein content of the whole forage from the Anderson plot was increased from 16.4% up to 19.3% as a result of phosphate fertilization. If ample feed from both plots was available, animals grazing on the higher protein plot would not necessarily perform better than those grazing the unfertilized plot since the latter produces forage that would probably provide adequate protein under any circumstance.

The changes in the percentage of phosphorus resulting from fertilization of these soils are probably of practical importance. Livestock subsisting on a diet composed entirely of the kind of forage produced on the check plot may show symptoms of phosphorus deficiency since the percentage of phosphorus in this forage is near or below the requirements necessary under most conditions.

The percentage of phosphorus in the forage from the plots receiving the larger amounts of phosphate fertilizer is well above the level required for optimum growth.

Since a number of factors affect an animal's ability to utilize phosphorus, it is difficult to prescribe the minimum amount which is necessary under all conditions.

The relationship of the amount of calcium to phosphorus in the ration is one of the important factors. Although ratios of 1:2 to 2:1 are generally most desirable, much wider ratios will have no detrimental effect on the animal when phosphorus is ample and vitamin D intake is adequate. Even under these conditions, the percentage of the phosphorus which is utilized may be somewhat depressed if this ratio is wider than 5:1.

To determine what changes occurred in the calcium content as the phosphorus content was increased, the percentages of this element in the forage from the plots near Anderson were determined and the calcium/phosphorus ratios calculated.

Compared to the increases in phosphorus content produced by phosphate fertilization, the changes in calcium content in the forage were slight. As a result, the calcium/phosphorus ratio, especially of the grass fraction, was progressively decreased as the amount of phosphate applied to the soil was increased. Although the smaller applications of phosphate resulted in the production of forage having a slightly lower percentage of calcium than that grown on the unfertilized plot, this difference was more than compensated for by the increase in the percentage of phosphorus.

Changes in the forage resulting from phosphate fertilization other than the increase in the percentage of phosphorus and the decrease in the calcium/phosphorus ratio must be considered in interpreting the effect of fertilization on the nutritional value of the forage. For example, the proportions of the various kinds of grasses may be different in the forage from the fertilized plots than that from the check plots. This may have an effect on the palatability and on the distribution of the forms in which various constituents exist in the plant and, consequently, on the ability of livestock to utilize them.

Further research—including actual feeding trials—will be necessary before a more complete interpretation of the effects of fertilization on the forage of irrigated pastures can be made.

While phosphorus fertilization is only one of a number of factors which determine the yield and quality of feed produced, the studies reported here indicate that on some soils at least it is an important one.

V. V. Rendig is Junior Soil Chemist in the Experiment Station, University of California College of Agriculture, Davis.

W. E. Martin is Associate Agriculturist in Soils, Agricultural Extension Service, University of California College of Agriculture, Berkeley.

F. F. Smith is Farm Advisor, Agricultural Extension Service, University of California College of Agriculture, Shasta County.