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The Texas Harvester Ant

OKLAHOMA AGRICULTURAL EXPERIMENT STATION
Oklahoma A. & M. College, Stillwater
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In Brief

Many methods have been used for controlling Texas harvester ants. Some are useless or impractical, and some contain an element of danger for the user. Various chemicals have been tried at the Oklahoma Agricultural Experiment Station for several years. Results of these experiments are summarized as follows:

Insecticides which gave most effective control were:

Carbon disulfide poured into the entrance at the rate of about ¼ pint per nest.

Calcium cyanide placed in an 8-inch deep hole dug in the entrance and covered.

Chlordane used as a 3 per cent solution of the technical concentrate in carbon tetrachloride or alcohol poured into entrance at the rate of one cup or more per nest. An emulsion in water to form a concentrate containing 3 per cent chlordane gave excellent control when applied at the rate of one quart per nest. From one cup to one quart or more of the 3 per cent chlordane should be used, depending upon the size of the hill.

Parathion emulsion poured in the entrance, or parathion dust applied to the top of the mound, gave fair control when high concentrations were used. *This material is not recommended at the present time. It is highly poisonous to people and livestock.*

Benzene hexachloride, toxaphene, and DDT did not give satisfactory control.

Two new insecticides, aldrin and dieldrin, showed promise in preliminary tests, but are not recommended at the present time. They are very poisonous to humans and to warm-blooded animals.

"Activators" in household sprays, which are intended to speed up the rate of kill, are very repellent to ants. This results in a scattering of the ants and many new starts become established as new colonies. *Chlordane preparations often contain such activators and should not be used for harvester ant control.*

When chlordane is used, results are most satisfactory if it is applied in the spring and during dry periods. Moist soil is favorable for the use of carbon disulfide, but unfavorable for the use of chlordane.

Colonies will occasionally recover or the workers will start new entrances. For this reason it is necessary to re-examine the colonies once or twice at intervals of two or three weeks after the first treatment, and treat again as needed.

Greater quantities of insecticide, both by volume and concentration, increase the effectiveness of initial treatment. Small amounts of concentrated material poured into the entrances allow the ants to make new starts rather frequently and re-treatment is necessary. This appears to be due to an isolation of the poisoned area. When the nest is extensively poisoned by using a quantity of chlordane, there are occasional new starts; but the ants usually get back into the poisoned area and are destroyed.

Chlordane remains as a poison in the soil for a long period of time, but in the amounts used for ant control it does not injure vegetation.

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Each summer brings the Experiment Station numerous requests for methods of controlling the large red ants whose low mounds are a familiar sight throughout Oklahoma. The economic loss caused by these pests is slight compared to that caused by, for example, the boll weevil; but their habit of invading lawns, school playgrounds, and

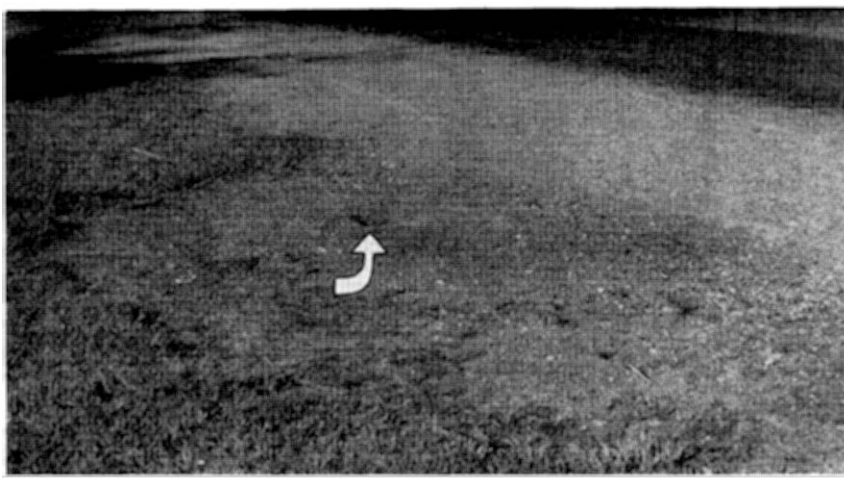
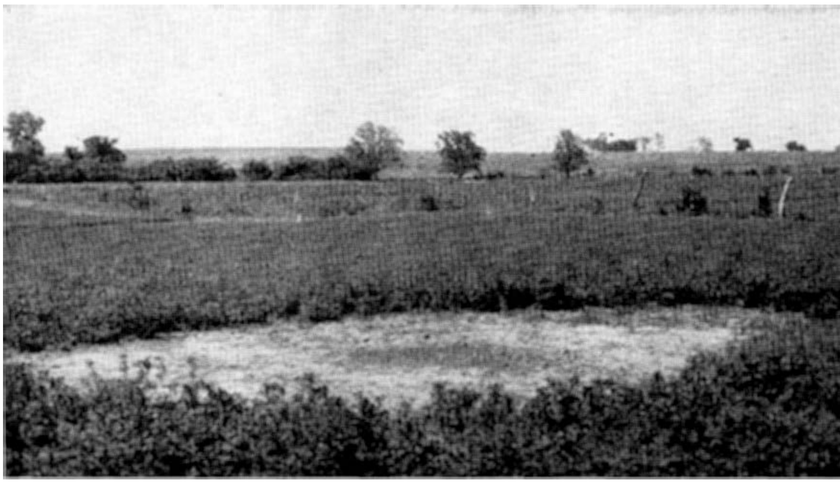


FIG. 1.—Two Texas Harvester ant hills near a gravelled path. The arrow points to the entrance of the larger hill, and the smaller hill is shown at right. Although the small stones are many times larger and heavier than the ants, they have been carried a considerable distance and used to surface the hill.

similar areas (Figure 1), and their vicious stings when disturbed, make them a perennial nuisance to farm and city dwellers alike.

The correct common name of this insect is "Texas harvester ant." They are frequently referred to as "red harvester ant." Entomologists know them as *Pogonomyrmex barbatus* var. *molefaciens* (Buckl.).

Texas harvester ants prefer open ground that is well drained, and their mounds characteristically dot alfalfa fields, pastures, and roadsides. Often they are so numerous that a high percentage of the vegetation is destroyed by them (Figure 2).



(Picture by G. A. Bieberdorf)

FIG. 2.—The hill of a Texas Harvester ant colony in an alfalfa field. Note the wide area of visible damage, which may extend to a diameter of 15 feet or more.

The question, "How do you kill those red ants?" will find many a ready theory. One lady reported she had destroyed a colony in her yard by pouring scalding water on them each time they appeared. An elderly gentleman simply smashed them one at a time. Gasoline, kerosene, lye, and nearly every other available substance has been poured into the mounds with varying degrees of success.

This bulletin summarizes experiments on control of Texas harvester ants which have been conducted for several years by the Oklahoma Agricultural Experiment Station.

Good control has been found dependent upon many things in addition to the type of poison used. Soil conditions, temperature, moisture, activity of the colony, and other factors condition the effectiveness of any treatment. Only by testing a chemical many times and in many ways can its usefulness be estimated.

CHEMICALS TESTED AND THEIR EFFECTIVENESS*

Carbon disulfide.—Until recently, carbon disulfide was the main chemical used for Texas harvester ant control. The material is a color-

* Tests using carbon disulfide and cyanide were conducted by Dr. R. G. Dahms of the Oklahoma Agricultural Experiment Station.

less, pungent-smelling liquid that vaporizes rapidly when exposed to the air. The gas is heavier than air. It is highly inflammable and explosive, and therefore must be used with caution. If the gas is inhaled, it causes dizziness and nausea; and it is deadly if inhaled in large amounts.

Carbon disulfide has been used on several hundred hills and several methods of application have been tried. Best results were obtained when all the ants were in the nest at the time of treatment. If the soil is hot and dry, the effectiveness of the chemical will be increased by pouring two or three cups of water down the hole just before the carbon disulfide is applied.

Maximum kill will not be obtained with carbon disulfide unless the entrance hole is covered with moist or wet dirt after treatment.

If the correct method of application is followed, 4 oz. or ¼ pint of carbon disulfide to the average size nest is sufficient.

Calcium cyanide.—Several kinds of cyanide have been used for control of the Texas harvester ant. However, the experimental work with this chemical has been done with calcium cyanide dust. Cyanide gas is generated from this type of dust when it is exposed to the air. Unlike carbon disulfide, this gas is lighter than air and diffusion is upward and outward. *Cyanide gas is one of the most deadly gases known.* Extreme care is necessary in using this material, and containers should never be handled inside a building without proper gas masks.

Eight different methods of applying calcium cyanide dust for the control of harvester ants were tried. Best results were obtained by digging a hole at least 8 inches deep in the main entrance with a soil auger. It is recommended that the hole into the nest be bored several hours before it is to be treated, thus giving the ants an opporunity to clean out the tunnels leading into the soil auger hole. After the dust has been placed in the hole, a tight cover must be placed over the hole at once to prevent the escape of cyanide gas. Both cardboard and metal covers have been used with equal success. In most tests a cardboard 6 inches square was placed over the hole and weighted down with dirt.

Two ounces of calcium cyanide per nest is recommended.

Toxaphene.—Toxaphene was dusted on top of the mound. Three tablespoons of 20 per cent dust were used per hill. Fifteen hills were treated. The dust was toxic and also repellent. By the end of 24 hours no ants were active around the hills; but all colonies were active again within from one to two weeks. One large colony was re-treated four times and recovered each time within 48 hours. *Control was unsatisfactory.*

Benzene hexachloride.—Dust containing 5 per cent of the gamma isomer of benzene hexachloride was applied in the same manner as toxaphene. This material was toxic and highly repellent. Ants were scattered and many new entrances appeared. After three days, ants crossed the dust without becoming poisoned and no repellency was evident. *Control was unsatisfactory.*

Parathion.—Parathion was highly poisonous to the ants. Many were apparently dead within 10 minutes after contacting the chemical. Treatments made were as follows:

Ten cc (3 teaspoonfuls) of 15 per cent wettable powder in one cup of water per colony. This was poured into the entrance. Sixty-six per cent of the colonies treated were destroyed with one application.

Two tablespoonfuls of 15 per cent dust was scattered on top of each mound. Fifty-five per cent of the colonies were destroyed with one treatment. Two per cent dust applied in the same manner destroyed 19 per cent of the colonies with one application.

Colonies treated with dust containing 0.5 per cent parathion usually recovered. Many ants were killed by contact during the first few hours after parathion was applied. The colonies then became inactive for about two days. On the third day, activity began and they appeared to be no longer poisoned by the residue. Many dead ants were carried out of the nests. In one test a rain seemed to increase effectiveness of the poison and extend the toxic residual period somewhat. Several re-applications of the low concentrate dust were necessary in order to destroy the colonies. *Because of the high toxicity of parathion to warm-blooded animals, it is preferable to use some other insecticide.*

Chlordane.—The most effective methods of applying chlordane were as follows:

One cup or more of carbon tetrachloride containing 3 per cent technical chlordane by volume poured into the entrance. In four tests, 398 of 400 colonies were destroyed with one application. However, it was not quite so effective in some other tests.

Chlordane emulsion mixed with water was satisfactory when poured into the entrances at the rate of from one cup to one quart or more per nest. This preparation contained at least 3 per cent chlordane. In some hills the entrances were enlarged by pushing a pencil into them. This makes it easier to pour in a larger amount of chlordane mixture.

Dust containing 10 per cent chlordane scattered on the mound at the rate of two tablespoonfuls per colony gave fair control, but more repeated applications were necessary than when preparations were poured into the entrance.

Ants seem to "sense" the effect of a poison, and to a greater extent under some conditions than others. This occasionally results in abandonment of the poisoned area of their nest and the establishment of new entrances. If they continue to use the old entrance, as is often the case, chlordane will destroy them since it remains as a poison in the soil for a long period of time.

Some chlordane preparations on the market contain activators such as pyrethrum. These are intended to increase the speed with which an insect is killed. They are common in household sprays which are generally applied with an atomizer spray gun for the purpose of killing flies, mosquitoes, etc. The activators, however, were found to be very repellent to harvester ants and scattered them. Many new entrances were setup and thus the number of nests was increased.

Chlordane is comparatively safe to use, and when poured into the tunnel entrance is not exposed to children or animals as in the case of poisons applied on the surface.

Aldrin and Dieldrin.—Aldrin and dieldrin, two new insecticides, were found to be very poisonous to the ants. *These compounds are not recommended at the present time. Both are highly toxic to warm-blooded animals.*

DDT.—DDT has not given satisfactory control.

FACTORS AFFECTING CONTROL

It would be difficult to determine all of the factors influencing a poisoned ant colony which might enter into the effectiveness of the treatment.

The season appears to have some importance. Nests treated in the spring seemed to be more readily destroyed than those treated during summer or fall.

Temperature affects activity greatly. Ants remain within the nest during periods of high or low temperatures, going deeper into the ground as the temperature becomes more extreme. Several nests were treated during a cool day in October using a number of different poisons. Prior to the application, few ants were on the surface and these were sluggish. Within a few minutes, ants began emerging from the nests. Many new entrances were made and tunnels near the surface were opened to form little ditches which were filled with ants. This situation persisted for more than two weeks. In chlordane treated nests, ants were dying continuously and by the end of a month most of the colonies were dead. In contrast, nests poisoned with chlordane during warm summer days ceased activity within 24 hours.

Soil moisture and rainfall greatly influence ant control. During the warm, sultry periods prior to a rain, ant nests boil with activity. Ants are everywhere, but very shortly after the first drops fall, they return underground and none are about during the rain. Following a warm rain and especially when the sun shines, they return to the surface in a burst of energy. Each ant seems to be trying to dig a new tunnel and they give the impression of little dogs burying bones. Here and there individuals cluster together and some new nests are actually started. Winged kings and queens come to the surface, sometimes in great numbers. These may leave the old nests and take up with the groups of enterprising workers. This occurs throughout late spring, summer, and fall, seemingly limited only by rainfall and temperature conditions. This reaction by ants to moisture may partially explain poor control when nests are poisoned in moist soil or during a rainy period.

The amount of poison used is a factor important in effective control. It has been mentioned that chlordane remains as a poison for long periods of time, but if the poisoned area is isolated, it would be ineffective. This may happen when a concentrated poison mixture is placed in the entrance especially if a repellent such as pyrethrum is included, or if the soil is damp, or if the ground is loose such as in a plowed field. Isolation of the poisoned area is less likely to happen if the nest is extensively treated by using a quantity of emulsion or solution. Three per cent chlordane emulsion poured into the nest until it appeared to be full (one quart or more) gave excellent results with a single application.

LIFE HISTORY OF THE HARVESTER ANT AND SOME OF ITS HABITS

The nest.—Although we have set the harvester ant apart as an enemy, we cannot but admire her industry. The subterranean domain these creatures build is on a scale comparable to our greatest sky-scrapers, for it may spread over a diameter of more than 10 feet and penetrate deep into the ground. It is a complex structure interwoven with tunnels and galleries, and almost impossible to study by turning with a spade. A fine probe will lead through tunnels from one chamber to another until the search ends in collapsing earth. Some of the tunnels are so near the surface they must be continuously maintained and in nests that have been destroyed by poison, little ditches will appear when a rain crushes them in. Ants open these surface tunnels and galleries often and during swarming periods new entrances will appear and disappear. A well established colony will last for many years.

The Castes.—Within the nest there are different kinds of individuals called "castes." These are pictured in Figures 3 to 7. The busiest type is the worker. One is illustrated in Figure 3. These ants are females

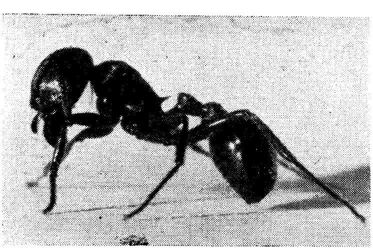


FIG. 3—Worker of the Texas Harvester ant enlarged 4¼ times. This is a sterile female. The egg-laying structures are modified to form a sting.

FIG. 4.—A king, or male Texas Harvester ant, enlarged 4 times. This is a winged form with a pair of short, blunt appendages at the tip of the abdomen.

whose generative organs function as a stinger rather than for egg laying. These are the smallest ants. A king or male ant is shown in Figure 4. These ants are larger than the workers and have wings. They can be recognized by the pair of short, blunt appendages at the tip of their abdomen. Queens are the largest ants. As is shown on Figure 5, they can be recognized by their size and the presence of wings.

Workers carry seeds or other plant material into the chambers occupied by queens, but the queen must feed herself. Eggs laid by the

FIG. 5.—A queen, or female Texas Harvester ant, enlarged 4 times. The queen is the largest member of the colony.

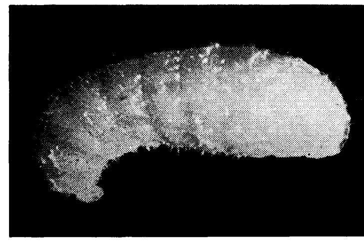
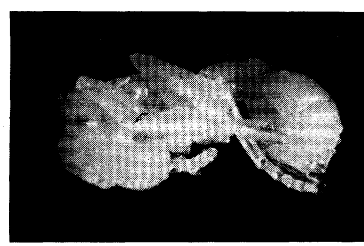


FIG. 6.—Larva of the Texas Harvester ant enlarged 5 times.

queen hatch into tiny, soft, white, worm-like larvae. One is shown in Figure 6. These larvae are usually kept in a separate area of the nest and are fed small insects, seeds, and plant material.

When the larvae are fully grown, they enter the resting stage and become pupae. A pupa is shown in Figure 7. It is inactive, and during

FIG. 7.—Pupa of the Texas Harvester ant enlarged 5 times. In this stage, the insect undergoes transformation from the worm-like larva to the adult.



this stage the insect undergoes complete transformation, emerging as an adult ant which has no resemblance to the larva. Pupae are also kept in a separate area of the nest.

When the adult ant first emerges from its pupal covering it is soft and almost white. It gradually turns yellow, then light brown, and finally the characteristic reddish brown. Sometimes after a rain and considerable moisture has entered the nest, worker ants will bring the larvae and pupae to the surface to dry them.

Occasionally an ant nest is abandoned and new quarters are set up. Two or three days may be spent moving stored food, larvae, pupae, and newly emerged adults. The busy workers trade their burdens about as they make the long trek from the old nest to the new. A larva will be dropped by a worker which then scurries about to pick up another larva or pupa and continue for another segment of the journey. The two nests may be fifty or more feet apart, and between them will lie the traffic-laden highway of ants.

Seasonal Activity.—Harvester ants may be seen above ground during any month of the year. On warm days during the winter, they may become somewhat active and bring various debris to the surface. Some of this material consists of sprouted seeds which may grow and create a sort of plant canopy around the entrance.

Surface activity accelerates greatly during the last of May and into June. Winged reproductives—the kings and queens—have been observed leaving nests from June into October. These fly about in search of worker ants which are starting new tunnels. The workers will be joined and new nests established. Sometimes during the summer, after a warm rain and especially if the sun is out, reproductives will leave the old nests in such numbers that swarms result.

Ant control appears to be least effective during this period of greatest surface activity, partly because new nests are being set up and partly because the poisoned area is more readily isolated and new entrances established.

ANT STINGS

Texas harvester ants as a rule are so industrious they have only enough time to tend to their own business. Therefore it is possible to watch their labors for long periods without disturbing them, but they seem to sense an attack. If the hill is trod upon or scuffed or disturbed, as the young man on the cover of this bulletin is shown doing, angry ants may strike back. They run rapidly to the ankles or up on the legs, grab the skin with their strong jaws to gain purchase, and then administer a painful burning sting. The venom may produce a second reaction in a day or two which is as painful as the first experience and is accompanied by some inflammation. The red spots should not be scratched. An antiseptic soothing cream will partially reduce the irritation. Such stings can be very severe and have caused one known death of a child in Oklahoma.