Zeitschrift: Acta Tropica
Herausgeber: Schweizerisches Tropeninstitut (Basel)
Band: 19 (1962)
Heft: (7): Pests of crops in warm climates and their control

Artikel: Pests of crops in warm climates and their control
Autor: Wyniger, R.
Kapitel: III. Pests of crops in warm climates : ants
DOI: https://doi.org/10.5169/seals-311035

ANTS

Ants and their Role as Plant Pests

Like termites ants are social and form highly organised colonies. Their most distinct morphological characteristic is the slim *petiolus* or *pedicel* formed by the first and second abdominal segments, which links the thorax and the rest of the abdomen.

Three of the five subfamilies of Formicidae:

Camponotinae
Dolichoderinae
Ponerinae
have the *petiolus unsegmented* (see Fig. 66) while in the
Myrmicinae
Dorylinae
the *petiolus* has *two segments* (see Fig. 66).

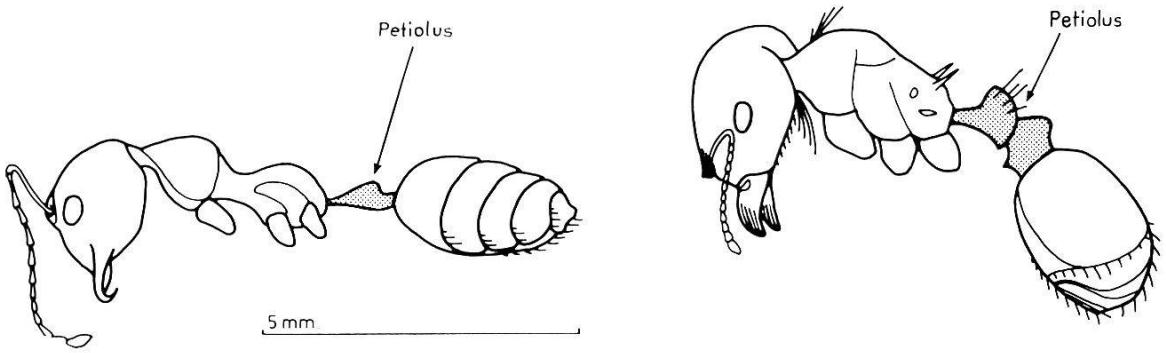

Fig. 66. Examples of unsegmented and segmented petiolus of ants.

The posterior part of the female's abdomen contains a poison apparatus which consists of glands, a vesicle and a sting, although many species have no sting. Ants which have a sting can inject their poison, mainly formic acid, directly into the wound, while some stingless species may eject small droplets of poison into wounds inflicted with their mandibles.

The thorax consists of 3 segments, a common feature of all insects; the morphology of these, however, is sometimes so complicated that in some species or forms they cannot be clearly distinguished. The mouth parts are robust, the mandibles being strongly dentate on their outer side. The antennae are long and thin, bent between the basal segment (scape) and the flagellum.

Nests and Castes

Form and structure of ant nests are manifold. There are two main types:

a) *Nests in the soil*

These consist of a more or less widespread system of underground passages. The nests of some species are indicated by mounds (or craters) of various shapes on the soil surface, although in other species there is no mound and the entrances are concealed by stones or may only be seen as small holes in the soil. Nest entrances can be found by tracing the ant runways on the soil surface.

b) *Surface nests*

To this category belong those nests which are built between stones or in the crevices of stone masonry. Some species build their nests in green or dead wood, forming chambers connected by passages. Carton nests, similar to those of wasps, consist of a mixture of masticated wood and earth particles glued with saliva. Finally there are tree nests in hollow trunks or branches of trees or in crevices perhaps at ground level. Some ant species spin the living leaves of trees into a nest (see p. 271 No. 497). According to DOFLEIN these worker ants, unable to produce silk themselves, use their larvae for this purpose. They hold them with their mandibles and move them over the edges of leaves which some workers hold together. The silk secreted from the larvae's mouth hardens rapidly and ties the leaves together.

Like termites ants are also divided into various castes which may be distinguished morphologically as well as ecologically. The swarming *reproductive forms* are alate and able to fly. The females or queens are considerably larger than the males; both have well developed antennae and eyes. Soon after mating, the wings of the queen break off at the base and the insect, now unable to fly, sets out to found a new colony, while the short-lived alate males (which have no poison apparatus), soon die. The numerically strongest caste, the *workers,* consists of undeveloped females, wingless and unable to reproduce. They are entrusted with the provision and distribution

of food and the care of the brood. Besides workers many ant species have *soldiers*, often recognizable by their large body and head and strong mandibles. They defend the nest against intruders and protect the workers along the runways.

Ant development is holometabolous: from eggs, legless white maggots emerge, developing, according to temperature and food conditions, within several days or weeks into pupae. In some species these are enclosed in egg-shaped cocoons (the so-called "ants eggs") and they may develop within only a few days to full-grown adults. Many ant species are useful or, if not useful, are harmless. Many, however, are directly or indirectly harmful to crops.

Ants of Economic Importance

Direct Damage to Leaves

In tropical and subtropical areas of America leaf-cutting ants (Sauvas, Parasol) of the subfamily Myrmicinae defoliate various crops. Many *Atta* species build huge, ramified underground nests with a complicated system of chambers. STAHEL and GEIJSKES, investigating those of *Atta sexdens* L., found nests with over 500 single chambers. Conspicuous earth mounds on the soil surface, characteristic of the respective species, indicate the presence of an underground nest.

A colony of leaf-cutting ants comprises several hundred thousand individuals, with some queens and reproductive males, but mostly workers and soldiers of various sizes. Thousands of workers

Fig. 67. Nest craters of *Atta sexdens* in the field.

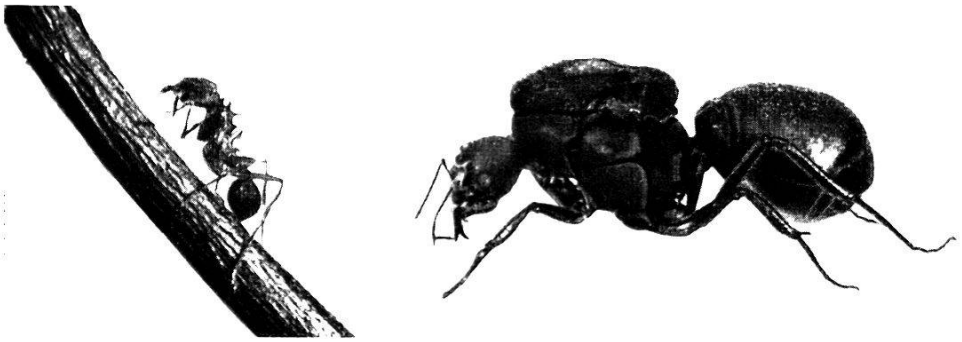

Fig. 68. *Atta sexdens* L.

left = worker;
right = queen after shedding its wings.

may climb on plants, and bite pieces from the leaves with their mandibles. These are carried into their nests to serve as a culture medium for fungus gardens. The majority of the numerous underground chambers are filled with masticated leaves on which the minute white sporangia of a certain fungus may be seen. The fungi serve mainly as food for the ants and their brood. The leaf refuse is stored in special chambers and finally discharged to the surface through craters, i.e. enormous earth mounds easily distinguishable from the smaller nest mounds.

Atta sexdens L., widespread in Brazil, is injurious to many useful plants such as vegetables, fruit trees, Cocoa, Coffee, and others. The adults are 7-10 mm long and brown; the thorax bears conspicuous sharp spines.

The nests are built either in open fields or in wooded areas. Breeding chambers are 3-4 m. below the soil surface. Leaf-cutting

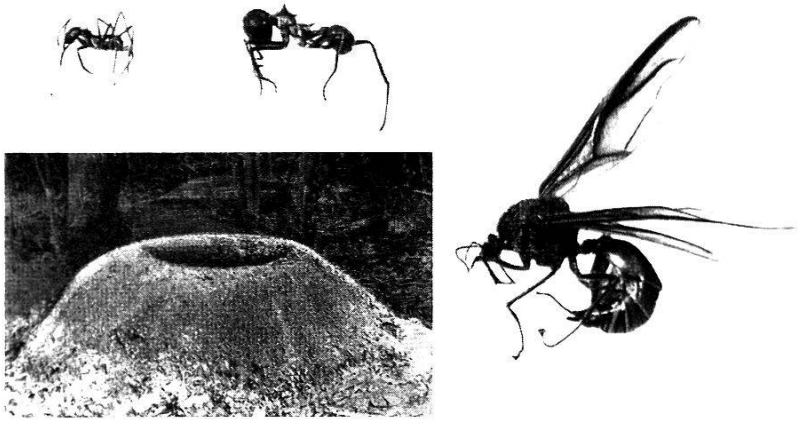

Fig. 69. *Atta cephalotes* L.

left above = worker and soldier;
left below = nest crater;

right = queen before shedding its wings.

ants use long underground passages for the transport of leaves; they are active in daytime as well as at night. The sharp-edged discharge craters may rise to 0.5 m. above the soil surface (see Fig. 67).

Atta cephalotes L. attacks Manioc, Mango, Coffee, Cocoa, Rubber and other crops. It occurs from Brazil to Mexico and the West Indies and favours wooded areas along the coast. It is 5-12 mm. long and brownish-red. It collects leaves at night, cuts them into small fragments whilst it is still in the tree and carries them along surface tracks into the nests. Breeding chambers of this species are 1-2 m. underground. The discharge craters are large and obtuse; their edge is rounded-off.

Atta insularis Guér. resembles the two previous species. It attacks Citrus, Sugar cane, Maize, Manioc and other crops in Cuba. The dark brown insect is 5-7 mm. long.

Control of Leaf-Cutting Ants

Since leaf-cutting ants live underground, fast-acting insecticides are recommended for their control; only those substances guarantee rapid extermination and prevent the ants from escaping through underground galleries. Application of gas poisons or liquid fumigants, or fast-acting contact poisons in powder form have come into use in the field.

Success of control actions greatly depends on the method of application which has to be adapted to local conditions. As a general rule care has to be taken that the poisonous substance reaches galleries and chambers in sufficient quantities and in the shortest possible time. The following methods may be applied:

1. *Application of liquid fumigants by hand* (method of STAHEL and GEIJSKES)

An earth mound, concealing the entrance to a gallery, is removed with a hoe. A piece of split bamboo, forming a gutter, or a glass or metal tube, is introduced as deeply as possible into the gallery. Then the liquid fumigant (for instance 50 c.c. carbon disulphide) is poured into the channel. One channel per sq. metre is treated. In order to prevent the vapour from escaping, both the treated crater and the surrounding ones are closed by pressing the lightly hoed earth mounds. The large discharge craters, recognizable by the refuse evacuated through them, need not be treated, since they are not connected with the fungus gardens or the breeding chambers, but with the refuse cavities.

2. Application of fumigants with pressure cylinders

With this method the poison gas is forced into a nest. The tube mounted on the cylinder valve is introduced as deeply as possible into a channel and the earth is packed around it so as to make it almost air-tight. According to size and extent of the nest (which may exceed 100 sq. metres) several pressure cylinders of ½ l. volume are applied in the above described way over the nest area; all the other earth mounds and craters are closed by pressing the earth very tightly. Then the gas is forced into the nest. After treatment, the tubes are extracted and the openings closed.

3. Application of dust

The nozzle or tube of a duster is put into the entrance of a gallery and with a few vigorous strokes the dust is blown into the nest. The quantity required depends on the size of the channel, 50-100 g. being used for each opening. These are *not* closed after treatment and have to be treated again 2-3 times at intervals of several days, according to the density of a population. They should be treated again after an interval of about 6 months because incipient colonies are usually overlooked.

4. Application of aqueous products

The poison, diluted by water, is poured with watering cans, hand or motor pumps, directly into a nest. The quantity required depends on the size of the nest and the effect of the insecticide (cf. appendix).

Ants Causing Direct Damage to Roots, Trunks, Shoots, and Flowers

These include several species of the subfamily Myrmicinae. *Tetramorium caespitum* L. is a small, dark brown ant, 3-4 mm. long, which nests in the ground or under stones and feeds on various plant roots. The entrances to a nest are visible on the soil surface by more or less extensive flat heaps of expelled earth particles. This species occurs in Europe, Africa and U.S.A.

Solenopsis geminata F., the fire ant, attacks Citrus, Coffee, Cocoa, and other plants. The dark reddish-brown workers are 3-4 mm. long, while the soldiers are about 5 mm. long; the light brown heads of the latter are unusually large. *S. geminata* often nests at the base of a trunk. The workers gnaw shoots, buds, flowers and fruits, and lick the emanated plant sap. They also attend the aphids. They occur in the West Indies and southern States of U.S.A.

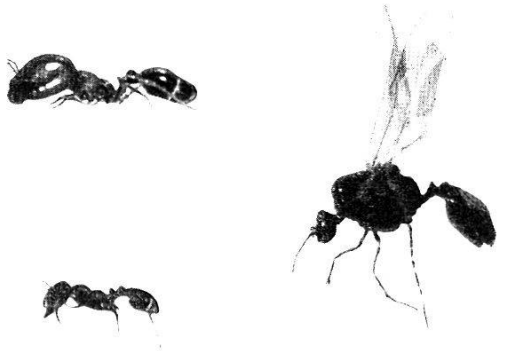

Fig. 70. *Solenopsis geminata* F.
left above = soldier;
left below = worker;
right = alate, reproductive queen.

Some species of *Crematogaster* build carton nests on branches or twigs of various trees, injuring the underlying bark and thus seriously disturbing the circulation of the plant sap, but the main damage is caused indirectly by their tending of the mealybugs, which suck on the plants. The genus *Crematogaster* occurs all over the world in numerous, usually minute species, about 3 mm in length, of reddish-brown to dark brown colour.

Iridiomyrmex humilis Mayr. of the subfamily Dolichoderinae (Argentine ant), is about 2.5 mm. long, of light brownish-red colour with a darker abdomen. This species builds either tree nests or underground nests, loosening the hold of plants by its mining activity (see Fig. 71). It attacks underground buds of Sugar cane and other crops and also eats the flowers of various plants. It occurs in Europe, Africa, the southern States of U.S.A as well as in Central and South America, also in Asia and probably Australia.

The *harvesting ants* are so called because they collect seeds of a wide range of crops in seedbeds or in the field, carrying them into their underground nests. This group mainly comprises species of the genera *Messor* For., *Pheidole* Westw., *Pogonomyrmex* Mayr., and *Tetramorium* of the subfamily Myrmicinae.

Control

Control measures against any species of ants mentioned above have to be directed against their nests. Insecticide seed dressings and broadcast insecticides are also highly effective. Earth nests have to be treated by pouring fast-acting insecticides with contact and fumigant effect into them (cf. also Fig. 64). Surface nests must be opened in 2 or 3 places before persistent contact insecticide in powder form

is introduced. When nests cannot be reached or located, dusting with contact insecticides is recommended. This method consists of spreading a thick layer of dust wherever ants may pass. (For details see appendix.)

Ants Indirectly Injurious

Relationships of ants to Aphids and Coccids such as Psyllids, Jassids and Fulgorids (cf. page 15) are of particular importance for the agriculturist. It is well known that many plant lice, especially Aphids and Coccids, excrete a sweet substance (the so-called honey-dew). Many species of ants visit infested plants and ingest the sweet exudate as soon as the droplets appear at the anal end of the lice. The ants may induce them to produce drops of honey-dew by stroking the lice with their antennae. They may benefit the lice by increasing their intake of food and also by protecting them from predators and sometimes from parasites, thus increasing their numbers. Some ant species attack predators which approach the attended plant lice and others may also build earth or silken shelters around them.

Ants attending Aphids and Coccids include species of the genera *Crematogaster, Pheidole* (subfamily Myrmicinae), and *Camponotus* and *Lasius* (subfamily Camponotinae).

These species, with the exception of certain *Crematogaster* which build carton nests in branches and twigs, climb up the trunk or stem on their way to the lice; their presence is detected by "ant tracks". Control must be directed against either the nests or the tracks on the trunks (for instance on Citrus), by applying contact insecticides. Good results may be obtained by wrapping insecticide-treated paper or fabric bandages around the tree trunks. This method is of long-lasting effect (cf. appendix).

Various species of the genera *Oecophylla, Polyrhachis* and *Camponotus* of the subfamily Camponotinae are of special interest to the agriculturist. These species build their nests on trees, spinning the outer leaves of a branch together so as to form a ball (see Chap. III No. 497), or they build their breeding chambers in hollow branches, or in the soil.

Oecophylla smaragdina F. is distributed in S.E. Asia, Queensland and W.Africa.Wherever it occurs, harvesting of Citrus, Coffee, Cocoa, etc. is difficult. The slightest contact with the plant foliage brings forth masses of these reddish-brown ants, about 10 mm. long, which fix themselves on hands and arms. Their bite is very painful and may cause sensitive persons to suffer from skin irritation. *Oe. smaragdina* lives predaciously and feeds on various insects living on trees; it, however, spares Aphids and scale insects. (For control see appendix.)

Azteca chartifex Forel, common in the West Indies and belong-

Fig. 71. Earth nest of *Lasius* sp. at the base of a Citrus tree.

ing to the subfamily Camponotinae, builds carton nests of earth particles and fine wood fibres, fixing them to branches of Cocoa and other trees. Aphid and Coccid colonies on shoots and pods are protected within carton tents by these ants.

Control

Successful control is obtained by applying contact insecticides in powder or spray form. Both the nests and their entrances, and the surrounding areas have to be treated. (For details see appendix.)

Driver Ants

Driver ants (subfamily Dorylinae) sometimes occur in crops, their presence causing annoyance and impairing agricultural work. In large processions, often many metres long, these black ants migrate through bush and field, overrunning roads and buildings. They live predaciously and being carnivorous, they attack insects or small vertebrates. Their mass occurrence and their painful bite make them a serious menace; when invading an inhabited place they compel the inhabitants to leave for a time. The processions of driver ants can be most frequently observed in the early morning, after rainfall or in daytime during the rainy season. Their nests are underground. When migrating they build several times new temporary nests.

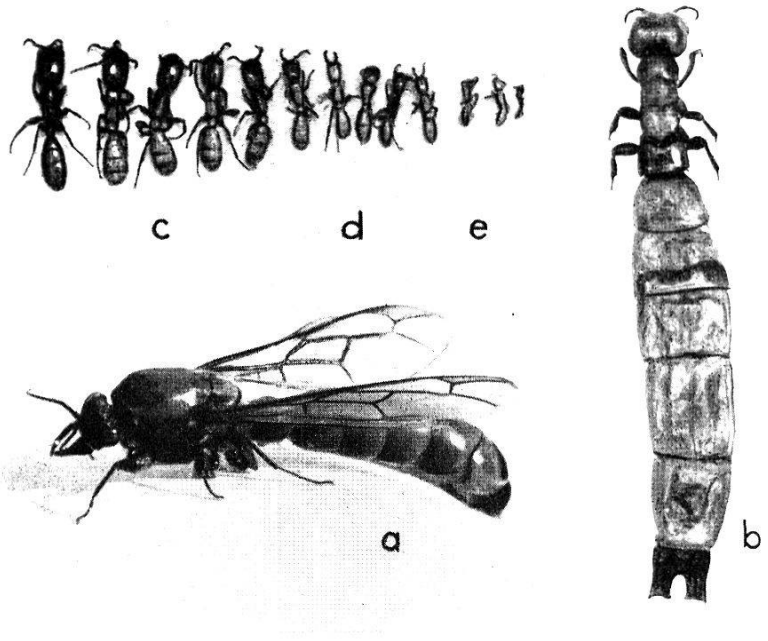

Fig. 72. *Dorylus fulvus* Westw.

a = alate, reproductive male;
b = reproductive female after shedding its wings;
c = large soldiers;
d = small soldiers;
e = workers.

Spraying of ant processions with very fast-acting contact insecticides with a knapsack sprayer causes them to disperse or diverts their course. (For details see appendix.) *Oecophylla* and *Dorylinae* are recognized as beneficial *predators*. They should be preserved if possible.