Atta cephalotes

Introduction

Atta cephalotes (Linnaeus) is one of fifteen (15) leaf cutting *Atta* spp., which has been described. It is the most widely distributed of the species, stretching from Mexico in the north through Central America and the Caribbean into South America, reaching Argentina in the south. It is an insect pest of tremendous importance, defoliating a wide range of broad-leaved plants, and rather than eating the cut leaves, uses them to build a fungus which it eats. This characteristic indicates that the ants have been pre-adapted for their role as agricultural pests. Two other characteristics which enhance the pest status of the species are the ability to build up high population densities and the longevity of colonies.
It should be recognized that leaf-cutting ants might also be regarded as beneficial organisms to the ecosystems of the Neotropics. Hölldobler and Wilson (1990) observed that they prune vegetation, stimulate new plant growth, break down vegetable material rapidly, turn and enrich the soil.

Identity

Authority : Linnaeus, (1758)
Classification
- Kingdom : Animalia
- Phylum: : Arthropoda
- Class : Insecta
- Tribe : Attini
- Order : Hymenoptera
- Family : Formicidae
- Genus : *Atta*
- Species : *cephalotes*
- Synonyms : *Oecodoma cephalotes* (Lepeletier, 1836), *Atta lutea* Forel 1893, *Atta cephalotes* v. *opaca* (For., 1904), *A. cephalotes* v. *integrior* (For., 1904), *A. cephalotes* subsp. *polita* (Emery, 1905), *Atta cephalotes* v. *erecta* (Santschi.,1929), *Atta cephalotes* subsp. *oaxaquensis* (Gonçalves, 1942), *Atta cephalotes* subsp. *isthmicola* (Weber, 1943)
- Common names: Bachac, acoushi, cushi, umbrella ants, troublesome umbrella ants, parasol ants, zompopo, sauva, sauva da matta, hormiga arriera, hormiga cortadora and blattschneideameise.

- Role : Pest

The species was first described as *Formica cephalotes* by Linnaeus in 1758. It was later revised and named *Atta cephalotes* by Fabricius in 1804.

Signs & Symptoms

A. cephalotes usually completely defoliates plants by cutting neatly rounded leaf pieces from them. Leaf fragments that litter the ground are evidence of ant activity in an area. Mound are created as the ants excavate to expand their nest. Mound size is usually an indicator of the nest size.

Morphology

The ants are characteristically polymorphic; there is distinct variation in the sizes of the different castes that make up a colony. The worker caste (Fig 1) comprise "soldiers", the largest in this cast, which protect the nest from invaders; "minima" workers which measure about
2 mm in body length, "media" workers measuring approximately 7 mm, and "maxima" workers which measure about 14 mm in length and a thorax length of 7 mm. Males have a body length of about 18 mm, while females are about 22 mm in length (Borgmeier, 1959).

Biology & Ecology

A. cephalotes is a eusocial insect species, living in large subterranean nests made up of chambers, which are interconnected by a series of tunnels. The pest grows a fungus with the leaf material, which it takes into the nest; this fungus is the only food eaten by the ants. The fungus, which reaches between 15-30 cm in diameter, has a spongy appearance, and is found in underground chambers.
Each colony comprises a queen, sexual forms (males and females), and workers (Fig. 1). Virgin queens/reproductives are responsible for the formation of new nests. Male and female reproductives are produced simultaneously within a colony. They leave the nest in large numbers on what is regarded as the mating or "nuptial flight". Females are believed to mate three to five times (Hölldobler &Wilson, 1990).

Fig. 1: Workers of *A. cephalotes*

Nuptial flights take place at the onset of the rainy season. Virgin queens leave the nest with a piece of the fungus in their infrabuccal chamber, beneath the opening of the oesophagus just to the rear of the base of the labium. After mating, the founding queen falls to the ground, sheds her wings, and sets about to start her own nest. Mortality at this stage has been estimated to be almost 90%; the major cause of death being fungal attack to which the queen is quite susceptible at this time since she has no workers to groom her (Hölldobler & Wilson, 1990).

Upon finding a suitable site, the queen digs a tunnel to a depth of about 10cm. The tunnel ends in the form of a chamber where the fungus is stored. She nurtures the garden by feeding it with her own eggs and excrement. Establishment of the nest depends on the survival of the fungus garden until workers are raised to take over the responsibility for its continued growth and multiplication; the period for this ranges from 5–10 weeks.

Once workers are produced the queen ceases to tend to the garden, and switches to her new role of producing offspring. The workers now take over the function of caring for the fungus garden and tending the queen. Media and maxima workers climb trees, cut leaf pieces and fetch them back to the nest. Weber (1966, 1972) and Hölldobler and Wilson (1971) surmise that the minima workers clean and scrape leaf surfaces (it is thought that this cleaning and removal of the cuticle accelerates fungal growth and removes foreign fungi and bacteria). They work the material into small pieces and add saliva and faecal material to it to form a sticky mass, which is added to the fungus garden. Additionally, several tufts of fungal mycelia are placed on it.

As the colony ages it expands in terms of its nest size (number of tunnels and chambers) and ant population. After 2 – 3 years it begins producing winged sexual forms, which then leave the colony in preparation to form new nests.

Dispersal

Dispersal of the species occurs during the period when new colonies are founded. This event takes place at the onset of the rainy season when the sexually mature males and females fly out of the nests on their nuptial flight. By this means the ants colonize new areas thereby expanding their range.

Management

Management of *A. cephalotes* is similar to that for other leaf-cutting ants, and revolves around three strategies:

a) Protecting plants against damage by the ants by using mechanical barriers,
b) Finding nests and destroying them by physical or mechanical means, and
c) Exploiting the ants' behaviour of collecting materials and fetching them into their nests.

Tree crops and ornamentals may be protected against attack by the ants by placing mechanical barriers around individual plants. These barriers may be in the form of grease, metal or PVC bands. Some home gardeners use water-filled troughs (usually cut tyres) around ornamentals.

Chemicals, in all it's various forms e.g. liquids, dusts, vapour or smoke, were first used for managing the ants by applying them directly to nests. In the 1930s carbon bisulphide, a highly flammable, very volatile liquid, whose vapour explodes when ignited, was used in Guyana to destroy nests (Cleare, 1930). Fogging of nests with various contact poisons is still practised.

The use of poisoned baits in the early 1970s proved successful in managing the pest without having to locate their nests. Baits using Aldrin and Mirex, two highly persistent chemicals, have now been replaced by products using less persistent chemicals e.g. Sulfuramide and Fipronil. In order to elicit a fast pick up response, attractive matrices, e.g. dried citrus pulp, are used, or known attractants e.g., soya oil, are added to the matrix to improve the bait's overall attractiveness. Baits can be further enhanced by, adding pheromones of the particular target species to the materials.

Baiting has proved to be successful from two perspectives; it is an effective and efficient method and is not labour intensive as earlier strategies.

Phillips *et al.*, (1976) observed that bait placed on old inactive trails leading from the nest was left untouched and allowed to spoil. Another study by Phillips *et al.*, (1979) demonstrated that *A. cephalotes* picked up bait placed on an active trail only and never foraged for scattered bait. This would suggest that aerial baiting is inappropriate for this species.

Natural Enemies

The virgin female is the most vulnerable stage for attack by natural enemies. Mortality at this stage is estimated to be almost 90%. The biotic agents responsible for this mortality are digging vertebrate predators, and more importantly, fungus to which the queen is extremely susceptible since at this stage, she has no workers to groom her (Hölldobler & Wilson, 1990). Phorid parasitoids are also recorded as natural enemies of leaf-cutting ants.

Host Notes

Characteristically, *A. cephalotes* attacks trees and shrubs rather than herbs. Mature colonies develop well-established trails, which are usually clear of debris (Weber, 1972). The species has been specialized to live in forest gaps, and as such attacks subsistence farms and plantations throughout Central and South America.

Distribution

The ants occur in Mexico, Central America (Guatemala, Nicaragua, Costa Rica, Panama), Cuba, Argentina, Venezuela, Colombia, Ecuador, Bolivia, Peru, Suriname, Guyana, French Guiana, Brazil, Trinidad and the Lesser Antilles.

Pest Significance & Phytosanitary Risk

Atta cephalotes is undoubtedly among the three most important leaf-cutting ants species, and is of tremendous economic importance. Like other *Atta* species, it is well adapted for its role as an agricultural pest since it has the following characteristics:

1. It has the ability to attack many plant species.

2. It builds up very high population densities.
3. Colonies also exist for as long as 25 years, and occupy vast expanses of land.

Cherrett (1968) showed in a study done in Guyana that the species foraged over 60 meters from the nest and attacked leaves and flowers of 36 of 72 plant species found in the area.

No estimates on losses have been done for any particular species, however, the ants in general have been estimated to cause about US$ 1,000 million in losses annually (Cramer, 1967). Losses of about 12 % resulting from ant damage have been reported in the Caribbean (Cherrett, 1968).

The ants will become established if introduced into a tropical environment. Such establishment is dependent on the introduction of a virgin queen carrying a piece of the fungus being introduced. The possibility of the ants being accidentally introduced into a country is, therefore, rather remote. For this reason the phytosanitary risk can be regarded as extremely low.

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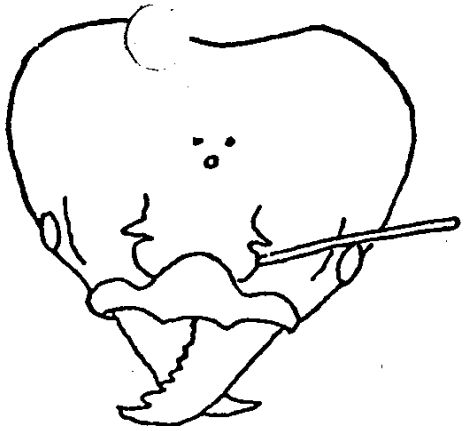

Fig. 2: Head capsule of *Atta cephalotes*

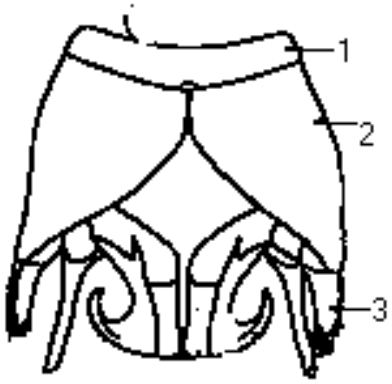

Fig. 3: Male genitalia of *Atta cephalotes*

Legend:

1. **Lamina annularis (basal ring)**
2. **Squamula**
3. **Stipes**