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Cinara cupressi:

A Pest of Mulanje Cedar and Cypress Trees in Malawi.

Abstract

Cinara cupressi(Buckton) (Aphididae : Lachnidae) is reported for the first time in Malawi, as a serious pest of *Cupressus lusitanica*, *Cu.torulosa* and *Widdringtonia nodiflora*. The pest and its life cycle are described. An account of damage caused by the pest is given and potential control measures are discussed.

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C.Z. Chilima

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1. Introduction.

The aphid was first reported in Malawi between 1985 and 1986 damaging Widdringtonia nodiflora(Mulanje Cedar), Cupressus lusitanica and Cu.torulosa(common cypresses in Malawi) in the city of Mzuzu and the Viphya Plantations(between latitudes 11°30' and 12°20'S and longitudes 33°40' and 34°10'E). The pest was subsequently identified as Cinara cupressi(Buckton) by the Commonwealth Institute of Entomology.(Harris, 1987, Personal comm.)

C.cupressi has since, spread throughout the country, attacking all trees of the genera Cupressus and Widdringtonia.

This species originates in the warmer temperate regions of Europe and North America(Mills, 1988). In Europe, it is fairly widespread, being reported from Britain(Carter 1983; Carter and Maslen, 1982). Italy (Lisi and Triggiani, 1977; Inserra et al, 1979) and Germany(Gunkel, 1963).

This appears to be the first report of this pest in Africa (Mills, 1988) although it may be present but unreported in other African countries.

2. Description and Life Cycle of C.cupressi.

Individuals ranging in size from 0.8mm (nymphs) to 3mm (adults), are pale brown when young, turning greyish brown as they age. Minute adpressed grey hairs which cover the whole body are only easily seen under a magnifier.

There is a distinct double row of black dots that diverge from the thorax posteriorly and an ill defined **black** band which links two prominent siphuncular cones. Further description is given by Carter and Maslen(1982).

C.cupressi exhibits incomplete metamorphosis, i.e. immature nymphs are similar in form to adults. Alate(winged) and apterous(wingless) adults have been observed ...

simultaneously in Malawi populations, but the alate forms are rare except towards the end of the dry season. During this season, alates are often seen flying about, presumably in search of fresh hosts.

Unlike many aphid species C.cupressi exhibits a simple life cycle on one host only. Colonies of viviparae (individuals which produce living nymphs) continuously reproduce throughout the year in Malawi. Oviparal(individuals that lay eggs) and males have not been recorded in Malawian populations. This constrasts with the situation in Europe where viviparae reproduce only in the summer periods and Oviparae appear towards winter and lay overwintering eggs (Mills, 1988; Carter and Maslen, 1982).

3. Damage Caused by C.cupressi.

Aphids damage plants by sucking sap from their tissues (Odendaal, 1989). This denies the plant of adequate water and nutrient supply. To assist their mouthparts penetrate plant tissues and reach cells rich in nutrients, the aphids inject enzymes with saliva into the plant(Carter and Maslen, 1982; Mitchel et al, 1970). It is known that these enzymes interfere with normal plant physiology and cause abnormal cell division and differentiation(Mitchel, et al, 1970). There is further indication that certain aphid species transmit pathogenic microorganisms e.g. fungi, viruses and microplasma (Lissi and Triggiani, 1977; Inserra et al, 1979; Nyirenda, 1987, Personal communication) and that these pathogens cause most of the damage to host plants. When feeding in large numbers, aphids produce large quantities of honeydew which falls on the foliage and soon becomes colonised by a sooty fungus. The fungus damages the plant by killing tender twigs and leaves and by reducing photosynthetic surface area(Carter and Maslen, 1982).

The symptoms of attack by *C.cupressi* are browning or yellowing of foliage and drying of twigs. Death of whole trees occurs after persistent or repeated attacks. Symptoms develop very rapidly in the dry season, probably due to a combination of large aphid numbers and stress caused by drought. In the rainy season, most damaged trees give new shoots and appear to recover from the attack.

In the Viphya Forest, an estimated 10,000 hectares of *Cupresus* and *Widdringtonia* spp. had been damaged by *C.cupressi* by the end of the 1987 dry season.

Host Trees Attacked.

The most severely attacked tree species in Malawi are *Cupressus lusitanica* and *Widdringtonia nodiflora*. *Cu.torulosa* is also attacked but to a lesser extent. No other tree species in Malawi are known to be susceptible.

In Europe, *Cu.sempevirens* appears to be the most susceptible but *Cu.macrocarpa*, *Cu.funebris*, *Juniperus chinensis* and *Thuja orientalis* are also susceptible(Luisi and Triggiani, 1977; Carter and Maslen, 1982).

4. Research and Future Programmes.

Biological Control.

General surveys have been conducted to investigate the potential for biocontrol of the aphids. The following coccinellids(ladybirds) have been identified feeding on *C. cupressi*: *Cheilomemes aurora* (Gerst.) *Ch.propinqua* (Mulsant), *Liaodalia intermedia*(Crotch) and unidentified species of *Exochomus*. Syrphid (hoverfly) larvae of the species *Betasyrphus adligatus* (Wiedman) have also been observed feeding on the aphids. Studies have shown however, that these predators are unable to keep aphid populations down. It is suspected that this failure is due to non-specificity of the predators i.e. they attack a wide range of prey as a result have no significant impact on an individual prey species.

FRIM in conjunction with the Commonwealth Institute of Biological Control(CIBC, UK) are planing a programme of biological control using specific and therefore more efficient predators, parasites or parasitoids imported from Europe. It is known that in Europe, such specific natural enemies of C.cupressi exist and that they are able to keep the pest under control(Mills, 1988).

Chemical Control.

Due to the possible high costs and environmental disturbances that chemical control of forest aphids would pose, research has only centred on protection of small wood-lots, christmas trees and hedges.

As a protection for hedges, the insecticides dimethoate and disyston have been tested, dimethoate being applied at various rates as a spray and disyston being applied as granules hoed into the ground at the base of the plants. Both insecticides proved effective but only for a short period(2-3 weeks). To protect christmas trees and small young woodlots, the insecticides dimethoate and azodrin have been tried, the latter being injected into the tree trunks at various rates. Results have shown that only dimethoate was effective but again for short periods. Other trials involving fenitrothion and controlled release granular formulations of phorate are currently in progress.

- **Breeding for Resistance.**

It has been observed that amongst badly damaged trees of a particular species, certain individuals are hardly touched or only mildly damaged. FRIM is exploring this, aiming at raising naturally resistant trees from these apparently resistant individuals. A programme of tree breeding for

5. Discussion and Conclusions.

C.cupressi attack has been most severe on Cu. lusitanica and W.nodiflora particularly where these are growing under physiological stress brought about by long dry weather spells and large aphid numbers(e.g. in the dry season).

3 main management options for protection of the trees have been mentioned; Chemical control; biological control and control using resistant trees.

The main advantage with insecticides is the ability to produce quick results especially where delay would lead to unacceptable tree mortality. However, conditions in forests are such that penetration of insecticides into the foliage may not be sufficient to kill most of the pests, so large quantities of insecticide would need to be applied, probably repeatedly; also large areas of forest may need to be treated to avoid recolonisation of sprayed areas; insecticides would need to be applied from the air, using aircraft. The whole operation would therefore be quite expensive. Apart from high costs, there are other disadvantages with chemical control of conifer aphids: firstly, the insecticides are not specific to aphids, so most other insects including useful parasites, predators and bees would also be killed. Secondly, most aphicides are harmful to fish, livestock, game, birds and also people living in the forests. Therefore, chemical control would only be recommended for protection of small woodlots, hedges and christmas trees.

Biological control using natural enemies(other insects which attack the aphids) has the advantage that once the enemies have been established, they are able to provide a long lasting self perpetuating control of the pest. The natural enemies being insects themselves, are more able to penetrate tree crowns and reach the aphids than chemicals. Where biological control of aphids has been tried, some results have been encouraging. For example in Chile and Hawaii, the aphids Pineus boerneri and P.pini were successfully controlled in the early 1970s through the importation of Leucorpis obscura and L. nigralona from Europe and Pakistan. Also in the late 1970s, imported parasitoid Pausia bicolor from North America was used to successfully control the exotic pine aphid Cinara cronartii in South Africa(Mills, 1988).

The prospects for control of the aphids through raising resistant trees are also good. In nearly all the plantations that have been attacked, the observed level of tree to tree variation in resistance is quite high. This is probably due to the broader genetic base of the tree crops as compared to agricultural crops, which have undergone generations of breeding.

At this stage of Cinara outbreak, it is considered that the pest is a serious threat to Cupressus and Widdringtonia species in Malawi. It is important therefore, to institute a programme of research into methods of reducing its potential as a pest.

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