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# Mealybugs found on agricultural crops in Yemen

**Abstract** - The scale insect fauna of Yemen is practically unknown to coccidologists. Systematic and faunistic research is being carried out to fill this gap. This paper reports on mealybug species collected on agricultural crops, namely grapevine, mango, guava, citrus, coffee and sorghum.

**Key words**: Yemen, Pseudococcidae, *Planococcus ficus.*

## INTRODUCTION

Agriculture is one of the main components of the economy in Yemen and contributes about 20% of the GDP. More than half of the active population is employed in it. The main agricultural crops are: cereals (sorghum and millet), banana, date palm, grapes, coffee, citrus, tropical fruits (guava, mango), vegetables, tobacco and qat. The provision of irrigation water is the main human input to agriculture production. Water is a scarce resource in Yemen as no permanent rivers exist and agriculture uses more than 90% of the available water especially for irrigation purposes.

The absence of both a relevant legislation and a plant quarantine service centres to regulate plant and seed imports has allowed pests and plant diseases to enter the country unchecked during many years. A plant quarantine law came in force only in 1999. The climatic diversity makes it possible for plant diseases and pests to thrive all year round In recent years among insect pests, scale insects cause increasing phytosanitary problems and hence are increased economic importance

The scale insect fauna of Yemen is poorly studied and practically unknown to coccidologists. Our knowledge is summed up in two Yemeni publications on insect crop pests (Nasseh & Mahyoub, 1987; Ba-Angood et al., 1997). These are really no more than lists of names, and most of the identifications probably are not very reliable. As far as we know, no voucher specimens have been deposited in any insect collection. A few other records are available in a general handbook (Gentry, 1965) and in two scale insect papers (Cox, 1989; Williams, 1996). According to the references above, the Yemeni scale insect fauna comprises 26 species, representing the following families (number of species are in brackets): Margarodidae (2), Pseudococcidae (4), Coccidae (5), Asterolecanidae (1), Phoenicococcidae (1) and Diaspididae (13). The mealybugs

listed for Yemen are the following: *Ferrisia virgata* (Cockerell), *Maconellicoccus hirsutus* (Green), *Planococcus citri* (Risso) and *Planococcus lilacinus* (Cockerell). For all recorded species, data on host plants, distribution within the country, months of main activity and economic importance are few or lacking.

On the other hand, the environment of the country would suggest the presence of a very interesting scale insect fauna, comparable to that of the neighbouring country Saudi Arabia (Matile Ferrero, 1984, 1988), where sampling had been extended to wild plants also.

As a first step, we focused our efforts on mealybug species on agricultural crops, collecting information as a basis for the development of plant protection programmes, including biological control. Simultaneously conducted studies of the natural enemies showed that most beneficial species used world-wide for the biological control of mealybugs were already present in Yemen, with the exception of the ladybird beetle *Cryptolaemus montrouzieri* Mulsant. In this paper, the first results of our investigations are presented.

## MATERIALS AND METHODS

Mealybug specimens collected during the years 1991-2000 on coffee, citrus, grapevine, guava, mango and sorghum in several localities were mounted on microscope slides and examined.

## RESULTS

Seven mealybug species were identified, namely: *Dysmicoccus carens* Williams, *Ferrisia virgata* (Cockerell), *Maconellicoccus hirsutus* (Green), *Paracoccus burnerae* (Brain), *Phenacoccus madeirensis* Green,), *Planococcus citri* (Risso) and *Planococcus ficus* (Signoret). Of these *D. carens*, *P. madeirensis*, *P. burnerae* and *P. ficus* are new records for Yemen, while the presence of *F. virgata*, *M. hirsutus* and *P. citri* is confirmed.

### ***Dysmicoccus carens*** Williams

This species was first described from specimens collected in India on *Saccharum officinarum* and was also reported from Pakistan (Williams, 1970). Until now, this was its entire known distribution. The biology of *D. carens* was studied by Razak *et al.* (1994). At present, it cannot be regarded as an economically important species.
*Material examined*: 6 specimens, on sorghum, Bait al Faqih, 03.xii.97, coll. A. van Harten.

### ***Ferrisia virgata*** (Cockerell)

The striped mealybug is a polyphagous species known from about 200 host plants

with an almost cosmopolitan distribution (Ben-Dov, 1994). It is a pest on several crops in India and Pakistan. In Yemen the mealybug is not a pest because it is frequently heavily parasitized.
*Material examined*: 2 specimens, on guava, 20.x.91, Ta'izz, coll. A. van Harten; 5 specimens, on guava, Wadi Bana, 16.v.00, coll. A. van Harten.

***Maconellicoccus hirsutus*** (Green)

The pink hibiscus mealybug is a polyphagous insect that attacks more than 300 plants, including most of the agricultural crops cultivated in Yemen. It is widespread in the world and has recently arrived in the Neotropical Region, invading many Caribbean islands, where it damages coffee, cotton, citrus and other crops (Charlet, 1997; Etienne *et al.*, 1998). It is a well-known pest in Egypt, Pakistan, India and Saudi Arabia (Talhouk, 1993). In India the species is a major pest of mulberries, transmitting a virus disease commonly known as 'Tukra' in most of the silk producing areas (Gangwar & Thangavelu, 1991). This mealybug is responsible for serious damage causing withering of plants, crinkling of leaves and deforming of buds, shoots and fruits owing to the toxicity of the mealybug's saliva. Leaves sometimes also show a characteristic curling, "rosetta", similar to damage caused by viruses. In Yemen it is a pest on mango and guava.
*Material examined*: 6 specimens, on mango, Al Kadan, 14.v.98, coll. A. van Harten; 9 specimens, on guava, Ta'izz x Al Mafraq, 15.vii.99, coll. A. van Harten.

***Paracoccus burnerae*** (Brain)

The oleander mealybug has been recorded from the Afrotropical (Angola, Kenya, South Africa, Zambia, Zimbabwe, Saint-Helena) and Oriental (India) regions (Ben-Dov, 1994). It is mainly found on ornamental plants. In South Africa it was listed among the three most important species which occur on citrus (Hattingh, 1993). The species was found on oranges imported into the United Kingdom from South Africa during May 1992 (Malumphy, 1993).

In the past *Paracoccus burnerae* has possibly been confounded with *Planococcus citri* in Yemen, although it can not be excluded that it might be a recent new introduction. A point in support of this last hypothesis is the fact that formerly, ornamental plants in Sana'a were not conspicuously infested with mealybugs, whereas nowadays many of them, especially oleander, jasmine and *Dodonaea viscosa*, are heavily infested by *P. burnerae*. The first confirmed record of the species dates from 1997. In agricultural crops, *P. burnerae* has been found only once so far.
*Material examined*: 8 specimens, on *Citrus* sp., near At Tur, 20.iv.98, coll. A. van Harten.

***Phenacoccus madeirensis*** Green

This mealybug is common in the Afrotropical region and was probably introduced from the Neotropical region (Williams & Granara de Willink, 1992). Elsewhere, it has

been collected on grapevine only once, in Sicily (Italy) (Mazzeo *et al.*, 1994).
*Material examined*: 3 specimens, on grapevine, Bani Husheish, 30.ix.98, coll. A. Seif.

***Planococcus citri*** (Risso)

The citrus mealybug is a well-known cosmopolitan, polyphagous and harmful species, damaging many outdoor and greenhouse crops in all geographical regions.
*Material examined*: 6 specimens on *Citrus* sp., Sana'a, 18.iii.1991, coll. A. van Harten.

***Planococcus ficus*** (Signoret)

The grapevine mealybug is a pest in the Mediterranean region, South Africa, Pakistan and Argentina (Ben-Dov, 1994). Recently it has been introduced in California (first detected in 1994) and spread to the main grape-producing areas there. The main cause of damage is through contamination of grape bunches with honeydew, as *P. ficus* produces much more honeydew than most other mealybug species. It can also transmit grapevine leaf roll virus A (GVA) and associated closteroviruses (GLRaV3) (Engelbrecht & Kasforf, 1990; Acheche *et al.*, 1999).

In Central Yemen at high altitudes with rather harsh winter conditions, grape production is very important. The main production area is in Bani Husheish, north-east of the capital Sana'a, comprising some 18.000 ha. Other important production areas are in Sa'dah and Al Jawf. Grapes are still cultivated in a traditional way and little has changed in production of the crop for 50 years or more. In the existing pest lists (Nasseh & Mahyoub, 1987; Ba-Angood *et al.*, 1997) no mealybug species are listed on grapevine. However, the woolly apple aphid (*Eriosoma lanigerum* (Hausmann)) is listed as a pest of grapevine and as this aphid certainly does not live on this host, the record probably represents mealybugs, without distinguishing between *P. madeirensis* and *P. ficus*. During the last five years infestations with *P. ficus* in the Bani Husheish-area has caused considerable losses for grape farmers and the outbreaks during the months March – July have reached epidemic proportions. During the last two years also, infestations in the other areas have become more severe. Several possible explanations can be suggested for the sudden rise in importance of mealybugs on the grapevine crop. As no older material of mealybugs from grapevine in Central Yemen exists in entomological collections, it cannot be excluded that former infestations with mealybugs (indicated then as 'woolly apple aphid') had been caused only by *P. madeirensis* and that *P. ficus* is a recent new introduction. Another possibility is that the increased use of chemical fungicides in the crop has negatively influenced the beneficial insects regulating the population of mealybugs. A third hypothesis is that due to climatic change, the temperatures in winter and early spring are now higher than 10 years before, giving the mealybug populations an earlier and quicker start each year.
*Material examined*: 6 specimens, on grapevine, Bani Husheish, 29.v.99, coll. M. Mahyoub; 6 specimens, on grapevine, Bani Husheish, 14.v.00, coll. by farmer; 8 specimens, on grapevine, Ar Rawdah, 27.v.00, coll. A. van Harten.

## DISCUSSION

It seems that the number of mealybug species infesting agricultural crops in Yemen is still rather limited, but that their importance is growing. Crops like mango and guava have been grown more widely since a few years, and their acreage will increase further. The problem with *Planococcus ficus* in grapevine is already very grave and ways to diminish the losses caused by this mealybug should be searched for in the near future. The only sustainable way to control mealybugs on a long-term basis is biological control, with the introduction of appropriate natural enemies. A start has been made with the import and mass multiplication of *Cryptolaemus montrouzieri*. Many thousands of specimens of this ladybird beetle have been released already since 1999.

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