Biology of Enset Root Mealybug (*Cataenococcus ensete* Williams and Matile-Ferrero) and its Distribution in Southern Ethiopia

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Introduction

Ethiopia is the only country in the world where enset (*Ensete ventricosum*) is cultivated extensively, traditionally around the homestead, as a starchy food, animal feed and a source of fiber. Enset root mealybug, *Cataenococcus ensete* is a major pest of enset in enset growing areas of southern Ethiopia. In view of the existing knowledge gap on its distribution, biology and economic importance, it became imperative that investigations need to be carried out on *C. ensete* to generate information that would assist to design appropriate management practices.

Materials and Methods

Identification of Mealybugs: Enset root mealybugs (Figure 1) were collected from Wonago (38^0 12'E, 6^0 12'N, 1,763 masl), southern Ethiopia were sent to International Institute of Tropical Agriculture (IITA), Benin for identification.

Biology of Enset Root Mealybug: The biology of the enset root mealybug was studied at the Awassa Agricultural Research Center at room temperature of approximately 25 and relative humidity of 60%. A total of 20 whole pumpkin fruits were inoculated with 20 first-instar nymphs each. The mealybugs introduced were maintained in boxes covered with black muslin cloth. The number of nymphs produced per adult female (i.e. fecundity), the number of instars, and the period taken to complete each stage, growth and survival were recorded. The new recruits were removed everyday to avoid repeated counting. The body length and width of thirty individual mealybugs for each developmental stage (first-instar nymph, second-instar nymph, third-instar nymph and adult female) was measured to determine the body size.

Survey Sites: Main enset producing areas and the Agro-ecological map of enset distribution was used to select the survey sites. A structured random sampling procedure was adopted. A total of 25 districts were selected and from each district three peasant associations (PAs) and in each PA two farms were randomly selected. **Farm observation:** Two most dominant enset clones from each farm were selected for root and corm damage assessment. From each clone three 2-4 years old enset plants were selected and assessed for presence or absence of mealybugs. The level of mealybug infestation at each farm was also recorded on a 0 - 4 scale. To determine vertical and horizontal distribution of mealybugs cubes of soil and roots with a size of 20 x 20 x 20 cm were dug out starting from the area adjacent to the corm up to a distance of 80 cm from the corm and up to a depth of 100 cm and cord roots and adult root mealybugs were counted for each cube.

Data Analyses: The distribution of mealybugs and the intensity of infestation were analyzed using SPSS for windows version 11.0.

Figure 1. Enset corm with root mealy bugs

Biology

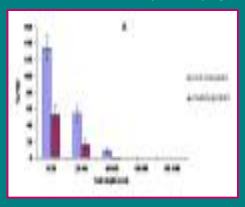
Mealybug specimens collected on enset roots were sent to the International Institute of Tropical Agriculture (IITA), Benin where its identity was confirmed as C. *ensete*. *C. ensete* has hitherto been referred to as *Paraputo* sp., which is now sucked as a junior synonym of *Cataenococcus* sp. The females are viviparous and produced 253 ± 17.4 nymphs/female. The average duration of the first, second and third-instar nymphs was 16.2, 18 and 20 days, respectively. The average life span of the adult female was 50 days. The body length and width of the adult female mealybugs ranged from 2.9 to 4 mm and 2.5 to 3.5 mm, respectively when measured with wax covering (Table 1).

Geographical Distribution

The mealybugs were recorded in Sidama, Gedeo, Gurage, Bench, Kembata Tembaro, Hadyia zones and Amaro and Yem districts. However the level of infestation was found high only in Amaro, Gedeo, Sidama and Bench in which 100%, 66.7%, 61.5% and 57.1%, respectively of the surveyed farms were infested (Table 2). The survey revealed that more than 30% of the total surveyed farms were infested. surveyed enset farms in Wolyita, Silte, Maji, Gamo Goffa, Sheka, West Showa and Jimma were found free from this insect.

C. ensete Distribution on roots

The majority of the mealybugs inhabited the roots (79%), while 21% was found on the corms. The root density of enset as well as mealybug populations decreased with increasing soil depth. About 99% of the mealybugs were found in the upper 40 cm soil layer. In addition about 90% of the mealybugs were collected within a 60 cm radius from the plants (Figure 1).



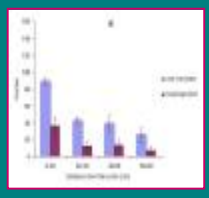


Fig 1.Vertical (a) and Horizontal (b) distribution of *C. ensete*

Table 1. Average duration ± SE of the different stages of *Cataenococcus ensete* (N = number of insects tested)

Stage	N	Duration (days)	Range (days)
First-instar	20	16.2 ± 0.5	13 - 19
Second-instar	20	18.2 ± 0.7	13 - 25
Third-instar	20	19.8 ± 0.4	16 - 23
Adult female	20	50.0 ± 0.5	46 - 53
Total duration	20	103.9 ± 1.1	94 - 113

Table 2. Population density of *Cataenococcus ensete* in different areas of

Area	No of farms	Infested farms (%)	Weighted Average Infestation	Mean number of adult mealybugs/plant
Gedeo	21	66.7	58.33	81.2
Sidama	26	61.5	43.27	65.2
Amaro	6	100	58.33	49.7
Hadyia	12	9.3	8.33	33.5
Bench	7	57.1	14.28	31.5
Keffa	7	29.6	14.28	29.0
Gurage	12	9.3	2.08	19
Kembata Tembaro	12	25	6.25	14.7
Yem	6	17.7	4.17	3.3

Conclusion and Recommendations

In conclusion, the current study revealed that enset root mealybug is a serious pest that is causing heavy damage to enset. Hence there is a dire need for strengthening extension programs in order to educate people on the level of distribution and severity of the pest. Techniques of production of clean planting materials in nurseries and regulation of the distribution and exchange of planting materials should be devised.

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