

## Occurrence and Infestation of Coffee Leaf Skeletonizer, *Leucoplema Dohertyi* (Warren) on Young Coffee Seedlings at Jimma Ethiopia

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**Abstract:** Coffee production in Ethiopia is expanding to non-traditional geographical areas without sufficient information on the influence of insect pests on coffee production. With the existence of some preliminary studies on minor pests, the economic importance of minor coffee insect pests in relation to weather factors in Ethiopia both under controlled and field conditions yet require more detailed studies. This study was conducted to understand the nature of damage and assess the level of infestation for coffee leaf skeletonizer on coffee seedlings planted in green house. The result showed that different degree of infestation ranged 35.29 – 85.11% was recorded. On the other, the number of pupae per seedling was various in different seedling pots with range of 0.04 – 0.21. Thus this study calls understanding the potential impacts of leaf feeders insect pests of coffee in relation to climatic variables at seedling stage is crucial.

**Keywords:** Abundance, coffee seedlings, leaf feeder

### 1. INTRODUCTION

Coffee is one of the highly preferred international beverages and the most important traded commodities in the world next to petroleum (FAO, 2015). Coffee is the most important export commodity for Ethiopia and it accounts for about 34% of value of all exports (FAS, 2019). *Coffea arabica* L. is the most widely cultivated coffee species in the world, which accounts for about 58.68% of world coffee production (UCDA, 2019). More than 125 million people worldwide are deriving their income directly or indirectly from its products in cultivation, processing, trading, transportation and marketing (Mishra and Slater, 2012).

In Ethiopia, the coffee is important to the economy of the country which is used as source of foreign income and also millions of the population relying on coffee production for their livelihood (ECTA, 2018). Nationally, it is estimated that there are around 5,270,777 households participated in coffee production activities. However, an estimated over 25 million people are engaged at least on coffee production, distribution, trading, processing, exporting and other support and downstream activities (ECTA, 2018). It also accounts for 25-30 % of Ethiopia's total export earnings, 5% of the gross domestic product (GDP) and about 50% of the total production for domestic consumption (ECTA, 2018).

Insect pests cause up to 20% of crop loss and reduce coffee value by 30 to 40% (Pablo *et al.*, 2012). Although Ethiopia is the homeland for Arabica coffee and the environmental conditions are suitable for coffee production, the average national yield is very low. Insect pests are among the factors considered to limit coffee production in both quality and quantity (Million and Bayissa, 1986; Million, 1987; 2000). Over 47 species of insect pests are recorded on coffee in Ethiopia (Crowe and Tadesse, 1984; Million and Bayissa, 1986), among which the antestia bugs (*Antestiopsis intricate* and *A. facetoides*) and coffee blotch miner (*Leucoptera coffeina*) are the major ones inflicting considerable damage. Moreover, insect pests such as coffee berry borer, (*Hypothenemus hampei*), coffee thrips (*Diarthrotrips coffeae*), green scale (*Coccus alpinus*) and coffee cushion scale (*Stictococcus formicarius*) are potentially important pests which can cause serious damage when conducive factors met.

Eminent scientists/Climatologists are warning the world, that the global warming is increasing worldwide resulting with the rise of temperature everywhere (Yilma, 2019). Nowadays, numbers of

insect pests previously considered as minor are becoming major and there is change of status in occurrence, distribution and development among coffee insect pests known in Ethiopia. The probable cause for such shifting may be the current climate change scenario and the shift from traditional to modern (intensive) farming systems, hence the existing and increasing change in dynamism of insect pests in general and coffee insect pests specifically demand for updated information, enabling to pay due attention. In this regard among the Coffee attacking insect pests known to severely to occur in all leaf producing growth stage of coffee (Leaf skeletonizer) and prevalent in either farming systems (Forest, Semi forest, Garden, Modern), was assessed under green house environment aiming to estimate the prevalence/abundance at seedling stage.

## **2. MATERIALS AND METHODS**

### **2.1. Description of the Study Area**

The study was undertaken at Jimma Agricultural Research Center (JARC) coffee protection research green house in 2020. JARC is located at 07°46'N latitude and 36°47'E longitude coordinate and at an elevation of 1753m.a.s.l. The site is 360 kilometer away from Addis Ababa, the capital of Ethiopia and 12 kilometers west of Jimma town. It is situated in the tepid to cool humid mid highlands of South Western Ethiopia which receives annual rainfall of 1572mm. Its mean minimum and maximum temperature is 11.6°C and 26.3°C, respectively. The major soil type of the area is Eutric Nitosol and Cambisol (reddish brown) of upland and fluvisol of bottom land with pH of around 5.2 (IAR, 1997).

### **2.2. Coffee Seedling Raising**

Seeds from Geisha coffee variety were planted in July, 2018/19 in 0.19 m<sup>2</sup> pot following the standard coffee Arabica seedling raising protocol. Fifty pots were raising in a single 2.5m x 1.5m cemented block and totally three cemented blocks were used for 150 pots seedling raising. In each pot six seedlings were raised.

### **2.3. Data collection**

From each cemented block ten seedling pots were randomly selected and from each pot three seedlings were considered for study. Therefore totally from the three cemented blocks consisting optimum of 50 pots, thirty from each block and a total of ninety coffee seedlings were selected randomly for coffee leaf skeletonizer infestation and pupae abundance assessment. Infestation and pupae abundance were calculated using the following formula,

$$\text{Infestation} = \frac{\text{Number infested leaf}}{\text{Total number of sampled leaf}} * 100$$

$$\text{Pupae abundance} = \frac{\text{Number pupae collected}}{\text{Total number of sampled seedlings}}$$

## **3. RESULT AND DISCUSSION**

Coffee leaf skeletonizer, *Leucoprema dohertyi* (Warren) a Lepidoptera attacking coffee leaves both in field and at seedling stages. The larvae feed on the underside of leaves, usually near the midrib eating everything except the veins and the upper epidermis, leaving irregular lace-like patches in the leaf. The occurrence of this insect in the glass house was abundantly found during the assessment. The overall mean of infestation showed high in all pot coffee seedling ranged from 55.0 – 74.42% planted in block A (Fig. 1a). This showed that the infestation is various and serious by this insect in all assessed seedlings. On the other the mean number of leaf skeletonizer pupae per seedling or pupae abundance recorded ranged from 0.06 – 0.14 (Fig 1b). According to a report of surveys conducted in Southwestern Ethiopia showed variation of incidences of coffee leaf skeletonizer was recorded with a mean leaf damage of 15.4% (Esayas, unpublished).

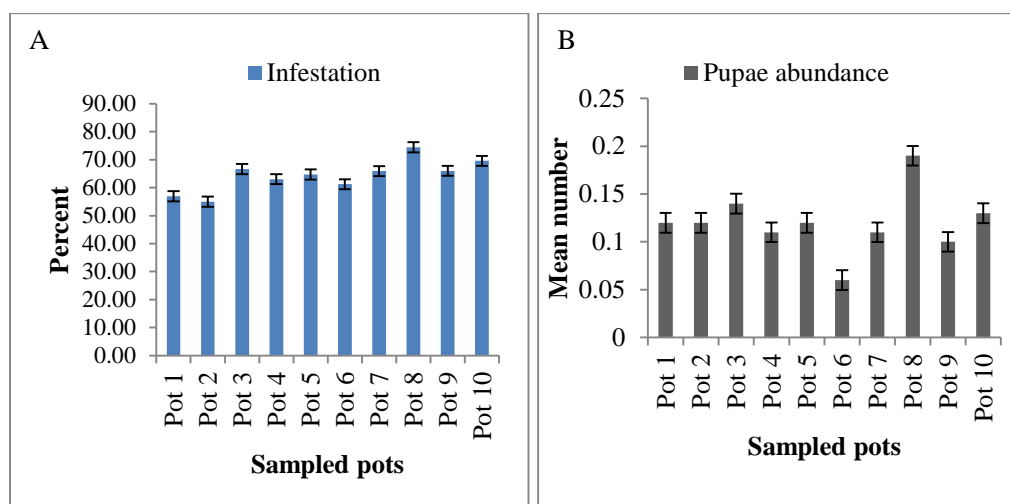


Fig1. Infestation and number of pupae of coffee leaf skeletonizer in green house (From block A)

Similarly, coffee seedling in block B showed different level of infestation with a relatively higher level compared to in block A with a mean range of 55.6 – 85.11% and the mean number of pupae on seedlings in block B is 0.04 – 0.21(Fig. 3a & b). This is may be due variation in population density of seedling since very few seedlings in blocks A and C were lossed due to other factors such as damping off. According to Ugandan coffee development authority, coffee leaf skeletonizer one of the major insect pest frequently damage as an outbreaks at nursery station but minor in the fields especially on coffee robusta in Uganda feed under surfaces of leaves leaving veins and upper epidermis to create window like patches (UCDA, 2019).



Fig2. Coffee seedling in pots raised in three cemented blocks (A), Leaf skeletonizer Infestation in Block 1 (B)

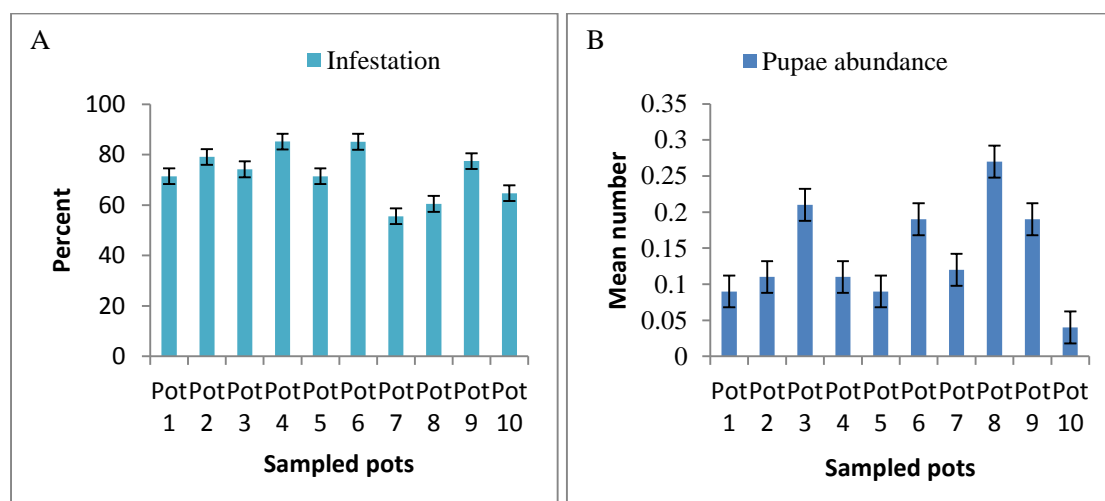


Fig3. Infestation and number of pupae of coffee leaf skeletonizer in green house (From block B)

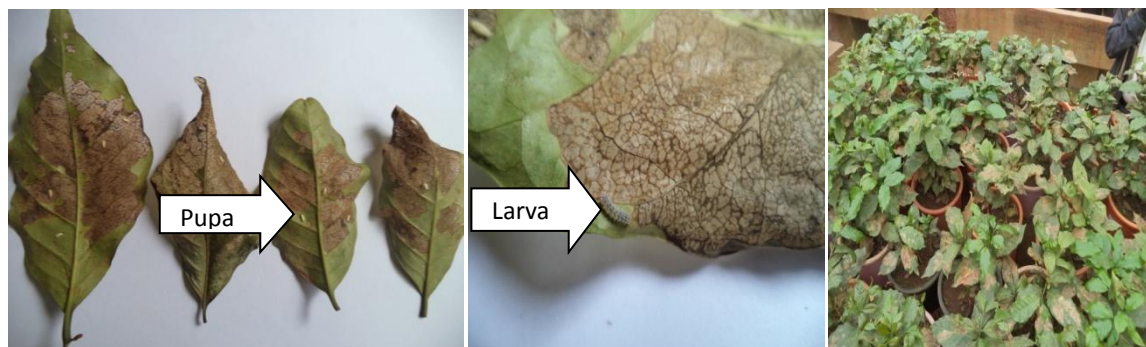


Fig4. Pupae and larvae of leaf skeletonizer on assessed coffee seedlings and the damage

Coffee leaf skeletonizer also infested seedlings planted in block C, showed variability among seedling both infestations level and number of pupae. The infestation is ranged from 35.29 – 72.97% and from 0.06 – 0.16 number pupae per seedling (Fig. 5a & b).

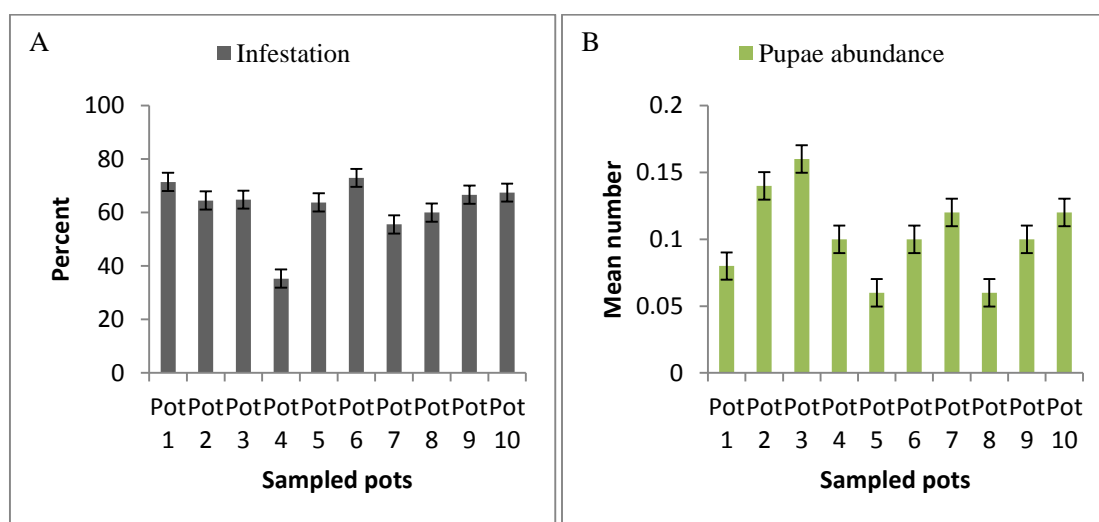


Fig5. Infestation and number of pupae of coffee leaf skeletonizer in green house (From block C)

Leaf damaging insect pests like coffee leaf skeletonizer was reported in Southwestern Ethiopia, with different mean proportion (Fuad, 2010; Chemed *et al.*, 2015). Fuad (2010) stated that the leaf damage proportion on wild coffee was 53% for leaf skeletonizer. The above author also stated the mean incidence of leaf damaging insects during wet (31.2%), transition (31.9%) and dry (17.62%) season, and the least was recorded during dry season. Similarly, in Southwestern Ethiopia the abundance of coffee leaf skeletonizer, 100% of plots, (Samnegard *et al.*, 2014). Also, the mean leaf damage of 2.7 to 31.76% by coffee leaf skeletonizer was recorded in Southwestern and Western coffee growing areas of Ethiopia (Tamiru *et al.*, 2017). A study conducted by Crowe and Tadesse (1984) reported that larvae a grey/white caterpillar with many pimple-like projections on the body and finally after pupation a grey/brown adult moth with a wing span emerge. According to Crowe and Tadesse (1984) recommendation the insect can be controlled by fenitrothion 50% E.C or fenithion 50% E.C foliar spray.

#### 4. CONCLUSION

The issue of degree of infestation fluctuation of minor insect pests of coffee has becoming a more threatening to sustainable development because nowadays minor insect pests become major, uncommon became common pests. It is important updating previous chemical control recommendation. Therefore research attention should be given to bio ecological studies in relation with climate change.

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