

Coffee Thrips, *Diarthrothrips Coffeae* Williams (Thysanoptera: Thripidae) a Threatening Pest to Coffee (*Coffea arabica* L.) Production in Southern Ethiopia

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Abstract: Ethiopia is the origin of coffee (*Coffea arabica* L.) and coffee is one of the most valuable crop in the country. However, its production is constrained by various factors both biotic and abiotic such as insect pests, diseases, weeds, poor management practices, soil infertility and poor pricing. Among insect pests, coffee thrips (*Diarthrothrips coffeae*) is becoming potentially important insect pest of coffee production in Southern Ethiopia. The aim of this study was to assess the occurrence, incidence and distribution of coffee thrips in the major coffee growing of southern Ethiopia. Following the outbreak of a coffee thrips infestation on coffee trials at Awada Agricultural Research Sub-center in March 2017, field surveys were conducted at different coffee testing site and farmers' fields. During surveys, coffee plants were examined visually as well as aided with magnifying glasses at different growth stages of the crop. The infestation of the coffee thrips was carefully examined by randomly taking ten to fifty plants from each field using a 10x hand lens for the presence or absence of coffee thrips. Result indicated that the pest was heavily infested and widely distributed in survey areas of coffee plantation field. High infestation level and damage level occur at Awada Agricultural Research Sub-center station and followed by Amarokelle sub-station site, Dale Woreda (farmers' fields) and Lekutesting site. Low infestation and damage level occur at Wonago sub-station site, Kumatotesting site, Dillatetesting site, Shakiso Woreda (farmers' fields) and Adola Woreda (farmers' fields). A large mass of coffee thrips were visible on upper and lower leaves coffee and observed at surveys areas regardless age and varieties coffee plants. Coffee thrips was found to feed on upper and lower leaves of coffee and green shoots makes irregular grey or silvery patches covered by numerous tiny black spots as a result of the sucking of the plant fluids and removal of the chlorophyll and other plant pigments. Attacked of the plant by the pest gradually drying of the leaves and ultimately leading to the death of the whole plant. Highest infestation and damage level were occurred in March and become lower and lower in April and May and disappear in June of 2017. This may due to high drought and high temperatures occur in the March. This study important for farmers, researchers, agricultural extension experts and development agents to aware the problem coffee thrips need to be alerted, trained on the identify and damage symptoms so that they can detect the infestation by the coffee thrips as early as possible.

1. INTRODUCTION

Coffee farming remains a key foreign exchange earner in most coffee producing countries where it is estimated to support the livelihoods of over 120 million people (Osorio, 2002). Ethiopia is the origin of *Coffea arabica* L. and coffee is one of the most valuable crops in the country. It accounts for 55% of the total export earnings, 10% of the government revenue, employs 25% of the domestic labor force and about 20% of the population depends on coffee for their livelihood (Tsegaye *et al.*, 2000 and Berhanu *et al.*, 2013). Coffee is grown in different production systems, namely forest, semi forest, garden, and plantation coffee production systems (Workafes and Kassu, 2000).

However, coffee production is constrained by various factors both biotic and abiotic such as insect pests, diseases, weeds, poor management practices, soil infertility and poor pricing. Though this is the case, several factors such as the attack by insect pests avert coffee farming in many tropical countries. The changes in climatic conditions are predicted to profoundly influence the population dynamics and the status of agricultural insect pests and as temperature has a strong and direct influence on insect development, reproduction and survival (Ward and Masters, 2007). The impact of insect pest problem is pronounced more in intensive coffee production system than coffee in traditional home gardens and semi forest coffee since such systems could have long traditional and culturally associated protection practices (Million, 1987). Coffee thrips (*Diarthrothrips coffeae*) are potentially important insect pests in Ethiopia (Million, 1987; Esayas *et al.*, 2008). In coffee farming, *D. coffeae* is the most damaging

species of thrips especially in East Africa (Le Pelley, 1968). It occurs on coffee in very small numbers, but can increase to populations likely to cause severe damage. Normally, this pest is a serious threat under hot dry weather conditions and especially where the soil is dry and lacking in humus.

Following the outbreak of a coffee thrips infestation on coffee trials at Awada Agricultural Research Sub center in March 2017; the researchers felt that the pest might be infesting other coffee-producing areas in Southern Ethiopia and considered that such information might help to alert farmers about coffee production and the economic consequences that may accrue from the infestation if timely measures are not taken. Taking the economic importance of the pest into consideration, an exhaustive field survey was carried out with the specific objective to assess the occurrence, incidence and distribution of coffee thrips in the major growing of southern Ethiopia.

2. MATERIALS AND METHODS

2.1. Field Surveys

Following the outbreak of a coffee thrips infestation on coffee trials at Awada Agricultural Research sub center in March 2017, Southern Ethiopia; field surveys were conducted at different coffee testing site at Awada Agricultural Research Sub-center, Wonago Sub-station site, Komatotesting site, Lekutesting site, Dillatesting site, Amaro Kelletesting site, Dale Woreda farmers fields, Shakiso Woreda farmers fields and Adola Woreda farmers fields in March 2017. The survey was continued in April, May and June to know the progress of the coffee thrips infestations and damages through the time. During surveys, coffee plants were examined visually as well as aided with magnifying glasses at different growth stages of the crop. The infestation of the coffee thrips was carefully examined by randomly taking ten to fifty plants from each field using a 10x hand lens for the presence or absence of coffee thrips. Picture of coffee thrips infested coffee plants and damaged fields were taken with digital camera. Plants found within and nearly infested coffee fields were also inspected for possible infestation by thrips. In the areas where thrips were observed, informal discussions were held with farmers, development agents and experts on probable sources of infestation and management. Samples of adult coffee thrips were collected and placed in plastic vials half filled with 70% ethyl alcohol. About 40-70 coffee thrips were collected in a vial.

3. RESULTS AND DISCUSSIONS

3.1. Field Surveys

In the 2017 survey, the distribution, incidence and damage level of coffee thrips (*Diarthrothrips coffeae*) was done in southern Ethiopia. The pest heavily infested and widely distributed in survey areas of coffee plantation field. A large mass of coffee thrips were visible on upper and lower leaves coffee and observed at surveys areas regardless age and varieties coffee plants. High infestation level (8 to 50) and damage level (3 to 31) occur at Awada Agricultural research sub-center station and followed by Amarokelle testing site, Dale Woreda (farmers fields) and Lekutesting site 5 to 38.75, 22 to 37 and 5 to 36.5 infestation level and 5 to 17.9 to 22 and 5 to 13.5 damage level, respectively (Table 1). Low infestation level and damage level occur at Wonago sub-station site, Kumatotestingsite, Dillasite, Shakiso Woreda (farmers fields) and Adola Woreda (farmer field) 5 to 10, 10.5 to 15.5 and 5 infestation level and 5.5, 3 to 5.0 and 0 damage level, respectively (Table 1). Report indicates that coffee thrips is one of the potentially important insect pests of coffee and thrips defoliated a large number of coffee trees at both the Jimma and Tepi areas (IAR, 1972; 1997a). Highest infestation and damage level were occurred in March and become lower and lower in April and May and disappear in June of 2017 (Fig.3). The prevailing hot and dry conditions that happened in the march of 2017 in the area/region may aggravated for occur and outbreaks of the pest. Million (2000) observed that thrips favored extended period of drought and disappear as soon as rain starts. In Kenya, *D. coffeae* increases in numbers about the end of the dry season in February and March following the hot dry weather experienced from December to March. However, this is not always the case especially where predacious Phytoseiid mites, *Euseiuskenyae* (Swirski and Ragusa) are adequately conserved by use of fertilizer sources such as organic compost and safe insecticides (Mugo, 2010).

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Table1. Infestation level and damage level of coffee thrips on coffee in Southern Ethiopia during March, April, May and June 2017

S/N	Location	Status(present/absent)	Infestation level (%)	Damage level (%)	Distributions
1	Awada Agricultural Research Sub-center (Station)	present	8 to 50	3 to 31	all over field and varieties
2	Awada areas (farmer field)	present	15 to 35	7 to 19.5	Scatter
3	Wonago Sub-station site	present	5 to 10	5	Spot area
4	Kumato Testing site	present	10	5	scatter
5	Leku Testing site	present	5 to 36.5	5 to 13.5	widely spread
6	Dilla Testing site	present	5 to 15	3 to 5	Spot area
7	Amarokelle Testing site	present	5 to 38.75	5 to 17	widely spread
8	Dale Woreda (farmers fields)	present	22 to 37	9 to 22	scatter
9	Shakiso Woreda (farmers fields)	present	5	0	scatter
10	Adola Woreda (farmer field)	present	5	0	scatter

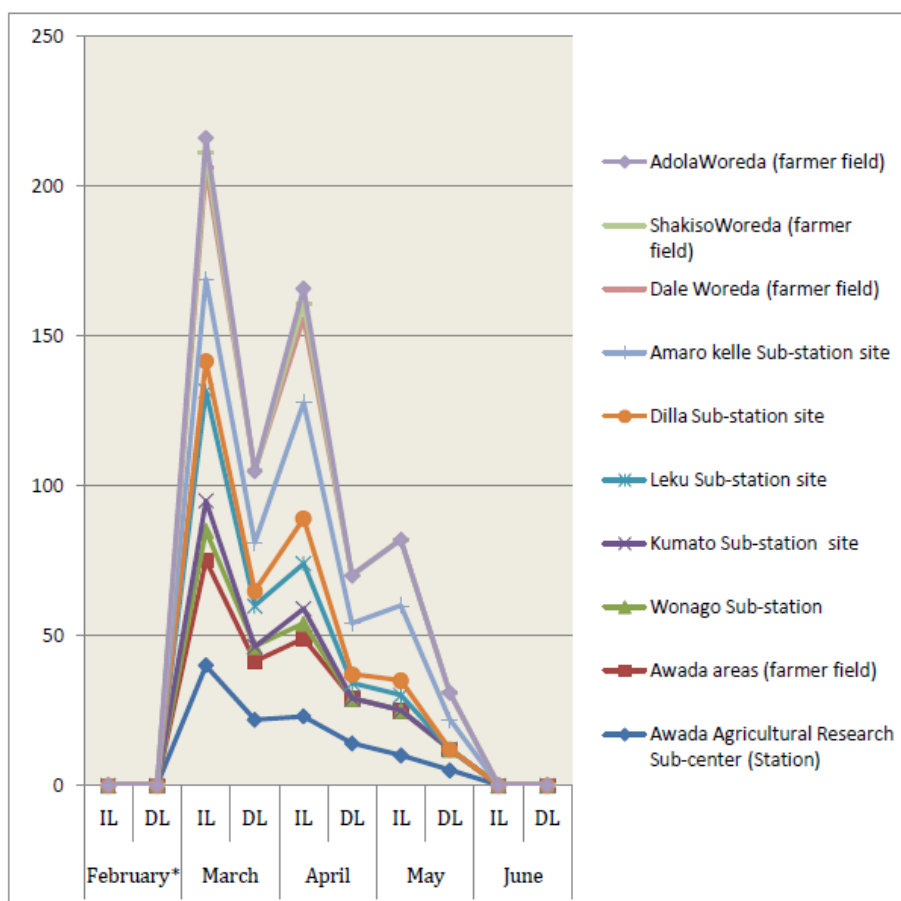


Figure3. Infestation level (IL) and damage level (DL) of coffee thrips on coffee in Southern Ethiopia during February, March, April, May and June 2017

*No any data were taken in the February month because the thrips dictated/outbreak in March in 2017

3.2. Damage Symptoms due to Coffee Thrips on Coffee

Coffee thrips was found to feed on upper and lower leaves of coffee and green shoots makes irregular grey or silvery patches covered by numerous tiny black spots as a result of the sucking of the plant fluids and removal of the chlorophyll and other plant pigments (Fig 1). Attacked of the plant by the pest gradually drying of the leaves and ultimately leading to the death of the whole plant (Fig 2 B, C and D). Coffee thrips destroys coffee beans and leaves by puncturing and sucking their contents and cause grayish strips to form on the leaves hindering photosynthesis (Jaramillo *et al.*, 2011). Coffee Research Foundation (Gichimu and Omondi, 2010) indicate that both nymphs and adults feed on underside of leaves, but in severe infestations they also attack upper side of leaves, berries and green shoots. In case of severe infestation, leaves dry up and fall off. Coffee thrips occur during extended

drought and disappear as soon as rain starts (Million, 2000). The heavy outbreaks occur during periods of drought and high temperatures.



Figure1A. Coffee thrips damage symptoms on lower and upper leaf surface of coffee and its infestation



Figure2. B, C and D damages by coffee thrips, *Diarthrothrips coffeae* on coffee

4. CONCLUSION AND RECOMMENDATION

Southern Ethiopia is one of the major coffee growing areas and were infested by coffee thrips (*Diarthrothrips coffeae*), primarily being reported from Awada Agricultural Research Sub-center. The coffee thrips is therefore, a potential serious threat to coffee production in this part of the country. Agricultural extension experts, development agents and farmers need to be alerted, trained on the identify and damage symptoms so that they can detect the infestation by the coffee thrips as early as possible. In addition, novel and integrated pest management (IPM) need to be identified or screened for use as integral components the pest management options. Moreover, emphasis on the sustainable management of the pest and research attention should be given to the required level through integration of all available options for effective management of the pest population, including use of biological agents and cultural management. In general, during the prolonged dry season and high temperature coffee potentially growing areas out breaking of coffee thrips is being expected in Ethiopia and other countries.

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