ISSN: 2520-7687 (Print) and XXXX-XXXX (Online)
Journal of Agriculture, Food and Natural Resources
J. Agric. Food Nat. Resour., Jan-Apr 2017, 1(1): 25-33
Journal Homepage: http://www.afnrjournal.com/
http://www.wollegajournals.com/

Original Research

Assessment of the Intensity of White Mango Scale (*Aulacaspis tubercularis* (Hemiptera: Diaspididae)) on Mango Trees in Assosa District, Benishangul Gumuz National Regional State, Western Ethiopia

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Abstract

In Western part of Ethiopia where high infestation of insect pest on mango plant is observed, no study was conducted to investigate the pest fauna. The present study is to assess Species Composition, Pest Status and Distribution of Insect Pests, and their association with mango Production was carried in three (AK) of Assosa district peak mango producers from September to January 2016.Information from KII, FGD and HH was collected using questionnaire and cross check by observation from a field report .The quantitative result of the study were analyzed using statistical software SPSS. Mango is the top ranked fruit produced from seed (unimproved cultivar) on farm yard. on season and harvest estimated as 300 fruit per tree or 21-30 tons per ha. Three each mango plant lower branches leaves were purposively sampled to determine the species composition that are living on mango plants. The study shows, the prevailing of birds, monkey, and arthropods,/insect. Among these, Red ants and spiders are arthropods, termites, scale insects and beetles are insects. Both harbor the differ parts of plants. Out of the observed species, Red ants were widely distributed followed by White scale insect, termites and spider. Beetles are the lowest distributed insects. With regard to pest status and their association Termites cover with soil on stem, root and protect sun lights, feed on roots or move upward making the tunnels with construction of mud galleries on trees Spiders produce silk and this silk cover the whole surface of the plants, Red ants are abundantly observed both on the ground and on the tree produce un pleasant fecal material. Red ants (*Oecophyllasa mangdline*) - webbed of leaves with ants forming nests of all season year. White mango scale insect is the emerging pest observed from its inception harbor leaves, and compute for photosynthesis product and cause leaf to dry. White mango scale insect is the only insect negatively associate with mango production. To determine the white mango scale insect *Aulacaspis tubercularis* infestation status and distribution one sample mango tree lower branch twig leaves from each (AK) yard were considered, were estimated to less than 50% ,majority 60% of remain un infested shows it is the emerging pest. As a result only smoking the pest is started as means of protection, assuming the smoke may suffocate the pest. The result of this study may serve as a base line for designing the study of economic impact of the pest.

Article Information

Article History:

Received : 05-02-2017

Revised : 14-04-2017

Accepted : 25-04-2017

Keywords:

Assosa

Mango

White scale insect

Species composition

Abundance

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INTRODUCTION

The mango (*Mangifera indica L)* M*ember* of the family Anacardiaceae is one of the most important tropical fruits of the world (IShaq *et al*., 2004). Mangos originated in tropical Asia. The most cultivated mangifera species *M. indica* (mango) has its origin in south and south East Asia in India and Mayanmar (Beeson, 1941). The edible fruit genus mangifera are of several species, most of them are the fruit tree that are commonly known as mango belong to the species *M. indica* .*T*he other edible magnifier species generally have lower quality fruit and are commonly referred to as a wild mango. *M. indica* has become naturalized and adapted throughout the tropic and subtropics (Johonson and Parr, 2006).

Out of 1000 species named mango varieties throughout the world 500 are in India. Mango grows up to 1200 m.a.s.l. However, commercial varieties grow below 600masl. Mango grows best in areas receiving 400mm-3600mm rainfall per year. Cultivated species of mango grows up to a height of 3-10m and others grow up to 15-30m. Mango grows on top, sand, clay and mixed soil with optimal PH of 5.5-7.5 and more favored in warm climate (FAO STAT, 2007).

The cultivated mango plays an important role in the diet and cuisine of many diverse cultures. It is highly nutritious fruits containing carbohydrates, proteins, fats, minerals, and vitamins, in particular vitamin A (beta

carotene), vitamin B1, vitamin B2, and vitamin C (ascorbic acid). As the fruit ripens, concentrations of vitamin C decrease and glucose, fructose, and sucrose concentrations increase (Bally, 2006). It is a good source of sugars, vitamins A and C and minerals (Johnson and Parr, 2006). The fruit is also eaten green and processed in to pickles, pulps, jams, and chutneys, and is frozen or dried. The fruit is also an important source of nourishment of birds, bats, insects and mammals. In addition to this mangos can be processed in to a number of unique products such as dried mango pieces, chutney and mango leathers (Azeredo *et al.*, 2006). Processing of mangos enables exporters to serve their markets even during "off season" periods for fresh fruits.

In addition to food value, mango has medicinal value. For example ripe mangos are a rich source of vitamin A which used to treat vitamin A deficiencies called night blindness. Diabetes has been treated with a drink made from the infusion of fresh mango leaves. Dried mango seed ground in to flour is used to treat diarrhea (Germain *et al*., 2010).

As animal fodder livestock grazes on mango leaves and eat fallen fruit. Seeds and by-products of processing fruit have been used to feed cattle, poultry, and pigs. Mango flowers are a rich source of nectar collected by honey bees for honey making. Mango also used as timber when properly seasoned has been used in furniture, for carving. as wall and floor paneling, and utensil manufacture (Germain *et al*., 2010).

Due to its vitally, mango is now cultivated throughout the tropical and subtropical world for commercial fruit production, as a garden tree, and as a shade tree for stock and account for approximately half of all tropical fruits produced worldwide FAO Statistics (2002). The food and Agriculture Organization of the United Nations estimated worldwide production at nearly 35,000.000 (39,000,000) in 2009. The aggregate reduction of the top 10 countries is responsible for roughly 80% of worldwide production .

Mango crop is exotic and introduced to Ethiopia some fifty years ago (Kidus and Awol, 2010). Ethiopia has excellent potential for the development of a very prosperous mango sub-sector. As result mango fruits are produced in Ethiopia by large ex state farms, private and small holders aimed at country consumption, home use and income generation. Currently Ethiopian government expand mango production by distributing high yielding varieties known as improved varieties Tommy Atkins, kit and Kent for small scale farmers As result of this various mango varieties have adapted in many of the mango-ecological regions of Oromia, Gambela, Benishangul Gumuz and the SNNP where mango grows quite extensively (Biniyam, 2010).

Moreover, the government further distributing high yielding grafting mangos varieties for small scale farmers especially in the southern and Oromia regions by propagating high yield varieties at upper Awash Agro industry enterprise. So far over 2000 seedlings Tommy Atkins, Keitt and Kent mangos and apples are distributed from July 2006, similar distribution is don in the western part of Ethiopia Assosa Benishangul Gumuz region by (NGO) and Government (CSA, 2009). The western Ethiopia, particularly Assosa-Homosh district which is located in the upper Blue Nile valley is suitable to mango production where the farmers experienced to produce mango from old cultivar mango introduced from sailors during Etio-Italian war from Sudan, Presently at the eve of the study improved varies Tommy Atkins, Keitt and Kent are under cultivation with the immediate supervision of agricultural expiries (observation by researcher,, 2011).

The 28% of the mangoes produced in the Assosa by farmers is sold in the capital Addis Ababa by Et- fruit (the state owned Ethiopian fruit marketing agency) and there by exported to , Djibouti, Saudi Arabia and UAE (United Arab Emirate) (WAFC, 2006). With increased demand growing more commercial varieties of mangos such as Kenti, keitt and Tommy Atkins. Would present a better alternative to the domestic market with less fiber and higher level of sweetness than exiting hybrid variety (FAO, 2008).

Whilst world production of mango has increased by more than 60% during the period 1983-2007 the area grown by mango is almost doubled during the same period however the yield per unit area has decreased by 14% (FAO, 2008).In similar way little mango exported from Ethiopia with only 4 tons in 2006 sold at a value of less than us $ 1000 according to (World vision Ethiopia, 2008).This a significant decline is due to problem associated with export and transport access.

Mango crop can be damaged by fungi and other pests. So far about 260 insects have been reported as pests of mango and this may include mango hoppers, mango mealy bugs, scale insects, stem and shoot borers, leaf feeders and gall formers (Veeresh,1989).

To effectively monitor a mango orchard for insect pest outbreaks, growers must first be aware of the types of insect pests they are likely to encounter and should conduct the surveys on a regular basis. This entails becoming familiar with insect pests and their life cycle stages. The types of damage they cause and the time of the year they are most likely to occur may prevent yield loss (Brown, 1992).

Small scale farmers mango producers reporting impact of insect Arthropods and (other disease with which they are not familiar) on mango crops currently from Mango producing districts in western Ethiopia Assosa small villages. With visual observation, after flowering mango plants are observed attacked arthropods(spider), birds and other mammals, producers also claims that some of the pests are migratory i.e. they disappear when the rainy season comes. As the reports of (World vision Ethiopia, 2008). Manifests they were not used any form of pest management.

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Mango orchards have been infested heavily by different mango pests. Nevertheless mango fruit crops in Ethiopia are attacked by numerous pests, particularly white scale insect pest no study is under taken about the prevalence of white scale insect and other pest damaging mango crop in the study area, because of this, the study on Assessment of the intensity of white mango scale, *Aulacaspis tubercularis* (Hemiptera: Diaspididae) on mango trees in Assosa District, Benishangul Gumuz National Regional State was designed. The objective of this study is to investigate available insects and their association with mango production in Assosa district.

MATERIAL AND METHEDS

Description of the Study Area

Assosa district is one of the seven Woredas of Benishangul Gumuz National Regional State in the Upper Blue Nile mango growing agro- ecology of western Ethiopia. Assosa district has 74 Administrative *Kebele* association (Ak) or *Kebeles* and four small town totally 78 *kebeles*. The district is found North of Homash Mange woreda, south of Mao Como special Woreda, East of Bambasi woreda and west of Sudan (Figure 1). Assosa district is situated in lowland with latitude $14^{o}14$N to 34^{o} 53 N longitude 9^{0} 46 E to 17 E and Altitude range between 500--645m up to above sea level. Average maximum temperature varies between 24.3^{o}C and 33.9^{0}C and monthly average and minimum temperature vary between 19.7^{0}C and 25.8^{0}C, respectively The monthly rain fall pattern shows mono modal rain fall pattern with longer rainy seasons from May to October with the highest occurring in June, July and August, total rain fall is 1175.5mm which ranges from 680mm to 2000mm mean annual temperature 22.38^{0}C Topography is flat plains with average altitude of 1645 above sea level. Topographic feature of the study area favors Mango production and other horticultural crops. Soil type;- Clay, sand, and mixed type are available, but largely soil with less natural fertility, that is extremely leached soil and are mostly acidic. The total area of the land is estimated to be 45000 ha. The land is divided into farming, Forest and Grazing lands (Assosa District Agricultural office, 2010).

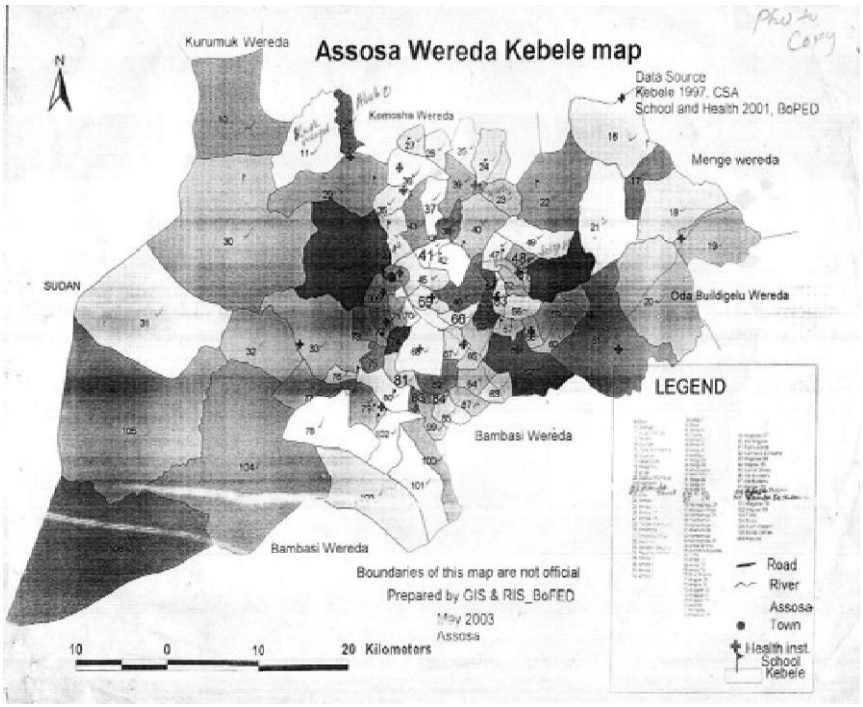

Figure 1: Assosa with its 78 kebele including the study site Ura, salgal-24, Quahmangal (Source; Assosa distric Agricultural office, 2011)

Population of the Assosa district is about 44,176 male and 43.190 female (total 87,366) (Housing and population censes of Ethiopia, 2009). About 85% of the local communities are engaged in agriculture, mixed farming involving crop cultivation (maize, and sorghum-Millet, Nigger, Teff, ground nuts and root crops) combined with cattle and small stock rising. The area grows rain-fed maize and other cereal crop during the rainy season (usually June to October) and main vegetables such as onions, tomatoes, potatoes, Sweet potatoes, green pepper and other vegetables by irrigation during the dry season (November to May).The major horticultural crops that grow in this area include Banana, Avocado, Papaya, Zaitun, Kashmir, coke fruits Mango and Sugar cane. These horticultural crops are both rain-fed and irrigated (Assosa woreda Finance and Economy Development Office, 2003).

Sampling Methods

A cross-sectional community based design study was employed based on the information gathered during the pilot study. In this study, four stage sampling procedure were employed First, by employing purposive sampling method Assosa Woreda was selected out of the 7 woredas of Benishangul Gumuz regional state. It is selected for the fact that mango production is predominant in Assosa woreda among the rest woredas of the region. In the second stage, out of seven major mango producing Administrative *kebeles,* three Administrative *kebele* (AK) which were registered as peak mango crop producers were selected purposively. These selected AKs were Ura, Salgal-24 and Qushmangal .At third stage respondents who own mango plantation were selected. 15% percent of the mango producers were taken purposively which accounts for 45 farmers. From each sample AK, respondents were selected by employing probability proportional to Size (PPS). Finally, farm lands and tree for study were purposely selected.

Four key informants, including agricultural extension workers from sample AKs and one experts of Woreda Agricultural office were selected by judgment sampling

technique to consider personnel who have experienced in horticultural production fields. One focus group discussion was administered with nine trained farmers, and 3 elders of mango farmers which were selected purposively to include individuals who have more awareness about mango production in the group.

Site Selection

The study was conducted on farm lands of Assosa district Ura, Salgal-24 and Qushmangal administrative *kebeles* which are found 20 km away from the Assosa town to the North, North east and west, respectively. The production capacity of these farmers Administrative *Kebeles* was obtained from Assosa district agricultural office. From each farmer Administrative *Kebele* three farm lands named as 1, 2, 3 arbitrarily were selected for the study. Then, a total of 9 farm lands were randomly selected for the study. From each farmlands four mango trees, a total of 36 mango trees were selected by moving diagonally in an "x" pattern and spotted with visible ink for Assessment of the intensity of white mango scale, *Aulacaspis tubercularis* (Hemiptera: Diaspididae) on mango trees on one lower branch leaf, flower and fruit. Very tall tree branches are omitted for inconveniency and ladders are used in very few cases.

Figure 2: Mango trees from sample Administrative Kebeles (AK) Source computed from field survey, 2016

Method of Data Collection

Well informed enumerators (Development agent and woreda agricultural office experts) recruited as part-timer and were trained for data collection. Before data collection, the questionnaire was pretested for 6 famers of the three administrative kebeles (AK) and 3 agricultural extension workers to evaluate the appropriateness of the design, clarity interpretation of the questions, relevance of the questions and time taken for an interview. After the necessary amendment and corrections were made, questionnaire were distributed to sample population in-order to obtain valid information on the available farm land, production, source, type, importance, plantation and harvest practice and mango insect and arthropod pest and natural enemies associated with.

Discussion which consists of mango production and productivity experience, available pests were administered for the 9 trained farmers, and 3 elders farmers who were selected for focused group discussion and in-depth interview was conducted with selected key informants. The interview and focused group discussion takes on average for 1-3 hours under the immediate supervision of the researcher. Since the period between flower induction and harvest takes about four month, only the greening season data is collected in May 2016, simultaneously field observation undertake by using checklist prepared. During observation the available insect and arthropods were seen for their impact on root, stem and leaf of all study sites following this, the association of these insect and arthropods with mango plants were also investigated. The result of observation is used for triangulation.

Infestation of white mango scale assessment was independently observed, because mango scale insect pest is the emerging pest. For this purpose, To determine the intensity of infestation 3 mango tree from the three *kebele* 9 mango tree were selected from these tree one lower branch 7 twig is confidently selected, from each twig all leaves are counted in discriminating infested leaves from un infested ones on the check list prepared (annex 5) for three *kebele* Finally the percentage were calculated and the intensity is determined.

Method of Data Analysis

Data collected through questionnaires from the respondents were analyzed by using descriptive statistics by SPSS Version 17.0 software. The results were presented using frequency percentage, The qualitative data collected from key informants and focus discussion were interpreted to support the descriptive result for the validity of the results.

RESULTS AND DISCUSSION

Agricultural Products Produced in the Study Area

Understanding agricultural production of the study area is crucial. Regarding this, the respondents were asked about commonly produced agricultural products in the area and found out that 64.4% respondents are agreed that farmers produce fruit more. 20.0% reply that cereal crops produced more, 6.7% of respondents said that vegetables are more produced, 2.2%, said that livestock and 6.7% of the respondents are responding that farmers produce almost all agricultural products (Table 1).

The respondents also asked about the dominant fruit crops produced. As displayed (Table 1), 73.3% of respondent viewed that mango is dominant fruit, 11.1% of them said avocado is common fruit, 8.9% reply that banana is major fruit and 4.4% said papaya is more produced fruit in study area.

Table 1: Common agricultural produced in the study area

		Frequency	%
Common products	Cereals Crop	9	20.0
	Vegetables	3	6.7
	Livestock	1	2.2
	Fruits	29	64.4
	All	3	6.7
	Total	45	100
Most produced fruits	Mango	33	73.3
	Avocado	5	11.1
	Papaya	2	4.4
	Banana	4	8.9
	Lemon	1	2.2
	Orange	0	0
	total	45	100.0

The result indicates that fruit crops are the dominantly produced crop in the study area followed by cereal crops and vegetable crops. Among the commonly produce fruit crops, mango is the widely produced fruit crops followed by avocado and banana. This result is supplemented by views of key informants in a manner that smallholder farmers in the study are mostly producing fruit crops which are dominated by mango fruits. The observation of the researcher during data collection also confirms the result.

Origin, Source and Variety Mango Produced in the Study Area

It is fact that plants species have their own origin. Based on this truth, survey has conducted to identify the origin source and type of mango produced in the study area. It is found that 56.6% of the respondents accept that the origin of mango in the study area is exotic, 22.2% respondents reply that mango as indignant plant. 17.4% respondents respond that it is both exotic and indignant; however, 4.4% respondents fail to discriminate the mango plant origin.

Regarding source of mango plant source 44.4% respondents say that this exotic mango primarily obtained in the form of seed. The 33.3% respondents respond that they use to plant mango seedling. 22.3% respondents however confirm that both mango seed and seedling is used. Concerning mango variety, 80% respondents agree that mango is obtained from local cultivar, 13.3% respondents reply that improved variety is used.6.7% respondents however respond how both local cultivar and improved variety is used (Table2).

The result indicates that mango plant that produced in the study area is exotic. Mango variety in the study area is dominated by local cultivar and producers use almost both seed and seedling to raise mango plant.

These results are supplemented by views of key informants in that mango is originally exotic to Ethiopia, source of planting material is seed and the widely distributed mango plant is the local cultivar.

Table 2: Origin, source and variety mango produced in the study area

	Category	Respondents	
		Frequency	%
Mango origin	Exotic	25	55.6
	Indignant	10	22.2
	Both	8	17.8
	Uncertain	2	4.4
	Total	**45**	**100**
Mango plant source	Seed	20	44.4
	Seedling	15	33.3
	Both	10	22.3
	Total	**45**	**100**
Mango variety	Local cultivar	36	80
	Improve variety	6	13.3
	Both	3	6.7
	I do not know	0	0
	Total	**45**	**100**

Mango Production

Farm Land and Farming Systems

Respondents asked about mango production in the study area and come up with the result as 82.2% of respondents, have adequate farm land. Regarding farm land occupied by mango plantation, 22.2% of the respondents have less than 0.5ha, 66.7% of them have 0.5-1ha, 8.9% of the respondents have 1.0-1.5ha and only 2.2% have more than 1.5ha of mango plant. Concerning mango farming method 71.1% of the respondents follow traditional way of farming and 88.9% of them used rain-fed farming system to produce mango in the survey area (Table 3).

Table 3: Farm land size, planting practice and mango production

	categories	Respondents	
		Frequency	%
Adequate farm land of respondents	Yes	37	82.2
	No	8	17.9
	Total	45	100
Mango plantation of respondents	Less than 0.5ha	10	22.2
	0.5-1ha	30	66.7
	1-1.5ha	4	8.9
	More than 1.5ha	1	2.2
	Total	45	100
Farming method	Traditional	32	71.1.
	Modern ways	5	11.1
	Uncertain	8	17.8
	Total	45	100
Farming system	Rain-fed	40	88.9
	Irrigable	3	6.7
	Uncertain	2	4.4
	Total	45	100

The results show that majority of mango producer smallholder farmers have adequate farm land and have 1.0-1.5 ha mango plantation mostly producing mango traditionally by rain-fed. The mango fruit is harvested once a year at early maturity. The key informants, in supporting the result obtained from smallholder farmers, that majority of the smallholder farmers sufficient even for expanding mango plantation and producing it in rain fed rarely in irrigation because of inaccessibility of the farm land for irrigation.

Harvesting and Productivity

As displayed in the(table4), 78.3% respondents perceive that the mango fruit harvested once a year; 55.6% respondents agreed that mango fruit harvested at early maturity stage; 44.4% of the respondents view that a mango tree produce more than 300 fruits while 37.8% of them say it is between 100 and 300 fruits. Regarding productivity of mango, 71.1% of the respondents reply that the productivity of mango in the study area is 21-30 tons per hector (ha).

According to the result there is only one mango fruit harvested season mostly at early maturity time. Commonly, a mango tree produces about three hundred fruit which accounts for more than 20 tons per hector. This results confirmed by the view of key informants and focus group discussants in a manner that the since the production system is rain-fed the harvesting season is once a year at early maturity to be convenient for transportation to distance market and the well managed mango plantation can produce more than 20tons per hector.

Table 4: Harvesting and productivities of mango

	Categories	Respondents	
		Frequency	%
Production season per year	Once	36	78.3
	Twice	8	17.4
	Trice	2	4.3
	Total	46	
Mango fruit harvesting time	Early maturity	25	55.6
	Late maturity	10	22.2
	between early and late maturity	7	15.6
	Others	3	6.5
	Total	45	100
Amount of fruit per mango tree	≤100	8	17.8
	101-300	17	37.8
	>300	20	44.4
	Total	45	100
Amount of fruit collected estimate from ha	Less than 10tons	5	11.1
	10-20 tons	0	0
	21-30tons	32	71.1
	31-40tons	3	6.7
	Greater than 40 tons	5	11.5
	Total	45	100

Constraints of Mango Production

Productivity of mango assumed to be affected due to several factors. To assess this respondent were asked and found out those producers 77.8% of the respondents claim decline of mango productivity in several on seasons whereas 22.2% argued. Pertaining to the reduction of mango productivity 51.1% of respondents perceive it is because of insects attack, 26.7% of them say it due to wild animals' attacks and 22.2% of the respondents agreed that it is a result of bird attack (Table 5).

The result shows that mango productivity decline from time to time mostly by insect pests and wildlife attack. These findings are ascertained by the insights of key informants and focus group discussions indicating that insects and wild animals such as monkey, apes and birds are seriously encroaching mango fruits.

Table 5: Production rate and major constraints of mango product

	Categories	Respondents	
		Frequency	%
Productivity of mango remaining constant	Yes	35	77.8
	No	10	22.2
	Total	45	100
Major mango plant problems	Disorder	0	0
	Drought	0	0
	Insect attack	23	51.1
	Wildlife	12	26.7
	Birds attack	10	22.2
	Arthropods	2	4.44
	Total	45	10

Abundance of Arthropods/insects Associated to Mango Plants

It is inevitable for living organisms to react with their environment for means of subsistence as a result arthropods/insect create association with mango plantation. Regard to this, almost 35.55% respondents wittiness the abundance scale insect living associated to mango plants, 22.22% farmers also reply the presence of Red antes, others 20% suggest also the presence of spiders. Some 15.55% respondents also agree with the presence of termites, very few 6.66% respondents also claim the presence of beetles (Table 6).

The result shows that the Scale insects are abundantly found which followed by Red ants, Spider Termite and Beetles respectively. These findings supported by the view of key informants and focus group discussions indicating that scale insects are widely distributed over the surface of leaves. Red ants are fond over the ground and on the stem of the mango tree. This result is also accepted by observation in that white mango scale is found with their white spot, Red ants are moving up and down on the surface of a tree, Termites making mound on the bark of the stem. In observation flying insects birds, monkey, apes and cattle's were not included.

Table 6: Available arthropods/ insects in mango plantation

Order	English name	Respondents	
		Frequency	%
Formacida	Red ants	10	22.22
Coleoptera	Beetles	3	6.66
Isoptera	Termites	7	15.55
Acarina	Spider	9	20
Hemiptera	Scale insects	16	35.55

White Mango Scale Observation, Distribution and its Impact

Investigation of the emerging time of may help to know life cycle of the pest and enable to forecasts' management practice to this effect .55.55% respondents tress that mango white scale observed at the beginning of 2013, other 22.22% suggest white mango scale insect appear between mid of 2013 and 2014.Still few 11.11% suggest that the pest emerge at the mid of 2012 (Table 7).

Table 7: Appearance distribution and impact of mango scale insect

	Categories	Respondents	
		Frequency	%
Time of white mango scale observation	Mid of 2012	5	11.11
	Beginning of 2013	25	55.55
	Mid of 2013-2014	10	22.22
	Total	45	100
Distribution of Mango white scale insects	Over one part of leaves	10	22.22
	Over all the part of leaves	30	66.66
	On the stem	5	11.11
	Total	45	100
The impact of mango scale	Cause leaf dry	30	66.66
	Cause fruit unpleasant	5	11.11
	Not known	10	22.22
	Total	45	100

The result shows that the appearance of Scale insects are during the beginning of 2013, the variation in response depend upon the farmers environment. Key informants in supporting this that ,the white mango scale shifts from on area to the other area showing that it does not suddenly occurred in all mango environment.

Prevalence of the Arthropods/insects in the Orchard and their Association

Knowing the available organisms in the orchard enable to presuppose the association that they have with mango plantation and its products. With this regard 66.66%responds witnessed the prevalence of arthropods/insects on the leaves, 22.22% respondents claim that stem harbor more and still very few respondents argue arthropods and insects harbor roots When the impact of Arthropods /insects assessed with respect to their prevalence, 57.77% Respondents agree that damage of termite is higher in stem others 26.66% and 15.55% also replay how termite damage is extended to roots and leaves respectively.

When the role spiders are investigated, 60% respondents viewed that spiders produce silk and this silk cover the whole surface of the plants, others 22.22% assume that these silk may contribute to the drying of leaves and others 17.77 fail to locate the problem caused by termites. Red ants are abundantly observed both on the ground and on the tree when 66.66 of the respondents are asked about the impact of Red ants they reply that Produce un pleasant fecal material,11.11% respondents say they simply move over the surface of plants, however, 22.22% respondents fail tell their impacts. White mango scale insect is the emerging pest to the study area, The impact of these pest is assessed since their inception accordingly 77.77% respondents reveal the impact of this pest to leaves, however, some17.77% and 4.44% say on stem and roots respectively (Table 8).

Table 8: Association of arthropods/insects with mango plant

	Category	Respondents	
		Frequency	%
Prevalence of arthropods/insects	Root	5	11.11
	Stem	10	22.22
	Leaves	30	66.66
	Total	45	100
Termite case damage to	Leaves	7	15.55
	Stem	26	57.77
	Roots	12	26.66
	Total	45	100
Spider	Produce silk and cover the plant	27	60.00
	Cause leaf to dry	10	22.22
	Problem is unknown	8	17.77
	Total	45	100
Red ants	Produce un pleasant fecal material	30	66.66
	Simply move through the body of plant	5	11.11
	Problem is unknown	10	22.22
	Total	45	100
Damage of Mango white scale more pronounced	On leaves	35	77.77
	On stem	8	17.77
	On root	2	4.44
	Total	45	100

The result shows that there are enormous amount of scale insect on leaves followed by stem. Scale insect is harboring leaf to get means of subsistence. Key informants and FGD in supporting this Confirm the prevalence of the white mango scale insect pest on major area of the leaf where they can easily get photosynthesis products, Observation of the mango plantation also ascertain that the abundance of the white mango scale insect pest on the leaf all study site.

Pest Status and its Distribution

Determination of the white mango scale insect infestation status and distribution is of vital important to forecast the intensity of damage they bring about, as a result assessment was done on three plant branch twig leaf on every study site, accordingly 33.82%,35.59% and 30.41% were infested at Ura, salgal-24and Qushmangal (AK) respectively. Similarly 66.18%, 64.41% and 69.59% were observed normal at Ura, salgal-24and Qushmangal (AK) respectively (Table 9).

Table 9: Sample collected from branch tree twigs from the study site

Kebele	Plant Condition	Leaves of the sampled plants				
		P1	P2	P3	Total	%
Ura	Infested	27	35	30	92	33.82
	normal	77	60	43	180	66.18
	Total	104	95	73	272	100
Salga-24	Infested	34	34	32	100	35.59
	Normal	60	37	84	181	64.41
	Total	94	71	116	281	100
Qushmangal	Infested	37	28	32	97	30.41
	Normal	75	82	65	222	69.59
	Total	112	110	97	319	100

The result reveal that the white mango scale insect infestation status and distribution is less that 50%, showing that the pest is at the emerging state, however such distribution at the bottom of a twig enable to forcast the intensity of damage can be aggressive in the forthcoming periods. Similar percentage of non infestation 66.18%, 64.41% and 69.59% were showing the pest distribute all of a sudden to the orchard to all study area Ura, salgal-24and Qushmangal (AK) The suggestion from KI and FGD also support the result obtained

Management Practice Employed

Whatever the pest is emerging pest searching management means is a must for all producers. Regarding this 60% respondents rely that they extending their report to Woreda agricultural office, 35.55% respondents claim that the problem is not devastating thus no need for immediate protection. However, very few 4.44% start practicing cultural control (Table 10).

Table 10: Management Practice

	Categories	Respondents	
		Frequency	**%**
Management practice	Reported to Woreda Agriculture office	27	60
	No protection means is required	16	35.55
	Start practicing cultural control	2	4.44
	Total	**45**	**100**

The result shows mango producers accept the pest as newly emerging pest to the area show that no visible damage is observed. The key informants and FGD accepting the response of respondents suggest that, the pest is newly introduced to the area, thus need expertise investigation and very few start smoking the tree during evening assuming that smoking kill the pest.

CONCLUSIONS

The results indicate that mango in the study area is exotic fruit crops and dominantly produced is the local cultivar mango raised from seed and seedling on adequate farm land produced traditionally by rain-fed harvested once a year at early maturity. Mango plants bear about 300 fruits estimated to 20tons per ha and harvested at one season periods.

Deterioration in productivity may it occur mostly by insect pests and wildlife attack. Species composition are comprises of many of which Scale insects are abundantly found then Red ants, Spider Termite and Beetles respectively, Indicating that scale insects are widely distributed over the surface of leaves. Red ants are fond over the ground and on the stem of the mango tree. The association of these arthropods and insect does not contribute to damage of the tree except the white mango scale.

White Scale insects appear as immigrants in mid of 2013, Distribution of scale insect are common on leaves perhaps rarely occur on stem and root. White mango scale insect infestation status and distribution is less than 50%, showing that the pest is at the emerging state; however such distributions at the bottom of a twig enable to forcast may be the intensity of damage can be aggressive in the forthcoming periods.

White mango scale insect pest is newly emerging pest to the area. Except few smallholder farmers start smoking the pest, by suspecting that smoke suffocate the pest, or reporting to the Woreda agriculture office for investigation. No one attempt to manage the pest. Therefore, this study may serve as a base line for designing to study economic loss, management practice that may includes sorting and raring resistant variety.

Conflict of Interest

The authors declared that they have no conflict of interest.

Acknowledgments

We are grateful to the School of Graduate Studies, Addis Ababa University and the Department of Zoological Sciences Insect science stream for funding and facilitating the work. Our acknowledgement also goes to the Asossa District Agricultural office, *Kebele* administrators and *kebele* agricultural extension agents for provision of their support and in house hold data collection. Our thanks also go to the Assosa University and my friends for their un reserved support in facilitating and preparing the necessary condition for the study. First author want

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