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Insect pests infesting pineapple (*Ananas comosus*) in southern part of Ethiopia

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Abstract
Survey was carried out to study the distribution, infestation and damaging level of insect pests of Pineapple (*Ananas comosus*) during 2017 cropping season in southern Ethiopia. Insect pests were observed and identified at their sites in the surveyed areas. In addition, samples of insect pests and infected plant parts were collected and insect images were taken. The samples were diagnosed in Ambo Plant Protection Research Center laboratory. A total of five species of insect pests were recorded as Pineapple (*Ananas comosus*) insect pest with different rate of infestation and damage level. Pineapple Mealy Bug (Dysmicoccus brevipes) was recorded with relatively high infestation and damage level from Kefa zone (Ginbo district), while others were considered as minor pest due to low infestation and damage level. Therefore, it is important to design control options for the Pineapple Mealy Bug to ensure plant health and pest action under economic threshold level.

Keywords: survey, pineapple, insect pests, infestation

Introduction
Pineapple (*Ananas comosus*) is one of the most important fruit crops in industry to produce Crude extracts from fruit, proteinases substances from leaf and stem (Lee *et al*., 1997) [7]. In addition to this paper, cloth, and composite plastics can be extracted and processed from pineapple leaf (Hepton and Hodgson, 2003) [3]. It is one of the important fruit that originated from southern Brazil where its wild relatives occur and distributed to other countries (Joy and Sindhu, 2012) [6]. Smooth cayenne (smooth leaf) and Red Spanish (Rough leaf) are the two cultivars of pine apple grown in the world Bartholomew, 2003) [1, 3].

Pineapple cultivation has been under threat due to various diseases and insects attacking it. Some of insect pest that affect this crops include: Mealy bugs, Scale insect, Thrips, Fruit borer, Fruit fly and Termites are very important (Beardsley, 1993). Among disease recorded Mealy bug wilt disease caused by virus, *Phytophthora spp* are very important (Bartholomew, 2003) [3, 1].

The demand for Pineapple and its product is increasing year by year in the world market, but production is limited to few countries. In Ethiopia, this crop approximately 50 years ago have been introduced by religious missionary in to Sidama zone of Southern nations and nationalities of People (SNNP) (personal communication). Recently, Pineapple has performed well in the south party of Ethiopia, particularly, at Sidama and Kefa zones. Due to its promising performance in these areas, various business plans on pineapple production, value addition and pineapple exporting are being planned. According to Sidama zonal report more than 3480 farmers are engaged in pineapple cultivation on the 4384 hectares at both zones (SZAO, 2017).

Hence, Pineapple cultivation limited to small area in Ethiopia and little has been done on crop protection. Therefore, the current study aims to check on the absence or presence, and distribution of the insect pest in the major pineapple growing areas of the two zones.

Methodology
Field assessment was conducted in two zones: Sidama, and Kafa during the 2017 cropping season. Team organized from Ministry of Agriculture and Natural Resource and Ambo plant protection Research Center (APPRC) haven participated during data collection. From Sidama zone, two districts (Aleta Chuko, and Dera and), Kafa one district (Ginbo), were assessed at maturity growth stages of pineapple (Figure 1). Thirty six sites (one private farm (Horizon Plantation PLC Gojeb Agricultural Development) and thirty five farmers' field) were assessed. Field size covered by pine apple was obtained from Sidama zonal agricultural office to determine representative samples. From each site, 10 to 15 plants were taken at random to assess pest prevalence from each pine apple sampled plant. Moreover, insect pests were collected from selected sites for further identification. A pocket lens (10X), camel brush, glass vials and polythene bags were used for collection of insect pests for their proper identification. Collected sample were brought to Ambo Plant protection Research Center for detail study, using pertinent literature and internet search. Geographic data (Longitude, Latitude and Altitude) of each sampling site were recorded by the use of GPS. ArcGIS 10.3 was used for spatial data management and Mapping of pineapple recorded area. Crop Protection Compendium (2007 Edition) (WWW cabicompendium. org/cpc) was used as reference during identification. The insect damage scale was assigned according to Seif and Hillocks (1999) that states very low (≤5%), 1ow (6 to 10%), medium (11 to 20%), high (21 to 50%) and very high (>50%) levels. Infestation and damage level from attacked plant

leaf/parts were calculated by using the following formula. Infestation per cent = Number of affected sampled plant/Total number of sampled plant × Hundred (100); Damage level = Area of plant tissue affected/Total area of plant (tissue) × Hundred (100)

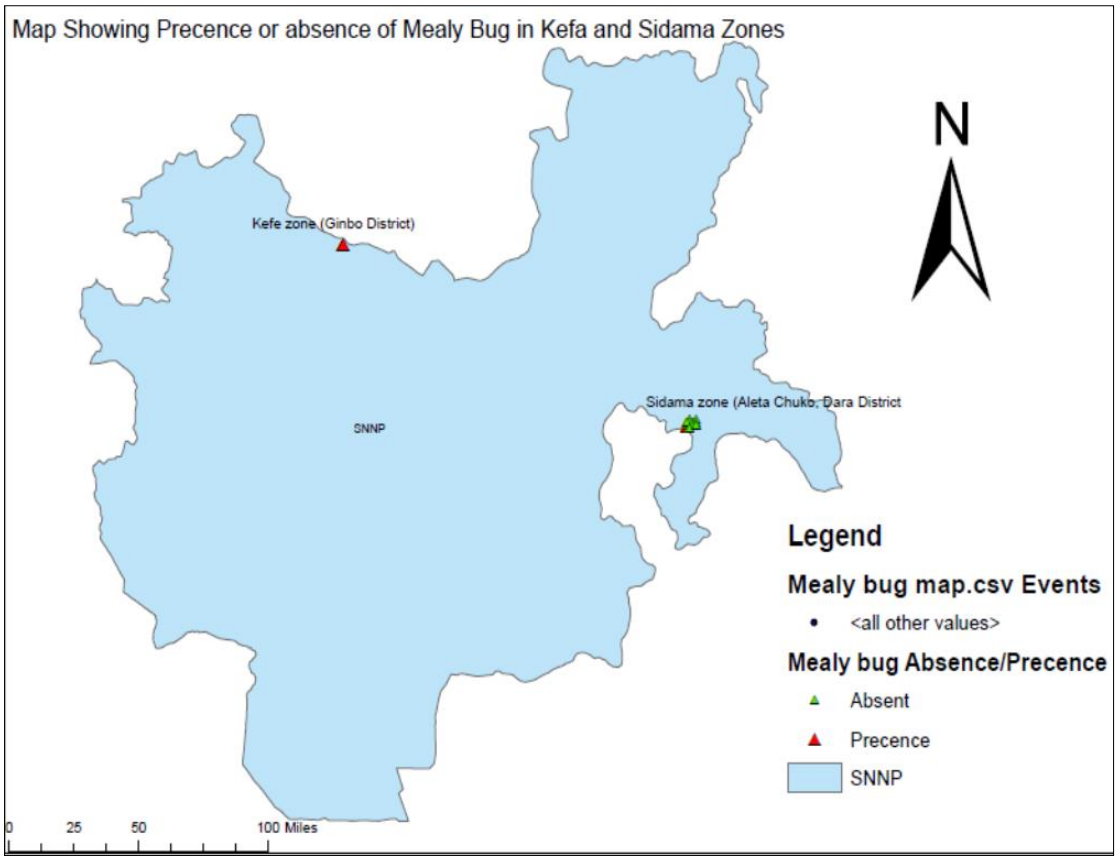

Fig 1: Map showing present (+) or absent (-) of Pineapple Mealy Bug in Kefa and Sidama Zones

Finding Result

The present survey revealed distribution, infestation, and damage level of Pineapple insect pests in southern part of Ethiopia (Table 1). Four species of insect pest from three orders were recorded from surveyed area. Among insect pests recorded were pineapple mealy bug (Dysmicoccus brevipes) (only on Smooth Cayenne Variety), scale (Diaspis spp), Thrips (Holopothrips spp), ants (*Pheidole spp.*) (On Red Spanish and Smooth Cayenne Variety) were recorded relatively with high infestation and damage level from some of surveyed areas (Table 1). Insect pests of Pineapple have been reviewed recently by Joy *et al* (2013) as Pineapple is infested by various species of insects. However, depending on the infestation and extent of damage, mealy bug (Dysmicoccus brevipes) could be considered as major pests (Joy *et al* (2013). Infestation rate of mealy bug (Dysmicoccus brevipes) was high in Kefa zone (Ginbo, 42.6%) and and the mealy bug damage level high in Kefa zone (Ginbo, 28.2 %) while mealy bug damage level was very low 0.001% (which recorded from poorly managed one field on Smooth Cayenne variety) (Table 1). Mealy bug whitish colony with waxy secretion, soft-body, various size instars with groups of colony were found infesting Pinneapple root and fruit in Kefa zone on Smooth Cayenne variety. Recorded colony found mostly associated with ants (*Pheidole spp.*) which probably attracted due to honey excreted during mealy bug feeding. The ants may support as agent of transport to spread mealy bug from plant to plant. Reimer *et al* 1990a also reported that the ants most commonly associated with Pineapple mealy bugs throughout the world are two genera which include Pheidole and Solenopsis. Pineapple with high infestation found with growth of sooth mold that probably caused by accumulation of plant excretion during mealy bug feeding. All infested Pineapple plant was found with wilt symptom (pale green to yellow at the proximity of leaf which bears brownish color) that probably caused by Mealy bug feeding and/or wilts disease transmission serving as vector. According to Hu and Sether (2002b) reviewed report 35% of Pinneaple yield loss caused due to wilt disease associated with mealy bug. As report indicated wilt only caused Pinneaaple infected by closterovirus (PMWaV-2) that are transmitted by mealy bug. In addition, Pineapple fruit found with covered by white mealy bug colony that may cause Pineapple fruit unfit for consumption and marketing. These pests occurred with undetermined infestation and damage level included: Pineapple scale (Diaspis spp.), Pineapple Thrips (Holopothrips spp.). These pests, which are found to be undetermined infestation and damage level in current survey, may became serious pests in future due to environmental fluctuation and pest dynamism behaviors

Table 1: Distribution and infestation level of insect pests of Pineapple in Southwestern parts of Ethiopia during 2017 cropping season

Zone	District	Kebele	No. field assessed	Altitude range (m.a.s.l)	Variety type	Insect recorded				Infestation in %	Damage level in %
						Order	Family	Species	Common name		
Sidama	Aleta Chuko	Dibicha	12	1514-1647	Red Spanish / Smooth Cayenne	Hemiptera	Pseudococcidae	Dysmicoccus brevipes	Pineapple Mealy Bug	0.01	0.001
						Hemiptera	Coccoideae	Diaspis spp.	Pineapple scale	undetermined	-
						Thysanotera	Phylaeothripidae	Holopothrips spp.	Pineapple Thrips	undetermined	-
		Teso	8	1610-1681	Red Spanish	Hemiptera	Coccoideae	Diaspis spp.	Pineapple scale	undetermined	-
						Thysanotera	Phylaeothripidae	Holopothrips spp.	Pineapple Thrips	undetermined	-
		Gambella	4	1556-1629	Red Spanish	Hemiptera	Coccoideae	Diaspis spp.	Pineapple scale	undetermined	-
						Hymenoptera	Formicidae	*Solenopsis spp.*	Ant	undetermined	-
	Dara	Safa	9	1532-1641	Red Spanish	Hymenoptera	Formicidae	*Solenopsis spp.*	Ant	undetermined	-
Kefa	Ginbo	Gojeb	3	1391-1450	Smooth Cayenne	Hemiptera	Pseudococcidae	Dysmicoccus brevipes	Pineapple Mealy Bug	42.6	28.2
						Hymenoptera	Formicidae	*Pheidole spp.*	Ant	undetermined	-
						Hymenoptera	Formicidae	*Solenopsis spp.*	Ant	undetermined	-
						Hemiptera	Coccoideae	Diaspis spp.	Pineapple scale	undetermined	-
						Thysanotera	Phylaeothripidae	Holopothrips spp.	Pineapple Thrips	undetermined	-
		Total	36								

The infestation and damage of ants were recorded in terms mealy bug spreading agent. Key: - Very low (≤ 5%) =*, low (6-10%) = **, medium (11-20%) =***, high (21-50%) =****level.

Table 2: Survey information in the major pineapple growing areas of SNNP, 2017

Farmer Name (Farm name)	Region	Zone	District	Location	Elevation (masl))	GPS data		Environmental factors		Insect pest status				Pineapple type
						Latitude (N)	Longitude (E)	Tem (Oc)	RH (%)	Mealy bug	Scale insect	Trips	Ants	
Mruso Muae	SNNP	Sidama	Aleta Chuko	Dibicha	1556	06’29.497	038’16.838	27.7	35	-	+	-		Red Spanish
Blayneh Batola	SNNP	Sidama	Aleta Chuko	Dibicha	1604	06’29.679	038’17.735	29.3	35	-	-	+		Red Spanish
Teshome Baranga	SNNP	Sidama	Aleta Chuko	Dibicha	1647	06’30.161	038’18.994	28.9	37	-	+	-		Red Spanish
Tagese Mute	SNNP	Sidama	Aleta Chuko	Dibicha	1628	06’29.923	038’18.364	27.7	40	-	-	+		Red Spanish
Shurubie Direga	SNNP	Sidama	Aleta Chuko	Dibicha	1555	06’29.674	038’17.113	28.1	28	-	-	-		Red Spanish
Gale Gebesa	SNNP	Sidama	Aleta Chuko	Dibicha	1540	06’29.679	038’16.796	29.2	32	-	-	+		Red Spanish
Tadesse Shae	SNNP	Sidama	Aleta Chuko	Dibicha	1514	06’29.299	038’16.342	29.1	30	-	-	+		Red Spanish
Tamerat Mekonene	SNNP	Sidama	Aleta Chuko	Dibicha	1588	06’29.885	038’17.713	31.5	32	-	-	-		Red Spanish
Teshale Tenegega	SNNP	Sidama	Aleta Chuko	Dibicha	1567	06’30.115	038’17.910	29.1	27	-	-	-		Red Spanish
Shunea Garemo	SNNP	Sidama	Aleta Chuko	Dibicha	1587	06’29.761	038’17.596	36.9	29	-	-	-		Red Spanish
Asetateke Dayano	SNNP	Sidama	Aleta Chuko	Dibicha	1615	06’29.845	038’17.861	25.5	33	-	-	-		Red Spanish
Asefaw Arata	SNNP	Sidama	Aleta Chuko	Dibicha	1633	06’30.057	038’18.825	27.2	28	-	-	-		Red Spanish
Ayele Banato	SNNP	Sidama	Aleta Chuko	Teso	1627	06’30.610	038’18.239	28.2	32	-	+	-		Red Spanish
Tesema hairbayo	SNNP	Sidama	Aleta Chuko	Teso	1610	06’30.645	038’18.139	28.8	30	-	-	+		Red Spanish
Kebede Muae	SNNP	Sidama	Aleta Chuko	Teso	1641	06’30.004	038’18.659	26.6	28	-	+	+		Red Spanish
Kechila Gabiso	SNNP	Sidama	Aleta Chuko	Teso	1681	06’31.002	038’19.092	30.6	36	+	-	+		Smooth Cayene
Degne Dabana	SNNP	Sidama	Aletachuko	Teso	1671	06’30.711	038’19.130	27	29	-	-	-		Red Spanish
Lema Meto	SNNP	Sidama	Aleta Chuko	Teso	1630	06’30.586	038’18.492	28.7	30	-	-	-		Red Spanish
Awedo Berasa	SNNP	Sidama	Aleta Chuko	Teso	1628	06’30.793	038’18.397	33	29	-	-	-		Red Spanish
Tesfaye Sefato	SNNP	Sidama	Aleta Chuko	Teso	1629	06’30.891	038’18.475	29.4	30	-	-	-		Red Spanish
Alemu Boredo	SNNP	Sidama	Aleta Chuko	Gambella	1591	06’31.006	038’17.394	28.2	26	-	-	-	+	Red Spanish
Tesema Yierdaw	SNNP	Sidama	Aleta Chuko	Gambella	1622	06’30.579	038’17.465	26.6	34	-	+	-	+	Red Spanish
Alemu Gebisa	SNNP	Sidama	Aleta Chuko	Gambella	1570	06’30.286	038’16.903	32.5	31	-	-	-	+	Red Spanish
Yosef Beriso	SNNP	Sidama	Aleta Chuko	Gambella	1556	06’30.390	038’16.517	27.1	33	-	-	-	-	Red Spanish

Kayamo Bango	SNNP	Sidama	Dara	Safa	1639	06’29.421	038’19.162	22.9	41	-	-	-	+	Red Spanish
Tamrat Kayamo	SNNP	Sidama	Dara	Safa	1641	06’29.280	038’19.123	26.4	38	-	-	-	+	Red Spanish
Tamange Tesfaye	SNNP	Sidama	Dara	Safa	1622	06’29.245	038’18.611	20.3	46	-	-	-	+	Red Spanish
ZerihunMenegesha	SNNP	Sidama	Dara	Safa	1594	06’29.018	038’18.076	23.3	45	-	-	-	-	Red Spanish
Yohanse Shopana	SNNP	Sidama	Dara	Safa	1557	06’28.726	038’17.562	25.5	32	-	-	-	-	Red Spanish
Teshome Hamaro	SNNP	Sidama	Dara	Safa	1532	06’28.612	038’17.125	26.2	33	-	-	-	+	Red Spanish
Memeru Yebure	SNNP	Sidama	Dara	Safa	1573	06’28.818	038’17.774	27.8	35	-	-	-	-	Red Spanish
Shiferaw Kimebita	SNNP	Sidama	Dara	Safa	1638	06’29.357	038’19.014	25.1	28	-	-	-	+	Red Spanish
Kebede Yohanse	SNNP	Sidama	Dara	Safa	1625	06’29.349	038’19.509	28	27	-	-	-	-	Red Spanish
Horizon pineapple plantation (private)	SNNP	Kefa	Ginebo	Gojeb	1450	07’25.240	036’21.330	20.5	58	+	+	+	+	Smooth Cayene
Horizon pineapple plantation (private)	SNNP	Kefa	Ginebo	Gojeb	1446	07’25.304	036’21.462	27	41	+	+	+	+	Smooth Cayene
Horizon pineapple plantation (private)	SNNP	Kefa	Ginebo	Gojeb	1391	07’25.197	036’21.655	32	33	+	+	+	+	Smooth Cayene

Fig 2: Pineapple infested due to Mealy bug, Ants and Scale insects recorded from Kafa zone (Ginbo District), during the 2017 cropping season

Conclusion

The survey provided some clues to understand infestation and importance of insect pests on Pineapple in Kefa and Sidama zones of SNNP region of Ethiopia. From this survey, it can be concluded that the insects which were the most important with high infestation rate and damaging level is Pineapple mealy bug (Dysmicoccus brevipes) particularly in Kefa zone, Ginbo distric (Gojeb kebele), which could be categorized as major insect pest recorded on Pineapple in present survey. Currently, insect pest recorded as major insect pests needed emphasis for development of suitable monitoring and management technique, while regular survey is important to access Pineapple field, because there is the probability for the current undetermined pest become serious pest in the future. Farmers need awareness about these pests and follow appropriate management Options.

Recommendations/Suggestions for Regulatory and Management of Pineapple mealy bug (Dysmicoccus brevipes)

Pineapple (Variety Red Spanish) introduction to Ethiopia particularly Sidama zone of Southern nations and nationalities of People (SNNP) estimated to be 50 years ago. However, there is insignificant insect infestation were recorded up to know. Even though some of the farmers field is poorly managed (Poor weed and agronomic practice) there is very low difficult to determine insect pest are observed on poorly managed farmer field. In contrary, to this we recorded high level of mealy bug infestation and damage in Kefa zone on Smooth Cayenne variety. Therefore, it needs high emphasis of regulatory control measure which needs government intervention. Based on this I suggest/recommend the following.

- Long range dispersal is possible only if infested planting materials, fruits, and contaminated containers are transported within or outside infested areas. Hence, inspection and prohibition of movement of infested plants and plant products (fruit) from infested area (Kefa zone) requires enforcement of regulatory measures.
- Selection of healthy sucker and Pre planting treatment are effective in controlling Pineapple mealy bugs
- Six years old sucker should be avoided (Carillo,2011)
- Before planting sucker can be dipped in insecticide such as Diazinon (Carillo,2011)
- Mealy bug spread can be minimized by controlling ant population
- The mealy bug infested fields should be cleaned by removing remaining plant residues
- Weed should be managed in appropriate way
- Indirect control treating soil with chlordane or heptachlor to kill the ants (Carillo,2011)

References

1. Bartholomew DP, Paull RE, Rohrbach KG. The pineapple Botany, Production, and Uses. Department of Tropical Plant and Soil Science, CTAHR, University of Hawai. 2003.
2. Bearsdsley JW. The pineapple mealy bug complex; taxonomy, distribution, and host relationships. In: First International Pineapple Symposium, D.P. Bartholomew and G.G Rohrbach, (eds), Acta Horticulture. 1993; 334:383-386.
3. Hepton, A, Hodgson AS. Pineapple: Processing. In: Bartholomew DP, Paull RE. Rohrbach KG. (eds). The pineapple, botany, production and uses. CABI, Wallingford, UK, 2003, 281-290.
4. Hu JS, DM Sether, XP Liu, M Wang, F Zee, DE Ullman. Use of tissue blotting immunoassay to examine the distribution of pineapple closterovirus in Hawaii. Plant Dis. 1997; 81:1150- 1154.
5. Joy PP, Sindhu G. Diseases of Pineapple (Ananaus comosus): Pathogen, Symptom, infection, Spread and Management. Pineapple Research Station, Vazhakulam, Muvattupuzha, India. 2012.
6. Lee KL, Albee KL, Bernasconi RJ, Edmunds T. Complete amino acid sequence of ananain and a comparison with stem bromelain and other plant cysteine proteases. Biochem J. 1997; 327:199-202.
7. Reimer NJ, JW Beardsley, GC Jahn. Pest ants in the Hawaiian Islands. *In* Vander.Meer RK, Jaffe K, Cedena A. (Eds.), Applied myrmecology: a world perspective. Westview Press, Boulder, 1990a, pp.40-50.