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Insect pests infesting korarima (*Aframomum corrorima*) (Braun) P.C.M. Jansen in southwestern part of Ethiopia

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Abstract

Survey was conducted to study the distribution, infestation and damaging level of insect pests of korarima (*Aframomum corrorima*) indigenous spice of Ethiopia during 2013/2014 cropping seasons in Southwestern parts of 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 Tepi National Spice Research Center laboratory. A total of fourteen species of insect pests from six orders were recorded as korarima insect pest with different infestation rate and damage level. Green stink bug (*Acrosternum*. spp), korarima flower thrips (*Sciothrips*. spp) mottled tortoise beetle (*Chelymorpha*. spp) and cardamom white fly (*Dialeurodes*. spp) were widely distributed and recorded relatively with high infestation rate from all surveyed areas while black leaf beetle (*Chrysochus*. spp), brown spotted grasshopper (*Cyrtacanthacris*. spp), spice grasshopper (*Catantops*. spp) were considered as intermediate due to medium infestation and damage level. The remaining insect pests showed very low infestation rate and damage level. They are grouped under minor insect pests. Therefore, it is important to design control options for these major insect pests to ensure plant health and pest action under economic threshold level.

Keywords: Survey, korarima, insect pests, infestation, damage level, spices

Introduction

Korarima (*A. corrorima*) is indigenous to Ethiopia and well known in every Ethiopian diet. The dried pods sold in almost every Ethiopian market and are quite expensive compared to other spices (Jansen 1981, Eyob *et al.* 2007) [5]. Dried capsules of korarima have diverse use from consumption as food seasoning to medicinal values. Some documents also indicate that korarima capsule was used as a bartering medium among the Ethiopian people before time immemorial. It mostly found in south and southwestern party of the country. The spice preferring shady locations and rich, moist, well-drained soil and recently well performed in South west part of Ethiopia particularly in Kafa, Gamo-Gofa, Bench-Mahag, Majangs zones (Eyob *et al.* 2007) [5]. Ethiopia exported dried pods of korarima to Sudan, Egypt, Arabia, Iran, India, and the Scandinavian markets (Jansen 1981, Lock 1997). The great potential of this plant has however, encountered different production problems. In the last few decades, yields, areas of production and biodiversity have declined both from farmer's field and natural forest of southern Ethiopia (EARO, 2000) [3].

In Ethiopia, korarima (*A. corrorima*) production is declining mainly due to destruction of plant's natural habitats (Jansen 1981, Eyob *et al.* 2007) [5] and other limiting factors such as non-improved variety, non-adapted agronomic practices and lose caused due to biotic and a biotic stress are very important (Edossa, 1998; Girma *et al.* 2008) [4, 9].

Information on pest in a specific agro-ecosystem is vital to understand the pest status that helps the planner to design pest management options. However, such information on korarima (*A. corrorima*) insect pests in Ethiopia still not documented at all. Therefore, the current study aims to survey insect pest damaging korarima (*A. corrorima*) in south western of Ethiopia to initiate control options.

Materials and Method

Survey was conducted during during the 2013/2014 cropping season from (South Nations and

Nationality and Peoples Regional State (SNNPRS) and Gambella Regional State of Ethiopia at flowering and maturity growth stages of Korarima. Field size covered by Korarima was obtained from zonal agricultural office to determine representative samples. At each site, a group of fifteen plants were selected randomly and accessed repeatedly for insect presence, infestation and damage level. Initial observation on damage symptoms on the leaves, flowers and capsules were noted by visual examination at their site. Moreover, insect pests were collected from selected sites for further identification. A pocket lens (10X), insect collecting nets, Camel brush, glass vials and polythene bags were used for collection of insect pests for their proper identification. Some pests were identified in the field using identification

keys and some of them were brought to Tepi National Spice Research Center for detail study, using pertinent literature and internet search. Some specimens have been maintained to be identified at a later date.

The insect damage scale was assigned according to Seif and Hilllocks (1999) ^[13] that states very low ($\leq 5\%$), low (6-10%), medium (11-20%), high (21-50%) 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 leaves/total number of sampled leaves x hundred (100). And Damage level = Area of plant tissue affected/total area of plant (tissue) x hundred (100).

Table 1: Geographical description of the study area

Regions	Zones	Geographic Location		Altitude (masl)	Temperature ($^{\circ}$ C)	Rainfall (mm)
		Longitude (N)	Latitude (E)			
Snnpr	Benchmaji	34.88 to 36.14	5.33-7.21	500 to 2500	15.1-27	400-2000
Gambella	Mejenger	7.20	35.10	2400-522	15 and 25	1400 and 2200
Snnpr	Sheka	35.24 to 37.90	7.12-7.89	1001-3000	15.1-27.5	1201-1800
Snnpr	Bonga/Kafa	-	-	500 to 3500	10.1 to 27.5	1001 to 2200

Source: (CSA, 2007) ^[2]

Results and Discussion

Korarima (*A. corrorima*) insect pests

Fourteen species of insect pest from six orders were recorded. Among identified korarima insect pest, the green stink bug (*Acrosternum. spp*), korarima flower thrips (*Sciothrips. spp*) mottled tortoise beetle (*Chelymorpha. spp*) and cardamom white fly (*Dialeurodes. spp*) were widely distributed and recorded with high infestation rate across the surveyed areas (Table 2).

The green stink bug (*Acrosternum. spp*) highest infestation rate was occurred at Sheko (21.7%), Godere (33.6%), Andracha (38.8%), Chena (30.7%) and Bitu (24.1%) woredas. The damage level of all surveyed areas ranged very low to medium (0.3-18.7%) except in Godere (25.5%) district (Table 2). The adults & nymphs were observed sucking sap from plant leaves and apical shoots which resulted leaf discoloration. According to McPherson and McPherson (2000), there are diversity of stinkbugs species which are economically important to agricultural crops. This finding is similar with what we recorded on present survey. High infestation rate (27.7%) and damage level (21.4%) were recorded due to korarima flower thrips attack on korarima plant in Kafa zone at Bitu district. Similarly this pest caused high infestation rate in Godere (20.7%) district (Table 2). The thrips were found sucking the inner content sap inside the apical shoot, flower petals and capsule of the korarima plants. Similar to cardamom plant, the thrips damaged the surface of the korarimacapsules and sucked the plant contents. The injured capsules resulted in malformed and discolorations of the capsule. This type of effect on the capsules highly influence the capsule appearance and finally the quality (Girma *et al.* 2008) ^[9]. Among the insect pests recorded, cardamom white fly was widely distributed in most of surveyed areas though very low to medium infestation rate and damage level. In Chena district this pest caused (29.9%) infestation rate and (23.4%) damage level. Cardamom white fly also caused 22.1% infestation rate and 15.0% damage level in Bitu district (Table 2). Whiteflies are found sucking the korarima plant which resulted in yellowing symptom and contaminated waste substance mostly under lower surface of

the leaves. Thrips and white fly were recorded with high infestation rate and damage level from cardamom plant and korarima from all surveyed areas. The occurrence of these pests on both crops may probably due to the crops are found under the same family. Anon (1977) ^[1], confirmed that Order *Zingiberales* (formerly known as Scitamineae) to which currently the family *Zingiberaceae* belongs has several wild spices among which Genus *Elettaria* (small cardamom) and *Aframomum* (large cardamoms) are two economically important seed spices widely distributed throughout tropics. These spices are much related in chemical constitute and morphological characteristics and their conducive environment for cultivation. Literature from different authors indicate that the existence of economically important insect pests on cardamom plant (Gopakumar and Chandrasekar, 2002) ^[8], (Selvakumaran and Kumaresan, 1993) ^[14] and (Singh *et al.* 1995) ^[15] are similar to that of korarima. From current findings we recorded thrips and white fly attacking both plants (cardamom and korarima) in all surveyed areas. This phenomenon may be occurred due to the crops similarity in plant constitutes. (Finch, 1986 and De Wilde, 1976) ^[7, 6] also states that even though some insect herbivores specialize on one host in their life, many insect pests have more than one host range in certain ecosystem to sustain their life.

Mottled tortoise beetle were widely distributed in all surveyed areas though the infestation rate and damage levels were very low to medium with the exception at Godere and Chena the infestation rate were 24.2% and 20.7%, respectively. The adult beetles were found feeding on the leaves and pseudo-stems which resulted in circular holes and stem damage. The second category that occurred medium to high population density includes pests black leaf beetle (*Chrysochus spp*), brown spotted grasshopper (*Cyrtacanthacris. spp*), Spice grasshopper (*Catantops spp*). These pests are the second most important pests recorded whereas seven species were recorded from very low to low infestation rate and damage levels. These include: leaf-footed plant bug (*Leptoglossus. spp*), leaf hopper (*Poecilocardia. spp*), termite (*Macrotermes. spp*), green grasshopper (*Catantops. spp*), small spotted leaf beetle (*Chelymorpha. spp*), plant bug (*Neurocolpus. spp.*)



Fig 1: Some major and intermediate insect pest infesting Korarima plant in southwestern Ethiopia

Table 2: Distribution and infestation level of insect pests of Korarima in Southwestern Ethiopia

Zone	District	Insect pests				Infestation (%)	Damage Level (%)
		Order	Family	Species	Common name		
Bench Maji	Sheko	Hemiptera	Pentatomidae	<i>Acrosternum. spp</i>	The green stink bug****	21.7	7.1
		Homoptera	Cicadellidae	<i>Poecilocarda. spp.</i>	Leaf hopper*	0.03	0.8
		Coleoptera	Chrysomelidae	<i>Chelymorpha. spp</i>	Small spotted leaf beetle*	1.3	0.5
		Hemiptera	Aleyrodidae	<i>Dialeurodes. spp</i>	Cardamom white fly*	4.7	2.3
		Coleoptera	Chrysomelidae	<i>Chrysochus. spp</i>	Black leaf beetle*	12.1	6.9
		Orthoptera	Acrididae	<i>Cyrtacanthacris. spp</i>	Brown spotted grasshopper***	16.2	5.5
		Thysanoptera	Thripidae	<i>Sciothrips. spp</i>	Korarima flower thrips***	15.8	13.3
		Coleoptera	Chrysomelidae	<i>Chelymorpha. spp</i>	Mottled Tortoise Beetles**	7.3	6.7
Majiang	Goderre	Homoptera	Cicadellidae	<i>Poecilocarda. spp</i>	Leaf hopper*	0.02	1.2
		Thysanoptera	Thripidae	<i>Sciothrips. spp</i>	Korarima flower thrips****	20.7	4.7
		Hemiptera	Pentatomidae	<i>Acrosternum. spp</i>	The green stink bugs****	33.6	25.5
		Coleoptera	Chrysomelidae	<i>Chelymorpha. spp</i>	Small spotted leaf beetle*	0.07	0.06
		Coleoptera	Chrysomelidae	<i>Chrysochus. spp</i>	Black leaf beetle*	17.0	10.1
		Orthoptera	Acrididae	<i>Cyrtacanthacris. spp</i>	Brown spotted grasshopper**	5.2	2.3
		Hemiptera	Aleyrodidae	<i>Dialeurodes. spp</i>	Cardamom white fly**	9.1	7.8

Continue

Sheka	Yeki	Coleoptera	Chrysomelidae	<i>Chelymorpha. spp</i>	Mottled Tortoise Beetles****	24.2	9.8
		Thysanoptera	Thripidae	<i>Sciothrips. spp</i>	Korarima flower thrips***	12.8	7.1
		Hemiptera	Pentatomidae	<i>Acrosternum. spp</i>	The green stink bug*	3.6	0.3
		Orthoptera	Acrididae	<i>Catantops. spp</i>	Spice grasshopper**	8.5	0.2
		Coleoptera	Chrysomelidae	<i>Chelymorpha. spp</i>	Mottled Tortoise Beetle***	17.8	14.5
		Hemiptera	Aleyrodidae	<i>Dialeurodes. spp</i>	Cardamom white fly**	5.9	1.7
		Coleoptera	Chrysomelidae	<i>Chrysochus. spp</i>	Black leaf beetle*	6.5	4.1
		Hemiptera	Coreidae	<i>Leptoglossus. spp</i>	Leaf-footed plant bug*	0.03	0.01
		Coleoptera	Chrysomelidae	<i>Chelymorpha. spp</i>	Small spotted leaf beetle*	0.9	0.4
	Andracha	Orthoptera	Acrididae	<i>Cyrtacanthacris. spp</i>	Brown spotted grasshopper*	4.0	2.2
		Coleoptera	Chrysomelidae	<i>Chelymorpha. spp</i>	Small spotted leaf beetle*	0.04	0.06
		Isoptera	Termitidae	<i>Macrotermes. spp</i>	Termite*	1.0	0.02
		Hemiptera	Miridae	<i>Neurocolpus. spp</i>	Plant bug*	2.3	0.7
		Hemiptera	Aleyrodidae	<i>Dialeurodes. spp</i>	Cardamom white fly***	13.1	10.2
		Coleoptera	Chrysomelidae	<i>Chrysochus. spp</i>	Black leaf beetle*	2.9	1.6
		Hemiptera	Pentatomidae	<i>(Acrosternum. spp)</i>	The green stink bugs****	32.8	18.7
		Coleoptera	Chrysomelidae	<i>Chelymorpha. spp</i>	Mottled Tortoise Beetles*	3.8	0.7
		Thysanoptera	Thripidae	<i>Sciothrips. spp</i>	Korarima flower thrips***	15.3	11.6
		Hemiptera	Coreidae	<i>Leptoglossus. spp</i>	Leaf-footed plant bug*	1.2	0.01

Continue

Bonga	Chena	Orthoptera	Acrididae	<i>Cyrtacanthacris. spp</i>	Brown spotted grasshopper*	0.1	0.1
		Homoptera	Cicadellidae	<i>Poecilocardia. spp</i>	Leaf hopper**	7.3	8.7
		Hemiptera	Pentatomidae	<i>Acrosternum. spp</i>	The green stink bug****	30.7	13.7
		Coleoptera	Chrysomelidae	<i>Chelymorpha. spp</i>	Mottled Tortoise Beetles**	20.7	5.9
		Hemiptera	Aleyrodidae	<i>Dialeurodes. spp</i>	Cardamom white fly****	29.9	23.4
		Thysanoptera	Thripidae	<i>Sciothrips. spp</i>	Korarima flower thrips****	24.1	9.6
		Coleoptera	Chrysomelidae	<i>Chrysochus. spp</i>	Black leaf beetle*	11.8	3.6
		Isoptera	Termitidae	<i>Macrotermes. spp</i>	Termite*	0.2	0.1
	Bita	Orthoptera	Acrididae	<i>Catantops spp</i>	Green grasshopper*	1.1	1.3
		Hemiptera	Pentatomidae	<i>Acrosternum. spp</i>	The green stink bugs****	24.1	5.3
		Isoptera	Termitidae	<i>Macrotermes. spp</i>	Termite*	0.2	0.03
		Hemiptera	Aleyrodidae	<i>Dialeurodes. spp</i>	Cardamom white fly***	22.1	15.0
		Orthoptera	Acrididae	<i>Catantops. spp</i>	Spice grasshopper***	12.2	10.5
		Coleoptera	Chrysomelidae	<i>Chrysochus. spp</i>	Black leaf beetle*	9.5	2.1
		Coleoptera	Chrysomelidae	<i>Chelymorpha. spp</i>	Mottled Tortoise Beetles**	6.1	0.8
		Thysanoptera	Thripidae	<i>Sciothrips. spp</i>	Korarima flower thrips**	27.7	21.4
		Hemiptera	Aleyrodidae	<i>Dialeurodes. spp</i>	Cardamom white fly***	23.0	16.9
		Homoptera	Cicadellidae	<i>Poecilocardia spp</i>	Leaf hopper*	3.1	0.06
Coleoptera	Chrysomelidae	<i>Chelymorpha. spp</i>	Small spotted leaf beetle*	4.5	1.8		

Very low ($\leq 5\%$) = *, low (6-10%) = **, medium (11-20%) = ***, high (21-50%) = ****level

Conclusions

The survey provided some clue to understand distribution, infestation and importance of insect pests on korarima in southwestern Ethiopia. From this survey, it can be concluded that the insects which were the most distributed and recorded with high infestation rate and damaging level could be categorized as major insect pests. These pests are green stink bug (*Acrosternum spp.*), korarima flower thrips (*Sciothrips spp.*), mottled tortoise beetle (*Chelymorpha spp.*) and cardamom white fly (*Dialeurodes. spp.*). Black leaf beetle (*Chrysochus spp.*), brown spotted grasshopper (*Cyrtacanthacris spp.*), spice grasshopper (*Catantops spp.*) also caused considerable infestation rate and damage level in the most surveyed areas. They categorized as intermediate pests because they were the second most important insect pests in the surveyed areas. Leaf-footed plant bug (*Leptoglossus spp.*), leaf hopper (*Poecilocardia spp.*), termite (*Macrotermes spp.*), green grasshopper (*Catantops spp.*), small spotted leaf beetle (*Chelymorpha spp.*), plant bug (*Neurocolpus spp.*) are minor pests occurred in some of surveyed areas. Currently, insect pests recorded as major insect pests need emphasis for development of suitable management option while regular survey is important to access potential insect pest because there is the probability of current minor pest become major insect pest in the future. Farmers need awareness about these pests and follow appropriate cultural practice.

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