Chapter One

Introduction

The sorghum crop (*sorghum bicolor* (L.) is a member of the grass family, Poaceae is grown in the world in over 41.91 million hectares and accounts for production of 65.53 million tons of grains with an average yield of 1459.2kg/ha. Nearly 80% of the cultivated area cereal crop in the world after wheat, rice, maize and barely. In acreage, it rants fifth and accounts for 3.5% of total cereal grain production. (Gordon, *et al*; 1995).

Sorghum is also an important source of animal feed and fodder, the term sorghum includes four groups of cultivated sorghum plants viz, grain sorghum (as forage and feed), sweet stakes (as forage and for animal feed), Sudan grass (for forage and pasture), and broom corn (for making brooms). The cultivated sorghum originated in Africa in the region of present – day Sudan and Ethiopia in includes five basic races, viz, bicolor, guinea, candatum, kafir and durra. (Delserone, 2007).

In tropical and sub-tropical areas of Africa and Asia sorghum is grown predominantly for human consumption. The grain is usually milled for flour and used for variety of unlearned breads such as roti and chapatti in India and leavened pancake. Like breads such as Injera and kisra in Ethiopia and Sudan, in America and Australia, sorghum is used almost exclusively for stock feed (Shoemaker, *et al* ; 2010).

The yield of sorghum crop is adversely affected due to insect pests, diseases, weeds, nematodes and bird etc. The grain losses range from 10-15% due to insect pests alone.to achieve higher yield of sorghum crop,

proper plant protection measures should be undertaken to prevent losses due to insect pests (Jaipal and Dass ,1993).

Damage in aphid feeding causes yellow to red to brown leaf discolorations on both sides, the honeydew way can kill young grain sorghum plants later infestations can prevent grain from forewing. (Bigger, 1958).

Natural pesticides are good alternative to synthetic pesticides because they are safe to environment, natural enemies, humans and other animals, *e.g.* most botanical pesticides have low to moderate mammalian toxicity, therefore it can be applied by farmers and small scale industries with little cost (Hassan, 1992 and Georges *et al*., 2008).

The natural products were used as alternative of insecticides to manage the damage of insets especially against aphids; plant extracts are cheap and available for farmers and safety for environment and living individuals.

Therefore this study was conducted to evaluate the effect of natural products of three plant extract as a biological agent in controlling sorghum aphid *R .maidis* the specific objectives of this study were:

1. Collection of plant materials.
2. Preparation of ethanolic extracts of three plant materials (damas, moringa ,kaphor).
3. Evaluation of the effect of plant extracts on insect adult mortality.

CHAPTER TWO

LETURE REVIEW

2.1 Sorghum

2.1.1 Nutritional Facts

Sorghum is an important food crop especially for subsistence farmers, and millions of people in semi – arid regions of Africa and Asia use sorghum as the most important staple food, serving as the main source energy, protein, minerals and vitamins (FAO, 1995).

Sorghum is considered to be powerhouse of nutrients Sorghum provides 49 to 24% niacin, 47 to 26% thiamin, 28 to 16% riboflavin, iron as well as high levels of magnesium, potassium, calcium, and vitamin B1 and good source of vitamins B2 .(Herbst,2001;Mohamed *et al* ;2010 and Bender, 2005).

2.1.2 Uses

Though sorghum is used largely for forage in the US, It is very important in the worlds human diet, with over 300 million people dependent on it was grown for grain, forage, syrup sugar, and industrial uses of stem and fibers. Sorghum is important a staple cereal in hot dry tropics, the threshed grain ground into wholesome flour. Stalks used as animal feed. (FSD, 2007).

Sorghum is an important summer fodder where temperatures are high and rain fall insufficient for corn. Most important for silage or green soiling, or hay when green irrigated is very dry areas. Pearled grain cooked like rice or ground as flour. Sorghum, with large juicy stems containing as much as 10% sucrose. Arubans make porridge and muffins from sorghum meal. Parched seed are used as coffee substitutes or adulterants. (Morton, 1981).

Sorghum is used to produce biofuel. There are claims that that sorghum-sap-based ethanol has 4 times the energy yield as corn-based ethanol; it is on par with sugar-cane. The sap could be used for ethanol while the grain is used for food (Blaney, 2008).

2.1.3 Distribution

Sorghums are tropical origin but have spread all over the world, with current production in many countries including Africa, China, Central and South America, India, and the United States. The genus *Sorghum* is one of about 6oo genera in Poaceae, it is the 5th most important agricultural grain crop after wheat, rice, maize, barely. (Barkworth , 2003).

2.1.4 Diseases of sorghum

Anthracnose one of the sorghum disease caused by the fungus *Colletruchum graminicola*, it damages foliage and stem of grain sorghum. On susceptible hybrids, the stem holding the head (peduncle) becomes infected and a brown sunken area with distinct margins develops. The control measures used were, crop rotation, and use of tolerant or resistant hybrids (Anaso, *et al* 1989).

Common smut is affect the tumor – like galls on plant tissues which are insatiably green white or silvery white color, interior of galls darken and turn into messes, Powder dark brown or black spore, control measures, maintain proper soil fertility, use resistant hybrids thiram 75% ws 10-12 g /acre in 400 ml of water for loose smut.(Kuchkarek , 1992).

Downy mildew is a diseases of serious concern to sorghum producers in several countries of Asia, Africa, and throughout the Americas. Symptom expression is greatly affected by plant age, pathogen species, and

environment. Usually, there is chlorotic striping or partial symptoms in leaves and leaf sheaths, along with dwarfing. (Adelen, 2000) Downy mildew becomes conspicuous after development of a downy growth on or under leaf surfaces. This condition is the result of conidia formation, which commonly occurs in the early morning. Control measures used were, resistant varieties and hybrids, crop rotation with non-host crops, usage of suitable systemic fungicide for both seed treatment and foliar spray, and weed control . Drying seeds before sowing reduces the disease incidence. (Anahosur and Patil, 1980).

2.1.5 Pests of sorghum

Sorghum crops severely damaged by stem borer (*Chilo Partellus*). Stem borer very serious pest sorghum found throughout in India, presence of dead heart in the early stages is the main symptom, the bore holes may be visible in contrast to the dead heart caused by the stem fly. Later it acts as a internode borer and is found till the time of harvest, yield affected much and the quality of the fodder is also reduced, The damage caused to the crop by this pest is estimated to range between 70 -80%. The control management of collection and destruction of the stubbles which are left in the field or heaped in one corner of the field since they act as a source of infestation , as the larvae hibernate in them, spraying of carbaryl 0.1% or endosulfan 0.07% thrice at an interval of 15 days from a month after sowing (Jotwani, 1978).

Another pest is sorghum midge *Contarinia sorghicola.* It has a worldwide distribution and is considered to be one of the important pests of sorghum. Damage the maggots feed on the developing grains and cause the developing grains to shrivel and severe infestation has a significant effect on the overall production of grains the loss varies from 20-50%(Harris,1984). The control

management, spraying of endosulfan 35EC 1 liter, or phasalone 35 EC 1 liter, or Malathion 50 EC , or Carbaryl 50 WP 2 kg per hectare at nearly 90% ear – head emergence and repeated after 4 or 5 days (Hill ,*et al.*, 1983) .

2.2. *Rhopalosiphum maidis*

2.2.1 Biology

These aphids are about 0.17 inch long and dark – green or bluish and found in the world of plants in the vegetative growth stage. The eggs are very tiny, shiny black, and are found on the crevices of bud, stems, and barks of the plant. Nymph similar to adult, however, it was smaller. They are young aphids, they look like the wingless adults but are smaller. They become adults within 7 to 10 days along each side of the body. The head is brown or green and mottled. The fully-grown caterpillars drop from the plant and burrow into the soil to pupate. The adult are small 3-4 mm long. Soft bodied insect distinguished with two projections on the rear and two long antennae, their body color varies from yellow green brown, to purple, and females can give birth to living nymphs. (Minls,*et al.*, 1987).

2.2.2 Scientific Classification

Phylum: Arthopoda

Class: Insect

Order: Homoptera

Family: Aphididae

Genus: *Rhopalosiphum*

Species: *maidis*

2.2.3 Life Cycle

The first spring adult winged females which fly in search of suitable host plant. Shortly thereafter they give birth to live nymphs which usually develop into wingless female's .under favorable conditions more winged females develop and migrate .Males are rarely found but females continue to reproduce without mating. Reproduction slows down in winter and summer and is most rapid during cool weather. Therefore corn leaf aphids tend to be a problem on winter grains in spring and on late planted corn full (Avienent, 1991).

Behavior of corn aphids can be found at all year around on all cereal crop growth stages. They are often found on the lower portion of the plant, feeding on the undersides of leaves, in the leaf whorl, at the base of hillers and on stems. Colonies generally develop within the furled emerging leaves of tillers (Moran, *et al.*, 1992).

2.2.4 Control

Biological control: the most important aphid predators are predatory bugs, carabid beetles (Carabidae), soldier beetles (Cantharidae), predatory gall midges(Cecidomyiidae), lacewings (Chrysopidae), ladybird beetles (Coccinellidae) ,hoverflies (Syrphidae) & Gnat. In addition, parasitic wasps (parasitoids) and entomopathogenic fungi are often involved in the control of aphid populations. Parasitized aphids can be easily recognized. They turn brown and hard and remain stuck to the plant surface. They are known as "mummies". Avoid use of pesticides toxic to natural enemies. If pesticides must be used, selective bio pesticides that target specific pests should be

preferred to broad-spectrum pesticides (that kill a wide range of insects including natural enemies). It is important to control ants feeding on honeydew produced by aphids. They disturb natural enemies giving protection to the aphids. Ploughing and flooding the field destroy ant colonies and expose eggs and larvae to predators and sunlight, several botanical products have been useful for the control of aphids: water traps, sticky board traps, chilli, ash, castor oil, petroleum oils and insecticidal soaps. Neem extracts can control early infestations of some aphids, but they are not efficient against all aphid species. For a reliable and satisfactory control neem extracts must be applied at an early stage of aphid attack. Usually repeated spot sprays of affected plants are necessary to achieve control. Therefore, test the extract on few plants before going into full scale spraying. Neem products have in general no or low negative effect on natural enemies (Elwell and Maas, 1995).

Chemical control: chemical control has to be applied during the period of overlap between aphid flight and seedling emergence and repeated immediately afterwards for autumn barely and sorghum in the northern hemisphere. In spring it is usually done on sorghum between ear emergence and flowering; delayed sprays are ineffective or uneconomical. Many insecticides are effective on aphids for example, carbamates and pyrethroids but most of them are also harmful to parasitoids and predators. Imidacloprid is very effective on aphids and gives long lasting control, but is not currently registered with Australian Pesticides and Veterinary Medicines Authority for use in cereals. Effective insecticides that are softer on natural enemies such as pymetrozine and pirimicarb are available in Australia. Pirimicarb is registered for use on winter cereals, but pymetrozine is not currently

registered for any broad – acre crop. Seed treatments with systemic insecticides (e.g. imidacloprid) were efficient at preventing autumn infestation within Europe and consequently BYDV spread, this effect was because of the insecticides prolonged persistence in the plants. The long – term consequences on the aphid and is natural enemy populations are not known (Ahmed and Akhtars , 2013).

2.3 Damas

Family combretaceae contains about 20genera and about 600species found in tropical and sub-tropical regions of the world, the family has few genera with great economic value, an useful timber is obtained from some species belong to it and other species have medicinal importance. Conocarpus lancifolius Engle is one of the most important trees in this family (Pandey and Misra, 2008).

2.3.1 Scientific Classification

Kingdom: Plantae

Order: Myrtales

Family: Combrateaceae

Genus: Conocarpus

Species: Ianciflius

2.3.2 Description

Damas is an evergreen tree that grows up to 20m in height and 60-250 cm or more in diameter under favorable climatic condition. However, it is thought that the higher tree have now been almost completely felled .where as it is generally a multi-branched tree in its natural habitat, trees plant in the Sudan

formed single, straight stem (NAS, 1983). Leaves dark green, smooth and shiny, simple lanceolate, Flowers are yellow-green, in round heads on branched stalks, slightly fragrant and it is fruit exist in dry, round, greenish heads, cone-like containing tiny, scale-like hard seeds (Bein *et al*., 1996). Fruit small scale –like 2 winged ,one seeded on cone like –heads overlapping and separating at maturity brown curved and very light (El-Amin,1990).

2.3.3. Distribution

Conocarpus lanafolius a tree species restricted to a small area around the southern red sea coasts is a well-known riverine tree in Somalia. Natural stands of this tree occur in this country and parts of the Arabian Peninsula, and it is cultivated in Djibouti, Yemen, Sudan, and Kenya and recently to more other countries. It is light demanding, tolerates a hot, dry atmosphere. There were some attempts for using Conocarpus in ameliorating salt – affected soils being experimented in Gulf – Arab countries, and Pakistan (Redha *et al*, 2012).

2.3.4 Economic importance

C. lancifolius is multipurpose; wood which is the main product is used domestically for house construction, fire wood and excellent charcoal. Commercially timber was more useful formerly, it was cut and exported from Somalia to Arabia for dhow construction, other potential uses in clued wood based board, bark may be a useful source of tannins (Booth and wickens, 1993).

2.3.5 Chemical construction

Chemical construction of Conocarpus plant revealed that sterols, triterpenes, flavone aglycones, emodols (anthracenosides aglycones), coumarins, coumarin lactone derivatives, tannins (gallic), reducing compounds, anthrocenosides, sterols glycosides, cardenolides, saponins and sapogenins are present in the plant (Jagessar *et al*., 2010).

2.3.6 Uses

Conocarpus was used in its native countries as folk remedy for anemia, catarrh, conjunctivitis, diabetes, diarrhea and fever (Abdurrahman and Gumgumjee; Abdel-Hameed, *et al* ,.2013) reported that methanolic extracts of Conocarpus have a high antioxidant and hepatoprotective properties when tested against mice.

Conocarpus tree is a pioneer species in reforestation projects in its native habitat. Conocarpus is one of the fastest growing trees there, producing large quantities of firewood, also Damas wood used for housing construction. Conocarpus is suitable for stabilizing riverbanks and improving poor, nutrient-deficient soil and also used as ornamental shade trees and windbreaks around irrigated farms (WCMC, 1998).

The trees wood is dense and suitable for charcoal .good fodder for goats and camels as well, so it must be protected when small although the leaves contain tannin. The growing trees there producing large quantities of fire wood it also provides strong poles and timber .Damas is used for fuel (Amina, *et al;* 2011).

2.4 Cafure

2.4.1 Description

Large ever green tree 24-40m high, with stout trunk often short and crooked, crown open and widely spreading irregular. Bark is smooth and white gray. Twigs are long slender, with angled reddish coloured. Leaves are lternate, narrowly lancceolatae about 8-22 long and 1-2cm wide, often curved or sickle – shaped, tapering to a long point, short pointed at base with dull pale green on both surfaces and occasionally grayish . Flowers about 5-10, each on slender stalk (Auxiliary), greenish white in color. Capsules are several, seeds hemiglobose 7-8 long with light brown color .Fruiting January- February. Wood hard, red durable, resistant to termites, used in construction for structural purposes (Thirakul, 1984).

2.4.2 Scientific Classification

Kingdom: Plantae

Order: Myratiflrae

Family: Myrataceae

Genus: Eucalyptus

Species: camaldulesis

2.4.3 Distribution

Eucalyptus camaldulensis Dehn is said to be the most widely distributed eucalyptus it is indigenous to eastern Australia and Tasmania in most of arid and semi – arid region but not the humid western coasts .It is cultivated in

southern Europe and South Africa (Varro *et al*., 1981). Plantation Occurs in Argentina, Egypt, California, Kenya, Morocco, Nigeria, Pakistan, Senegal, Siraleon, Spain, Tanzania, Upper Volta, Uruguay, and Zimbabwe. In Sudan, The species was planted along the banks of the Blue Nile River. However Eucalyptus microtheca is another species planted in the irrigated area of the Gezira Scheme (Duke, 1983).It is readily recognized by the striking characteristic smell of its bark (Thirakul, 1984).

2.4.4 Uses

Volatile oils which are introduced into medical uses contain 55-70% cineol, plus lesser amount of volatile aldehydes (Varro, *et al*,. 1981).In addition, Ethanolic extract from Eucalptus camaldulensis proved to have medical importance. Essential oil from Eucalyptus sp, was used as antibacterial antimicrobial and acaricidal agent. In traditional medicine red gum Eucalyptus is a folk remedy for Colds, Colic, Cough, Diarrhea, Dysentery hemorrhage, Laryngalgia, Laryngitis, Pharyngitis Sorethroat, and Wounds (Atta, and Alkofahi., 1998).

Eucalyptus camaldulensis adapts well to cultivation, though it often grows too large for home gardens. It has been used as a street tree, and is useful in public areas with wet soils. It can grow very quickly in cultivation and flower profusely. It can flower in its third year of growth in cultivation in optimal conditions. Birds are attracted to its flower heads. However, in some years its leaves are infested with leaps and detract from its appearance (Boland; et al 2006). A row of E. camaldulesis was planted at the Royal Botanic Gardens, Sydney in 1813, and the trees are still healthy (Moradshahi, *et al.,* 2003).

The tree is used for firewood and as charcoal in many countries, in erosion control, on sand dunes and as a roadside shade tree in many places, and in Uganda is used to drain swamps. Plantation 15–20 years for poles and 30–60 years for logs for sawing (Smith and James, 1793).

In cultivation, *E. camaldulesis* grows to altitudes of 1,600 meters (5,200 Ft.), withstanding average minimum temperatures of 3 °C (37 °F) and maxima of 35 °C (95 °F). The heartwood is extremely durable and resists marine borers it is used as a round timber for construction of wharves and fencing. The wood is light reddish brown in color and coarse-textured. The weight can vary widely between individuals and stands, averaging 38 pounds per cubic foot (Fairley , *et al.*, 2000).

2.4.5 Chemical constructions

Several species of Eucalyptus were studied for volatile oil production. Ninety different components were separated and most of them identified. (Fadel *et al.*, 1999). Leaves contain 5-11% tannin, while the Kino contains 45% kinotanic acid, wall as Kino red glycoside, catechol and pyrochatechol.Leaves and fruits test positive for flavonoids and sterols. The bark contains 2.5-16% tannin, the wood 2-14%, and the Kino 46.2-76.7% (Watt and Breyer, 1962). Fresh leaves contain about 3-4% volatile oils, which contain the bitter constituents. However yield of essential oil from dried leaves of Eucalyptus camaldulesis grown is Benin was 0.6-1.4%, at which, total of 28 compounds were identified, and the main essential oil was 1.8 Cineol (Eucalyptol), which ranges between 31-75.5%. Leaves contain 0.1-0.4% essential oils, 77% of which is cineol, beside some cuminal, phellandrene, aromadendren, valerylaldehyde, geranoil, cymene, and phellandral (Wallis, 1960).

2.5 Moringa

Moringa is also the common name of a particular species, *Moringa oleifera*.

Moringa, native to parts of Africa and Asia, is the sole genus in the flowering plant family Moringaceae. The name is derived from the Tamil word murungai which refer to *M. oleifera*. It contains 13 species from tropical and subtropical climates that range in size from tiny herbs to massive trees. The most widely cultivated species is Moeinga oleifera , a multipurpose. Tree native to the foot hills of the Himalayas in north western India and cultivated throughout the tropics. *M.stenopetala,* an African, is also widely grown, but to a much lesser extent than *M. oleifera* Moringa grows quickly in many types of environment.(Brawn,2003),

2.5.1 Scientific classification

Kingdom: Plantae

Order: Brassicales

Family: Moringaceae

Genus: Moringa

Species:oleifera

2.5.2 Description

with drooping branches ;branches and stems brittle ,with corky bark; leaves feathery ,pale green, compound, trip innate ,30-60cm long, with many small leaflets, 1.3-2 cm long, 0.6-0.3 cm wide, lateral ones somewhat elliptic, terminal one obviate and slightly larger than the lateral ones; flowers

fragrant , white or creamy –white, 2.5 cm in diameter, borne in sprays ;with 5 at the top of the flower ;stamens yellow ; pods pendulous , brown , triangular, splitting lengthwise into 3 parts when dry, 39-120 cm long , 1.8 cm wide, containing about 20 seeds embedded in the pith, pod tapering at both ends, 9- ribbed; seeds dark brown , with 3 papery wings .Main thick . Fruit production in March and April in sir Lanka (Gamal, 2004).

2.5.3 Nutrition

Much of the plant is edible by humans or by farm animals .The leaves are rich in protein, vitamin A, vitamin B, vitamin C and minerals. One hundred grams of fresh Moringa leaves have:2 times the protein of 100g yogurt (Moringa 8.3 g , yogurt 3.8 g);4times the calcium of 100 g milk (Moringa 434 mg , whole cow milk 120 mg); the same potassium as 100 g banana (Moringa 404 mg banana 376 mg); the same vitamin A of 100 g carrot (Moringa 738ug , carrot 713 up);3 times the vitamin C of 100 g orange (Moringa 164 mg , orange 46.9 mg).Feeding the high protein leaves to cattle has been shown to increase weight gain by up to 32% and milk production by 43 to 65%. The seeds contain 30 to 40% oil that is high in oleic acid, while degreased meal is 61% protein. The defatted meal is a flocculated can be used in water purification to settle out sediments and undesirable organisms (Gamal and Mohamed, 2002).

CHAPTER THREE

Materials and methods

3-1 Materials

1. Plastic cups

2. Rubber bands

3. Mushin

4. Brunch (1-15 mm)

5. Scissor

6. Labels papers

7. Plant extracts (plate 2)

3.2. Methodology

3.2.1 Collection of plant materials

Leaves of three plants were collected from agricultural areas of Shambat (College of Agricultural Studies-farm). The three plants were moringa (*Moringa oleifera*), damas(*Conocarpus lancifolius*),and kaphor(*Eucalyptus camaldulens*). (plate 2and 3).

3.2.2. Insect culturing

Adult of R. maidis were attained from laboratory of Entomology - College of Agricultural Studies. (Plate 1).Insect rearing were continue inside a plastic container under room temperature until the time of the experiment.

3.2.4 Methods of experiment

The ethanolic extracts of the three plants (moringa, damas, cafure) were used. Sorghum leaves were treated with three different concentrations (10%, 20%, and 30%) of each plant extract then was placed in plastic petri dishes (9cm). Ten adults of R. maidis were added to the treated leaves of each petri dishes.

As control same numbers of insects were added to some petri dishes contains sorghum without ethanol extract.

All the used plastic dishes in the experiment were covered with sterilized muslin which tied closely with a rubber band. The experiment was conducted in three replicates.

Data was recorded by counting the mortality of insect adult after 24hours and 48hours.

Plate (1): Sorghum aphid *R.maidis*

a) DAMAS b) CAFUER c) MORINGA

Plate (2): Dried Leaves of the three tested plants

Plate (3): Leave powder of the three tested plants

3.2.5 Data analysis

The experiment was conducted in completely Randomize Design (CRD). Data were analyzed using statistical Analysis Software (SAS). Comparison between means calculated using Duncan Multiple Range Test (DMRT).

CHAPTER FOUR

RESULTS AND DISCUTION

The effect of three ethanolic extracts on adult mortality of *R. maidis* after 24h was shown in figure (1). Results showed that, insect mortality percentages was more affected by sorghum leaves treated with cafure at concentration 20%,where higher mortality was achieved, while leaves treated with moringa showed lower infection at all concentrations.

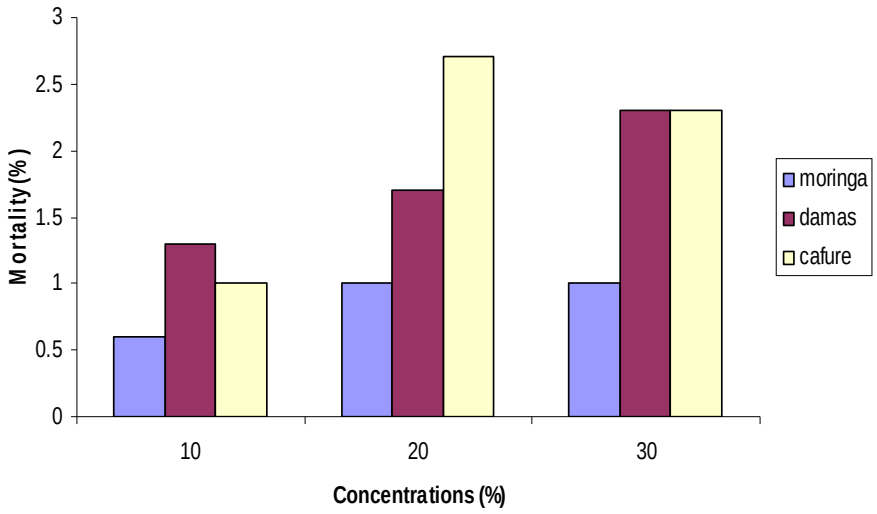

Figure (1) The effect of three different plants ethanolic extracts on Mortality of *R.maidis* after 24h of treatment.

Table (1). The effect of three different plants ethanolic extracts on Mortality of *R.maidis* after 24h of treatment.

Treatments (concentrations)	Adult mortality		
	Maringa	Damas	Cafure
10%	0.6^{cd}	1.3^{abcd}	1.0^{bcd}
20%	1.0^{bcd}	1.7^{abc}	2.7^{a}
30%	1.0^{bcd}	2.3^{ab}	2.3^{ab}

C.V% = 51.0 SE= ±0.7

From table (1) it was clear that, no significant difference was noticed for insect mortality percentages that achieved at concentration 30% and 20% for both cafure and damas.

All concentrations of moringa achieved mortality percentages significantly not different from that achieved by control and damas and cafure at 10%.

For more details see ANOVA table in appendix (A).

As seen in figure (2) and table (2), the results after 48h showed that insect mortality percentages affected more by sorghum leaves treated with concentration 30% of cafure where higher mortality was attained. However, it was more significantly different from other concentrations for cafure and the two other plants.

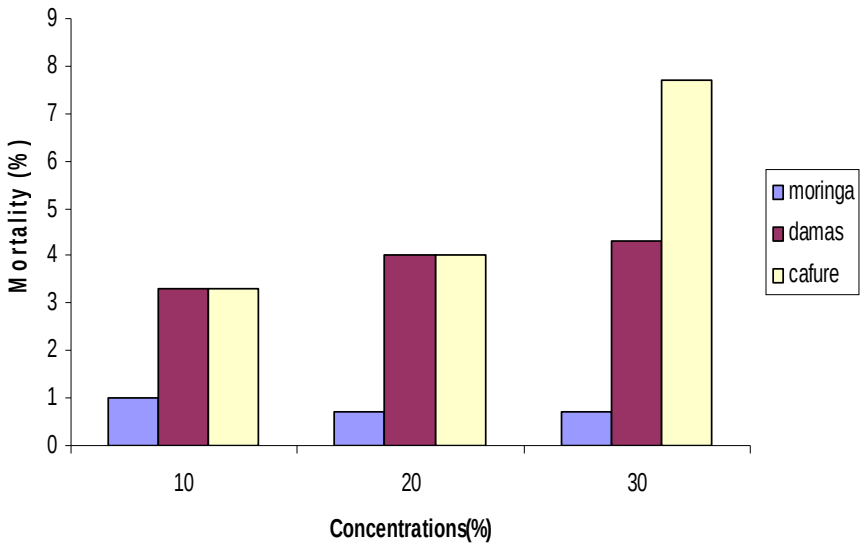

Figure (2) the effect of three different plants ethanolic extracts on Mortality of *R.maidis* after 48h of treatment.

Also all the concentrations of moringa after 48 hours of treatment, showed lower infection of mortality, same as the effect after 24 h.

No significant different was observed of the effect on mortality that obtained by damas (10, 20, and 30%) and that obtained by cafure at concentrations 10 and 20%.

Lower percentages of mortality were obtained by concentrations of moringa which were significantly not different from the control.

For more details see ANOVA table in appendix (B).

Table (2). The effect of three different plants ethanolic extracts on mortality *R.maidis* after 48h of treatment.

Treatments (concentrations)	Adult mortality		
	Maringa	Damas	Cafure
10%	1.0^{c}	3.3^{b}	3.3^{b}
20%	0.7^{c}	4.0^{b}	4.0^{b}
30%	0.7^{c}	4.3^{b}	7.7^{a}

C.V% = 23.8 SE= ±0.6

Means followed by the same letters were significantly not different from each other's.

From the above results it was clear that the concentration 30% of cafure ethanolic extract was obtained the maximum adult mortality which means it can be considered as effective natural plant for controlling *R.maidis* compared to other plants, the results agree with Abdalla (2009) who found that, the ethanolic extract of cafure (Eucalyptus) had the greatest mortality against khapra beetle larvae (*Trogoderma granarium*).

Damas plant obtained good results against mortality and that agree with Omer (2014) who used the powder, aqueous and ethanolic extracts of Damas (*Conocarpus lancifolius*) on red flour beetle (*Tribolium castaneum*).

Conclusion and recommendations

Form the result it was concluded that, ethanolic extracts of cafure plant was the pest in controlling sorghum aphid at concentration 30%. Damas plants also effective when the times of treatment increase.

It can be recommended that:

- Cafure have to be used at 30% after 48 hours of treatment to control sorghum aphid.
- The time for treatment must be increase for damas concentrations (20 and 30%).
- More research studies have to be done for the plant moringa and its effect against the insect.

REFFRENCES

Abdurrahman, S. H. and Gumgumjee, N. M. (2013). Antibacterial Efficiency and DNA Impairment unveil in Some Bacteria Strains Treated with *Conocarpus erectus* L. E. *Extracts. International J. Appl. Biol. and Pharmacol. Technol.,* 4(4): 37- 47.

Adenle v.o and KE. (2000) Seed transmission of *peronosclerospora sorghi* causal agent of sorghum downy mildew in Nigeria.*Plant pathology*, 49:628-634

Al-jamaan , S . M; (2008). Response of Conocarpus Tree growth to Treatment of Irrigation , running and paclo thesis plant production Department , College of food and Agricultural Sciences king Saud University.

Ahmed M, K Akhtars. (2013). Development of insecticide resistance in filed population of bervicoyne brassiere (Homoptera aphididae) in Pakistan. *Journal of Economic Entomology* 106: 954 – 958.

Amina R, AL-Mansour M, Suleiman P , afzal , M , R . Al-Has an (2011): leaf Traits and hist – chemistry of Trichomes of Conocarpus lancifolius acombretaceae in semi – Arid conditions. *American Journal of plant Science's* 165-174

Anaso AB (1989). Survival of anthracnose of sorghum in Nigerian Guinea

Savanna. *Applied Agricultural Research,* 4: 258-263.

Anahosur KH, Patil SH (1980) Chemical control sorghum downy mildow in India.Plant Diseases,64:1004-1006.

Atta, A. H.; Alkofahi, A. (1998). Anti-nociceptive and anti-inflammatory effect of some Jordanian medical extracts. *Journal of Ethnopharmacology*-2,117-124.

Avinent L.A, Hermosa de Mendoza, and G. Liacer, 1991 comparison of traps for capture of alate aphids(Homoptera– Aphidinea) in apricot tree or chards agronomies 11:013- 618

Barkworth, M, 2003. Sorghum Moench, In: flora of North America Vol 25 Magoliophyta: commelinidae (in part): Poaceae, part 2 . Oxford. P. 626 - 630

Bender, D, A and E Bender 2005 A Pictionary of food and nutrition – New York Oxford Univ – press ISNN.

Bein, E., Habte, B., Jabber, A., Britta, A. and Tengnas, B. (1996)**.** Useful tree and shrubs in Eritrea. Identification, propagation and management for Agricultural and pastoral communities. *Regional Soil Conservation Unit (RSCU), Nairobi, Kenya.* pp. 148.

Blaney, B. 2008. Sweet sorghum's sap good for ethanol. Associated Press.

May 14, 2008. Retrieved February 24, 2009.

Bigger. J. H 1958 Damage to the corn crop by the corn leaf aphid pro. N: cent Br. Entomic. Soc. Am 13-19

Boland, D. J.; et al. (2006) [1984]. Forest Trees of Australia (4th Ed.). Collingwood, Victoria: CSIRO Publishing. p. 298. ISBN 0-643-06969-0.

Booth, F.E.M. and Wickens, G.E. (1993). Non-timber uses of selected arid zone tree and shrubs in Africa. FAW, Rome, Italy. Pp. 46-50.

Brawn,M, Burgstaller,H, Hamdoun.,A, and Wallter,H. (2003).Common weeds of central sudan.P .105.

Delserone, L. M. 2007. Sorghum. J of Agric and Food Information 8:9- 14.

Duke, J.A.(1983). The gene revolution in: 0ffice of technology assement, Innovative biological technologies for lesser developed countries SGPO, Washington. Paper 1:89-150.

Elwell, H., Maas, A. (1995): Natural Pest & Disease Control. Nature Farming Network,Zimbabwe. ISBN: 0-7974-1429-0

FAO, (1995). Food and agricultural organization of the United Nations, Sorghum and millets human nutrition: Chapter 1 Introduced

On – FAO coppered repository – retrieved February 23.2009

Fairley, Alan; Moore, Philip (2000). Native Plants of the Sydney District: An Identification Guide (2nd ed.). Kent Hurst, NSW: Kangaroo Press. p. 210. ISBN 0-7318-1031-7.

Fadel, H.,Marx.,F.,El-sawy. A and Ghorab, A. (1999). Effect of extraction techniques on the chemical composition and antioxidant activity of Eucalyptus camaldulesis (Dehn). Brevirostris leaf oils. volume 208 (3):212-216

Fonseca R..L V F (1984) Cruz, carvalho if, Souza 13 (2004) resistance of sorghum genotypes to the corn leaf aphid *Rhopalosiphum maidis* (firth 1858)

Food Security Department (FSD). 2007. Chapter VII Sorghum: Post-harvest Operations. 1. Introduction. In INPhO (Information Network on Post-Harvest Operations), Compendium on Post-harvest Operations. Retrieved February 23, 2009.

Gamal, E. B., Awatif A. B, and A beer, A. D. (2004). Aromatic plant of the Sudan P. 133.

Gamal, E. B., and Mohamed A . M. (2000). Bibliography of Sudanese medicinal plant .P. 57.

Gordon, W.B., and D.A. Whitney. 1995. Starters bump sorghum yields 18 percent. Fluid J. 3:11-13.

Hassan, S.A. (1992). Guideline of the side-effect of plant protection product on *Trichogrammachilonis.* In: Guideline for Testing the Effect of Pesticides on Beneficial Organism, (ED) Hassan, S.A. IOBC/ WPRS Bullet. 15 (3): , 19-39.

Harris, K. M. (1984) the sorghum midge. A review of publisher information University College Station, USA: patansheru, A. P., 502324 India :(ICRISAT).

Herbst, S.T. 2001. The New Food Lover's Companion: Comprehensive Definitions of Nearly 6,000 Food, Drink, and Culinary Terms. Barron's Cooking Guide. Hauppauge, NY: Barron's Educational Series. ISBN 0764112589.

Hill, D. S. 1983. Agricultural insect pests of tropics and their control university press: Cambridge (746).

Jagessar, A.; Raymond, C. and Cox, M. (2010). Phytochemical screening of the CH CL_3 and CH_3CH_2OH extract of stems, twigs, roots and barks of *Conocarpus erectus* L. Int. J. Acad. Res., 2 (5): p.36

Jotwani, M. G. (1978). Investigation on Insect pests sorghum and millets with special reference to host plant resistance. Final Technical Report (1972 -1977). Research Bulletin of Division of Entomology.

New Delhi , India Agricultural Istitute. 114 pp.

Kuckarek, T – 1992 Foliar and need diseases of sorghum in Florida – circular 1073, Florida coop – Ext – serve, Gainesville.

Mohammed, N., A., Ahmed, I., A., M., and Babiker, E., E. Nutritional evaluation of sorghum flour (*Sorghum bicolor L. Moench*) during processing of injera. (2010). *Intl J Bio & Life Sci.* 6;*1*:35-39.

Minls AK, Harrewijn p. (Eds) (1987) aphids = their biology, natural enemies and control, Elsevier New York

Moran, N – A (1992) – The evolution of aphid life cycles – Annual review of entomology, 37, 321 – 348

Morton, J. F. (1981) Atlas of medicinal plants of middle America. Bahamas, to Yucayan C.C.Thomas, Spring field, IL

Moradshahi, A; Ghadiri, H; Ebrahimikia, F.,2003. Allelopathic effects of crude volatile oil and aqueous extracts of Eucalyptus camaldulensis Dehuh. *Leaves on crop and weed Allelopathy Journal* 12, 189 – 195.

NAS ,(1983) .National Academy of Science . Firewood crops, shrub and tree

species for energy production, Academy of Science.Washington, D.C., pp58.

Pandey, S.N. and Misara, S.P. (2008). Taxonomy of Angiospers. Ane Books Pvt., Darya Ganj, New Delhi. Pp438-440.

Redha, A.P Suleman, R Al- Hasan and M Afzal (b). 2012, Responses of Conocarpus lancifolius to envirenmental stress: a case in the semi-arid land of Kuwait International Journal of *Experimental Botany*. FYTONISSN 0031 9457(2012) 81:181- 190.

Shoemaker . C. E and D .L . Brans by . 2010 . The role sorghum as a bio energy feedstock . In : R . Branm , D . Karlen , and D . Johnson, editors , sustainable

Skolmen, Roger G. (1972). "Specific Gravity Variation in Robusta Eucalyptus Grown in Hawaii" (PDF). USDA Forest Research Paper (78): 1–7.

Smith, James Edward (1793). A Specimen of the Botany of New Holland. London: James Sowerby.

Thirakul, S. (1984). Manual of Dendrology. Canada Internationa Development Agency (CIDA) Forest Inventory and Market Denand survey project, Bahr EL GHAZAL and *Central Regions, Democratic Republic of Sudan.*

Varro, E. Tyler, L., Brady R. And Robber, Eucalyptus. (1981). Pharmacology 8th edition, lea and Fibiger, philadophia: pp 108 – 141.

Wallis, T. E. (1960) Text book of pharmacognosy 4th edition, codon, published by A and J Cher chill ltd pp 472 – 552.

Watt. J. M., and M.G., Breyer (1962). The medicinae and poisonous plant of Southern and Eastern Africa Tropical Science, 28 (2):119 – 122.

WCMC, (1998).World Conservation Monitoring Centre. *Conocarpus lancifolius*. In:IUCN Red List of Threatened Species. Version 2013.1. <www.iucnredlist.org>.

Appendices

Appendix (A): Analysis of variance output for the effect of ethanolic plant Extracts on mortality of sorghum aphid after 24h of treatment.

Source of variation	D.F	S.S	M.S	Computed F	P>F
Treatment	11	20.00	1.8	3.56*	0.0084
Error	18	9.2	0.51		
Total	29	29.2			

Appendix (B): Analysis of variance output for the effect of ethanolic plant Extracts on mortality of sorghum aphid after 48h of treatment.

Source of variation	D.F	S.S	M.S	Computed F	P>F
Treatment	11	150.1	13.6	2.8*	0.0001
Error	18	8.6	0.48		
Total	29				