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Insecticidal Property of Extracts of Seeds of Annonasquamosa on the Triboliumcastaneum(Herbst,1797)

KEYWORDS: Triboliumcastaneum, Annonasquamosa

Patil Dipti R.
Department of zoology Dr.BabasahebAmbedkar Marathwada University Aurangabad

Dr. S.P.Zambare
Department of zoology Dr.BabasahebAmbedkar Marathwada University, Aurangabad

ABSTRACT *Extracts from seeds of Annonasquamosa were tested against 6th instar larvae of the Tribolium castaneum.100% mortality was observed after treatment with chloroform extract at 1.6ml/kg wheat while 96.6±0.05larvicidal effect was observed after treatment with methanol extract at the same dose while adult were not emerged from those pupated.Only 53.3±0.05and 36.6±0.05 larval mortality was recorded in acetone and ethanol extract respectively and from the remaining pupated,23.4±0.10 and 43.4±0.15 adult emerge.Those treated at lower doses and having some adult emergence, most were having abnormalities.The chloroform and methanol extract can be used to control the infestation of the rust red flour beetle,Triboliumcastaneum*

Introduction:-

According to FAO 10 to 25% of world harvested foodIs destroyed annually by insect and rodent pest (Anonymous,1980). Stored food graindamageby Infestation of insects range from 5-30% ofworldtotalagriculturalproduction. This insect pest infestation causes losses in quantity and quality of food commodities and changesits chemical composition reducing nutritive value of theproduce (Howe, 1965; Swaminathan, 1977; Scott, 1991). Approximately onethird ofthe global food productionisdestroyedannuallybyfieldand the storage pest (Ahmed et.al.1984) and most of the insect occurring in stored food (Korunic, 1998,field andKorunic,2000;Arnaudet.Al. 2005).Wheat suffer heavy losses during the storage due to the insect pest. Storage losses have been reportedsignificantly 6%per annum.3.6-25.5,4-10% and 1-23% weight loss of wheat due to insect pest.

TheTriboliumcastaneumis one of the most destructive pest throughout theworld(Pronoto,et. al.,1991).Triboliumcastaneum feeding on different stored grain and grain products (Weston andRettlingourd,2000;Mishra et.al.,2012a;0212b) is generally found in the granaries,mills,warehouses and live on cracked grain, breakfast food or meal, rice,wheat,dried fruit, bleached and unbleached wheat flour, cornmeal, barley flour,oatmeal (Chittenden,1987)and other processed cereals,kernels already broken or damaged by other pest (Apert,1987).

Chemical control of insect in storage food has been used for a long time, but it has a very serious drawbacks (Sharby,1988).Thecontinuous use of chemical pesticide has given risk to many serious problems, including genetic resistance of pest species ,toxic residues,increasing cost of application, environmental pollution,hazardsfromhandling etc.(Ahmed,et.al.1981;Khanam,et.al.,1990).

There is a need for safe but effective biodegradable pesticides with no toxiceffectonnon- target organism.Throughout theworld the new trend is to use biopesticides for insect pest control in storageof cereals(Rizvi,et.al.,2001). Locally available plant material have been widely used in the pest control to protect stored produce against damage by insect infestation (Goloband Webley,1980).The main advantage of botanicals is thatthey are easily produced byfarmers,small scale industries and potentially less expensive. Among the meditationalplant,several locally available species has been reported to be repellentand toxic to Triboliumcastaneum(Sighmony,et.al.,1984;Obengofori,et.al.,1998;Golob,et.al.,1999;Mareggiani,et.al.,2000;Nikkon,et.al.,2009;Suthisut,et.al.,2011).

In the present study Annonasquamosa has been selected as one of the safer substitutes to control the stored pest Triboliumcastaneum.

Materials and Methods:-

Initial stock of Triboliumcastenumwas obtained from infested wheat grain bought from local marketin Aurangabad and was reared in a plastic jar of 10kg capacity covered with muslin cloth to ensure ventilationin the laboratory. The grains were sterilized at 60˚C for24hours inanoven. A standard mixture of whole wheat grain with 5% powdered dry yeast was used as food medium throughout the experimental periodwith 70-75% relative humidity. Mature6th instarlarvae were selected for present study.

Preparation ofplant extract:-

The seeds of Annonasquamosawere collected from the local market of Aurangabad and were washed with distilled water and dried in the shade and then oven for sterilization at 45^0c.The dried seeds were powdered with the help of the grinder.Thepowder of seedswaspacked in the filter paper and extract was extracted in soxhletapparatus in 1:10 ratio i.e.20gm of seed powder in 200ml solvent.After eight hours of continuousextraction the final extract was kept open to evaporate the solvent and remaining as a stock solution extract was stored in a refrigeratorat 4^0c temperaturewith proper labeling .Theextractswere extracted in chloroform, acetone, methanol and ethanol separately.

The seed extract of Annonasquamosa in each solventwasseparately mixed with 25gm of crushed wheat grains at 0.4,0.8,1.2 and 1.6ml/kgconcentration andwere placed into 250gms plastic bottles then five male and five femaleTriboliumcastaneum6^{th} instarslarvae were placed into the plastic bottles and covered with a piece of muslin cloth, tied with rubber band to prevent escape. The experiment was conducted under the laboratory environmentasmentionabove. The percentage of larvalmortality,pupation,pupalmortalitya

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nd number of adult emerged were recorded. The morphological abnormalities of the treated live larvae were recorded in eachgroup. The abnormal individual wasseparated and the deformed character wasstudied.

Observation and results:-
The larvae were treated with the high dose of extracts hadreduced body size and showedincomplete metamorphosis.

No any mortality occurred in the larvae feedon controldiet. Larval mortality was increased withincreasedconcentration of seed extract of ***Annonasquamosa.***In seed extract of ***Annonasquamosa*** in chloroform at 0.4mlconcentration, 26.6±0.10% larval mortality was recorded whereas atthe 1.6ml concentration 100% mortality was recorded. With the increase inthe concentration, asignificant reduction in pupation and adult emergence was observed. Pupation was 73.4±0.10% at0.4ml concentration which decreases to 16.7±0.05% at 1.2mlconcentration of ***Annonasquamosa.***At 1.6mlconcentrationof extract 100% pupalmortalitywas observed. Inmethanol extract at 0.4ml concentration larval mortality was recorded as 23.3±0.06% while 96.6±0.05% larval mortality was recorded at 1.6ml concentration of ***Annonasquamosa*** .As the concentration increased, a significant reduction in pupation and adult emergence was observed in methanol extract. Pupation was 76.7±0.06%in0.4ml concentrationwhich decreased to 3.4±0.05% at 1.6ml concentration of ***Annonasquamosa.*** so correspondingly no adult emergenceswererecorded at 1.6ml concentration of***Annonasquamosa***because pupalmortality increased insignificantly with increase of the concentration. At 0.4ml concentration, 13.3±0.06% pupalmortality which increased to 100% at 1.6ml concentration of ***Annonasquamosa***in methanolextractsno adult emergence.

The present investigation showed that the effect of different dose levelof***Annonasquamosa***seed extractinchloroform and methanol on the larval,pupaland adult stages of the ***Triboliumcastaneum***.As the concentration increased a significant reduction in pupation and adult emergence was observed (Table 1) Body become paralyzed, black colourand blackskin, reducedbody sized, shrinkagebody segment. Microscopic examination of the dead larvae of the ***Triboliumcastaneum*** revealed that the extract has penetrated into larval digestive system.The treated larvae showed the curling up, vigorousbody movement which are the characteristic of the neurotoxicity.

The chloroformand methanol extract showed the highest mortality of larvae and pupa as compared with the acetone and ethanol extract.

Discussion:-
Theseeds of***Annonasquamosa***werereportedto haveinsecticidal properties.The pure compound annotemoyin-1 isolated from the chloroformextract of seeds of***Annonasquamosa***Linnwas evaluatedforitspesticidalactivityagainst bothadultanddifferentinstars of ***Triboliumcastaneum.***Alkaloids isolatedfrom custard apple showed larvicidal, growth regulating and chemosterilant activities against***Anophelesstephansi*** (Saxena et al., 1993).

The seeds contain chemicalsknown as acetogenins, which are toxic to insects.Vyas et al. (1999) reported that methanol extract from defatted seeds caused highest percent larval mortality against ***Spodopteralitura, Helicoverpaarmigera***and***Eariasvitella***.SantoshBabu etal. (1996) reported that chloroform extract from seeds showed high feeding deterrence against ***Longitarsusnigripennis***. Extracts from A. squamosakernel have shown pesticidalproperties for a range of insect pests like ***Chilopertellus***(Swinhoe), ***Nilaparvatalugens*** (Stal.), ***Spodopteralitura*** (Fabr.) and***D. koenigii***(F.) (Babuet al.1998, Bhagwan et al.1992,Hirenath, 1997).

It was also effective against stored grain pests like ***Callosobruchuschinensis***, R. ***dominica, S. oryzae, T. castaneun and C. cephalonica*** (Staint.) (Khalequzzaman and Sultana,2006). Larval stages are more susceptible than adult stage (Rehmanet.al.2005), ***Annona***seed oil prolong the larval and pupalperiods and reduced larval, pupaland adult weight ***Tribolium*** (Mondal et.al.1989; Khanamet.al.1990; Rahman,1992; Malekand Wilkins,1995). (Khalequzzamanand Sultana) reported the toxic effect of petroleum ether extract of***Annonasquamosa*** seed on***Triboliumcastaneum.***

Conclusion:-
The seed extract ofAnnonasquamosa have potential as grain protectants. Their extract in chloroform hasstrong insecticidal effect against Triboliumcastaneum. These plants have arange of chemicals which can be isolated and used for pest control.

In the investigation it may be conclude that seed extract ofAnnonasquamosal in chloroform can be used to control the Infestation ofTriboliumcastaneum in wheat.

Table 1:Efficacyof seed extract of***Annonasquamosa***in chloroform, Acetone, Methanol and Ethanol solvents against larval to adult mortality of ***Triboliumcastaneum*****.**

Solvent	Conc. of extract in ml/kg of wheat	Larval mortality (%)	Pupation (%)	Pupal mortality (%)	Adult emergence (%)
Chloroform	Control	0	100	0	100
	0.4	26.6±0.10	73.4±0.10	13.3±0.06	60.1±0.06
	0.8	43.3±0.05	60.0±0.10	16.6±0.05	43.3±0.15
	1.2	83.3±0.05	16.7±0.05	0	16.7±0.05
	1.6	100	0	0	0
Acetone	Control	0	100	0	100
	0.4	16.6±0.05	83.4±0.06	13.3±0.06	70.1±0.10
	0.8	30.0±0.10	70.0±0.10	13.3±0.06	56.7±0.15
	1.2	40.0±0.10	60.0±0.10	16.6±0.05	36.6±0.05
	1.6	53.3±0.05	46.7±0.05	23.3±0.05	23.4±0.10
Methanol	Control	0	100	0	100
	0.4	23.3±0.06	76.7±0.06	13.3±0.06	63.4±0.05
	0.8	66.6±0.06	33.4±0.05	13.3±0.05	20.1±0.15
	1.2	93.3±0.05	16.7±0.06	0	16.7±0.06
	1.6	96.6±0.05	3.4±0.05	0	0
Ethanol	Control	0	100	0	100
	0.4	0	100	0	100
	0.8	13.3±0.06	86.7±0.06	0	86.7±0.06
	1.2	26.6±0.05	73.4±0.10	13.3±0.05	60.1±0.10
	1.6	36.6±0.05	63.4±0.05	20.0±0.10	43.4±0.15

±Standared Deviation

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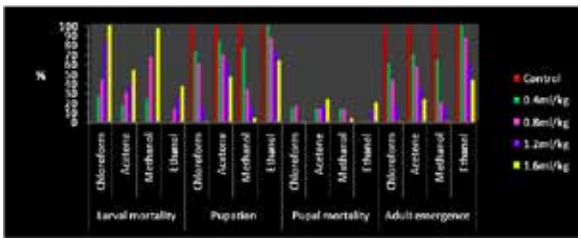

Figure 1:Efficacyof seed extract of*Annonasquamosa*in chloroform, Acetone,Methanoland Ethanol solvents against larval to adult mortality of *Triboliumcastaneum*.

(a) (b)

Figure 2: Control (a) larvae, (b) Male and, (c) Female of Triboliumcastaneum

(a)

(b)

(a)

(b)

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Figure 3: Larvaeof T.*T.castaneum*after**Figure 4** Adult of *T.castaneum* emerged

treatment with seed extract of ***A.squamosa***after treatment with seed extract of ***A.***

in chloroform(a) and methanol (b)solvent ***squamosa*** in chloroform (a) and methanol

(b) solvent

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