Evaluating the potential of some plant extracts along with new chemistry insecticides thiamethoxam and emamectin benzoate against *Cryptolestes ferrugineus*

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Abstract- Acetone extracts of plants Azadiarachta indica (neem), Citrullus colocynthus (Tuma), Moringa oleifera and new chemistry insecticides emamectin benzoate and thiamethoxam at a concentration of 5 %, 10 %, and 15 % were evaluated for their repellent and mortality effect against Cryptolestes ferrugineus. The results showed that maximum percent repellency (90%) was achieved in plant extract of Azadiarachta indica at a concentration of 5 % after an interval of 72 hours, while minimum percent repellency (3.03%) was recorded in plant extract Moringa oleifera after an interval of 72 hours at a concentration of 15%. Maximum mean mortality (78.43 %) was recorded in Thiamethoxam at 15% concentration after an interval of 72 hours and minimum mean mortality (5.08 %) was recorded in plant Moringa oleifera after an interval of 24 hours at 5 % concentration. From these results it was concluded that plant extracts are more effective as repellent while new chemistry insecticides had high toxic effects as compared to plant extracts against Cryptolestes ferrugineus

Index Terms- Azadiarachta indica, Citrullus colocynthus, new chemistry insecticides, Cryptolestes ferrugineus

I. INTRODUCTION

Food security is emerging threat to world expanding population. Food security and food safety cannot be achieved without safe storage of products. There are many reasons of storage losses. Among these insects and pests of stored products are important such as *Cryptolestes ferrugineus*. These insects cause quantitative as well as qualitative losses in stored grains (Upadhyay and Ahmad, 2011). In Pakistan, wheat is staple food of people which is lost 10-15 percent during storage. These losses are increasing over time due to unavailability of proper facilities and mass household storage. Furthermore wheat cannot be directly treated with insecticides due to their residual effects because these effects are dangerous for human consumption (Koul, 2008). But we cannot completely escape from chemicals due to their abrupt killing and availability. There are two reasons of their residual and harmful effects, like high toxicity and no biodegradable properties of pesticides (Isman and Machial, 2006).

To avoid these storage losses and residual effects of pesticides, it is need of hour to combat insects with the organic methods. Discovery of "Green Pesticides" brought immense revolution. It readily contributes in reducing insect pest population and on the other hand it increase food production and commercialization of natural products as green pesticides is a striking and gainful recreation. For stored grains insects, Plant extracts have active compounds against many insects (Kabera, 2004). The plant extracts and their byproducts are well known for the organic control of many insects (Nawrot and Harmatha, 1994; Adam *et al*., 1998). Among the diversity of subsidizing factors, insect pests are playing the vital role (Jillani, 1981). It is evident that plant extracts have enormous compounds that show antifeedant, hideous, sterilization and lethal effects in insects; Isman, 2006).

The toxicity of insecticides may be by contact or through fumigant action, But the toxicity of essential oils has sharpened since the 1980s therefore there are many appraisals which are dealing with the use of plant products in as pesticides against insect pests of stored products (Lale, 1995; Golob and Gudrups, 1999; Weaver and Subramanyam, 2000). Now a day's use of plant products as pesticides is evolving a leading role in the field of agriculture. It also protect environment from the lethal effects (Prakash and Rao, 1997).

United States Department of Agriculture (USDA) determines that the residual efficacy of currently marketed and potentially new chemistry insecticide like thiamethoxam. Several concentrations of the thiamethoxam are tested under long term field conditions. The results were reported to the U.S. Environmental Protection Agency (EPA) for registration purposes (Kard, 1999).

Emamectin benzoate show very lethal effects against salmon louse when it is applied to its different stages (Lees *et al*., 2008).

II. MATERIALS AND METHODS

A. Collection of Insects:

Adult insects of flat Grain Beetle, *Cryptolestes ferrugineus* were collected from godowns of Punjab Food Department and market located in Layyah. All these population was pooled together to make one sample and was kept in the laboratory for two month.

B. Rearing of Insects:

The culture of *Cryptolestes ferrugineus* was maintained in an incubator on wheat flour + yeast medium at 30 °C ± 2 and 70 ± 5 % R.H. The wheat flour was sterilized at 100 °C for half an hour.

The mixture of wheat flour and yeast were placed in glass jars having a capacity of half kilogram. The adult beetles were released on the medium (flour + yeast) in the jars. The mouth of jars was covered with muslin cloth so that to avoid insect escape. After five days adults were separated from wheat and the grains containing eggs were kept again in the incubator to get another generation.

C. Collection of plant material:

Fresh leaves of *Azadirachta indica and Moringa oleifera* were collected from the gardens which are located in Faisalabad whereas fruit of *Citrullus colocynthis* were used for the preparation of extracts.

D. Preparation of plant extracts:

The leaves of these plant materials were dried to remove moisture and then ground to make powder. Plant extracts were prepared in acetone at 1:2 respectively and placed at rotary shaker for 24 hours at 220 rpm. The plant extracts were sieve out with the help of muslin cloth and placed in 250 ml flask for further use. The concentrations of 5%, 10% and 15% of each plant extract were prepared by further dilution with acetone at 1:2 respectively.

E. Bioassay for % Mortality:

The experiment was carried in 80 mm Petri dishes and Whatmans filter paper was used for bioassay. Different concentrations of plant extracts and new chemistry insecticides were applied on the filter paper and then the filter paper was allowed to get dry. Twenty adults of test specimen were released in the each Petri dish. Mortality rate of the adults were recorded three times after equal intervals of 24 h. After this time interval and concentration effect was checked for mortality and repellency.

F. Repellence Tests on Filter Paper:

To check the repellent effect of different extracts and new chemistry insecticides against *Cryptolestes ferrugineus* was carried out using area preference method. The filter paper of 9 cm diameter was cut in two equal parts. Three concentrations of 5, 10, an15% of extract were used. 100 micro liter of each extract was applied to a half cut filter paper disk. The remaining part of filter paper was treated with acetone and was used as control. Filter paper was dried for 10 minutes. Both treated and untreated part of the filter paper was placed in Petri dish. Twenty insects were released in the center of each Petri dish. There were three replications for each treatment and the number of insects on both halves was counted after 24, 48 and 72 h.

G. Statistical Analysis

After the completion of the experiment the recorded data was analyzed using statistical software and the corrected mortality was measured using Abbotts formula.

$Pt = \{(Po - Pc)/100 - Pc)*100\}$

Pt = corrected mortality

Po = observed mortality

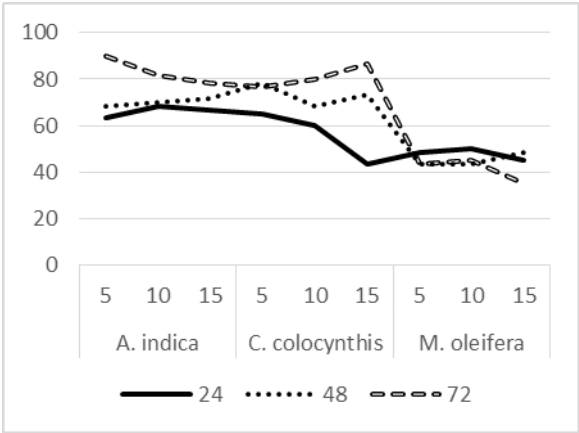
Pc = control mortality

The data was analyzed using CRD and Tuckey's w-honestly significant difference (Tuckey-HSD) test for multiple comparisons of the means. STATISTICA 6.1 software is used for the analysis of all data.

III. RESULTS AND DISCUSSION

Repellency results showed that at higher concentrations C. *colocynthis* was most effective and caused the maximum repellency of 86.66% at the time interval of 72 hours, while at other concentrations the repellency did not show much variation. In case of *A. indica* maximum repellency was recorded in treatments where 5 % concentration was applied and the test insect was exposed for 72 hours, while in other two concentrations the test insect was also repelled. *M. oleifera* did not show much potential of repellence as shown in the Fig1.

Fig 1: Showing Combine effect of time interval and concentrations of *A.indica, C.colocynthis* and *M.oleifera* on Mean comparison of the data regarding mean repellence of *Cryptolestes ferrugineus*



Furthermore, it is evident that higher concentrations of C. *colocynthis* plants extracts show more potential and are helpful in the control of stored grain insect pests.

Fig2: Combine effect of time interval and concentrations of *A.indica, C.colocynthis* and *M.oleifera* on Mean comparison of the data regarding mean mortality of *Cryptolestes ferrugineus*

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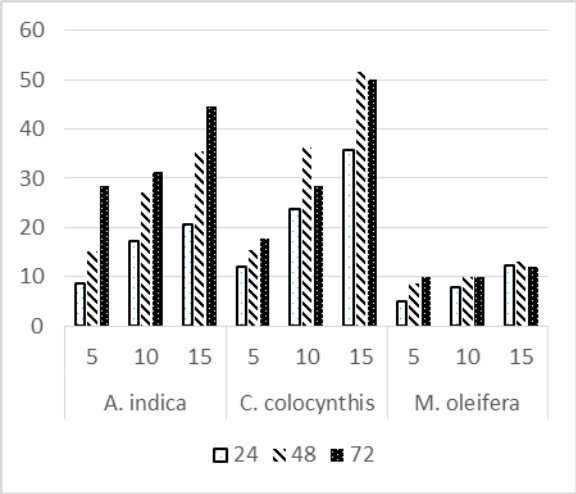
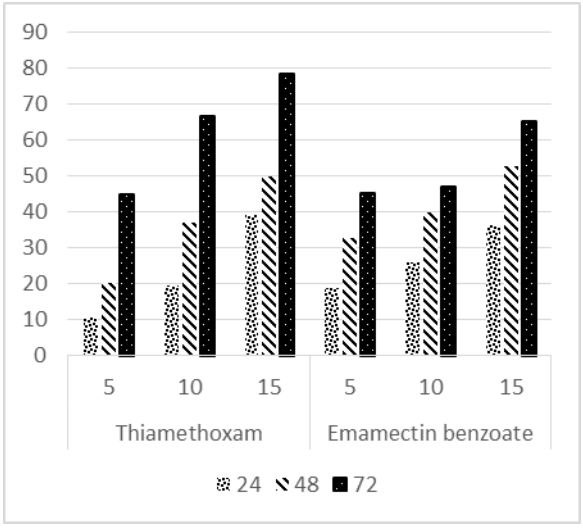


Maximum mean mortality was recorded in case of *C. colocynthis* at maximum concentration of 15% at an exposure period of 48 hour which shows that maximum concentration retains the capability of killing most of the insect pests as compared to other treatments followed by *M. oleifera.* In combination of treatments maximum mean mortality was recorded where all treatments were applied collectively after maximum exposure period. In case of *A. indica* mortality tend to increase by the increase of concentrations of the extracts and time period as well, as shown in Fig2.

New chemistry insecticides show much more potentials regarding the mortality of the concerned insect. Thiamethoxam shows maximum mortality of 78.43% at concentration of 15% and at an exposure period of 72 hours. Emamectin benzoate also have the potentials of mortality and as it is shown in Fig3. clearly depict that with the increase of concentration and time period the mortality also increased. The results are as like as Yoshii *et al*., 2000 prove that Emamectin benzoate when applied in high concentrations is a very effective to various pests of agricultural crops.

Fig3: Showing combine effect of time interval and concentrations of Emamectin benzoateon and Thiamethoxam on Mean comparison of the data regarding mean mortality of *Cryptolestes ferrugineus*



From the above results it was concluded that acetone extract of plants *A. indica* and *Citrullus colocynthis* and new chemistry insecticides Emamectin benzoate and Thiamethoxam had an adverse effect on stored grain pest *Cryptolestes ferrugineus* and their effect increases with increase in concentrations. The results also showed that maximum repellency was achieved with plant extracts while maximum mortality was obtained with new chemistry insecticides.

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