Botanicals strategies as recyclable bio rational substitute of synthetic insecticide in anticipation of Pulse beetle *Callosobruchus* spp. (Coleoptera)

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ABSTRACT:

Callosobruchus spp. is a major pest of pulses during storage. It causes heavy losses up to 50-60% of crop failures in India. These review papers represent the capability of plant origin product in the management of pulse beetle, mainly infestion start from field reduce down the quality and quantity of stored various types of legumes. Lot of botanical insecticidal plants has noted regarding attributes such as, repellent, affected in eggs deposition, reduce number of adult emergence population, found effective stage wise like eggs, Grub, pupal and adult activity. Feeding capability of bruchids on host affected based on toxicity of plant origin insecticides and fumigation show better outcomes. Botanical has found practically significant to protect the stored pulses from infestation bruchids at the time of storage. Such type of insecticides has provide assurance in integrated management to this pest as semiochemicals by give result in change the performance increase effectiveness against this pest, thereby, decrease chance of induced pest resistance issue which is often found in chemical pesticides. Hence, they may be approved in food security point of view, environmental safe as well as biorational substitute of inorganic pesticides supplying united control of the damage of stored legume grains due to pestilence of pulse beetle.

Keywords: *Callosobruchus spp.*, integrated pest management, bruchids, Botanicals semiochemicals.

1. INTRODUCTION:

Legumes are valuable rich point of supply dietary protein, as well as having uncommon attribute of retaining and improve soil fertility with the help of symbiotic nitrogen fixation by forming nodules at the root zone region and elaborating physical status of soil by virtual dropping of leaf. Pulse crops kept back sufficient amount of nitrogen within soil up to 30 kg N/ha. *Callosobruchus* sp. is major pest at the time of storage. It has ability to heavy loss 10 to 60 per cent (Gupta and Kashyap, 1971). Amid 5 known species of bruchids from India, 3 viz., *C. chinensis* (Linnaeus), *C. maculatus* (Fabricius) and *C analis* (Fabricius) act as valuable pests attack on various stored legumes (Raina, 1970). Detoriation of seed quality by attacked of pulse beetle due to inadmissible storage structure in India have been observed that 50 % occurred after only just three months storage of pulses. (Hussain and Abdel, 1982).

Callosobruchus sp. (Coleoptera: Bruchidae), is a primary economically valuable pest pulse crops such as, urd, Moong, cowpea, pigeonpea, Bengal gram (Talukder and Howse, 1994; Park et al., 2003). Female beetle deposited eggs, which are attached to the grain surface then larvae start boring into grains and complete growth and development occurred takes place within grain then adults came out by making exist hole symptoms, therefore, such contaminated material

have no market value due to not suitable for human feeding and have no germination occurred after sowing sprouts does not takes place. It acts as critical pests' problem of pulse in Asia and Africa under storage (Tapondjou *et al*., 2002; Raja et al., 2001; Ajayi and Lale, 2001; Mulatu and Gebremedhin, 2000; Okonkwo and Okoye, 1996; Ogunwolu and Idowu, 1994) Bruchids has been decisive to reason for reduction of weight, decrease germination capability and reduction of market value of seeds (Booker, 1967; Caswell, 1981). Genuine reason of genotypic resistance by means of insect species, pest resurgence, residual toxicity, phytotoxicity, vertebrate toxic content, significant habitat risks and growing value of utility of nowadays utilization of chemical pesticides have governed want for efficacious, ecological safe synthetic molecule. Focus has developed globally attention in the development of substitute methods; utilization of botanical products has turn out to be another in defending environment from chemical air contamination (Prakash and Rao, 1989; Tiwari *et al.*, 1990). Apart from the synthetic pesticides, temperature perform key role for growth and development of storage pest and Increase temp is effective manage tool of them. Fetal high temp is 40 ºC is found effective for stored insects (Iqbal, *et al.*, 2006) low temp also significant regarding this activity. Metabolism rate is high and food reserves low at high temp and insect multiplication is slow and eggs lying are decrease at low temp. (Flinn and Hagstrum, 1990) Temperatures below 14 ºC are lethal to stored grain insects, however; their development and fecundity are at climax between 25 ºC to 30 ºC (Ghosh and Durbey, 2003). Sun drying is followed since very ancient time to protect the infestation of storage pest before storage whereas it is a time consuming method though is it effective for large scale production hence artificial drying is used to follow for large scale production.

Many insect pests including lesser grain borer, red flour beetle, Granary weevil injury of Bengal gram at storages condition, *C. chinensis* L. is most damaging one. Being cosmopolitan, it also damages lentil, cowpea, mung, sorghum and maize (Ahmed, Itino and Lchikawa, 2003). By taking entry within grains by showing holes as well as start consumption up to fully destroyed. Infestation of this pest starts in the field to storage since adult can easily fly and deposited eggs on the chickpea pods. Damage occurred mostly by grub and adult. (Michalaki *et al*., 2006). On the basis of morphological characters male and female adult can easily be identified on the basis of their antennae and body size. Pectinate and serrate type antenna having male and female respectively (Halstead, 1963) Female has bigger in size than male (Howe and Currie 1964). At optimum condition 6-8 generations have reordered within year (Shaheen *et al.*, 2006; Fuxa 1987). The fecundity is usually maximum in number 99 egg per female, post embryonic development is 6.33 days, Immature stage time duration are 17.33 days as well as complete growth time span are31 days, From eggs to adult emergence of *C. chinensis* varied from 31-38.33 days with an average of 34.50 days during at various generations (Thakur and Pathania, 2013).

Now at that time, mainly fumigants and chemical pesticides are utilized to protect stored grain from insect pests that caused problems such as especially adverse effect of resurgence and food poisoning (Jackai and Adalla, 1997). To avoid this problem biological method component such as entomopathogenic mould, act as excellent alternatives of conventional pesticides being safer for ecosystem, animals as well as crops (Leathers and Gupta, 1993). The fungus *Beauveria bassiana*, pioneer by Augustine Bassi in 1835 from local disease. This fungus is generally found in soil with broad host range (Campbell, *et al*., 1985). Various experiments through find out that *Green muscardine* is successful against *Rhyzopertha dominica, C. maculatus, Sitophilus oryzae* and other stored pests (Batta, 2004; Kavallieratos, *et al*., 2006; Batta, Safieh, 2005*). B. bassiana* are broadly utilized against many crop pests under both laboratory and field conditions throughout the world (Dal-Bello, 2001).I t act as effective mold against important stored grain insects, sap and solid feeder pests of crops and animals (Roy and Cottrell, 2008; Sevim , *et al.*,

2012). *B. bassiana* differ from some other insect pathogens as they transmit a disease through the host body wall. At the time spore come in spores of *B. bassiana* attach to insect body, spore germinate, get enter through the body wall and kill them within short period of time by producing toxins and causing muscardine disease in insect (Kannan, *et al*., 2008; Lacey, Martins and Ribeiro, 1994). Main objective of the study was to assess the effectiveness of various amount of *B. bassiana* against *C. chinensis* in chickpea grains at storage condition.

In the current scenario, of all needs of became greater population compulsion, the undertaking of availability of food and protection is our most important consideration. In such a crucial condition, apart from growing our agricultural production, safety of component in particular stored grain is quite requisite, a number artificial pesticide have been used and observed successful in opposition pulse beetle (Patil *et al*., 1994 and Jolli *et al*., 2005) however these are harmful due to its residual content found food and in environment. Such adverse consequences of pesticides necessary for various hard work for cover more traditional, healthy and substitute plan to limit the damage on pulses as nicely as on environment. Lot of botanical origin provides the potential for developing safe pesticides that can be used in integrated pest management strategies. The use of indigenous plant substances has obtained a vital function in the current processes of pest control as they are comparatively safer to mammals due to their rapid biodegradable nature and microbial products takes an integral function in effective management of pulse beetle. Whereas single management strategy is not effective adequate for the management of Pulse beetle, therefore mixture of all the accessible management strategies is required to manage efficiently in sustainable way.

2. MATERIALS AND METHODS:

This paper was one organized by means of accumulating the data from all reachable assets i.e. books, journals, annual reports, lawsuits and many other published via one of a kind authors, researchers, teachers and research centers and stations. A total of fifty five research papers had been accrued and intensive review was once made. Gathered details were scientifically organized into extraordinary sub titled namely; symptoms of damage, Seed protectants, biological control, and botanical extracts.

3. **Symptoms of damage:** The egg laying and development are uninterrupted in pulse beetle. Adult oviposited eggs to external surface of grains. After hatching of egg mass, grub burrow inside the seeds complete development occurred is finished. Grub movement control within seeds at the place where eggs deposited by female. Adult emerge from seeds reproductively mature. Adults came out and easily adjust to store food material conditions, requiring neither food nor water to reproduce (Messina 1991). Contamination within food reported to be up to 100% in many stored Chana (Weigand and Pimpert 1993). At the time of 40–60% contamination of bruchids in chickpea, such grain not useful for consumption (Van der Maesen, 1972). Most of the pulse beetle infestation start from field on pods and grains from the field difficult to identify such hidden contamination is difficult before storing of the pulses. So, the heavy amount of stored produce is lost by the beetles. (Arora and Singh 1970 and Shehnaz and Theophillus 1975).

4. DISCUSSIONS:

Environmental friendly controlling strategies have been developed for protection from *C. chinensis* in storage condition. This includes, using of botanical products, seed protectants, biological control agents and plant origin pesticides. The quickest method for the controlling of pulse beetle is synthetic insecticides whereas the chemical insecticides are hazardous to the human health as well as environment. Considering the damage the chemical pesticides does to environment and its users, alternative environmental friendly methods are more suitable in the

current scenario of sustainability. The integration of these methods with each other and minimum use of less environmental hazardous insecticides are important to control the *C. chinensis* without disturbing ecological and biological world.

5. Protectants:

Utilization of fly ash stated for after harvesting of crops to protect from pulses beetle. No adult Pulse beetle observed on treated with fly ash even after 12 months on host food material. After passing 18 months of storage, Bengal germ utilize contaminated each in terms of quantity of insects decided in jute wrapping and damaged quantity grains. Amount of grain damaged caused by insect have been directly proportional number of insects available in bags. There is no side effect of fly ash treated nutritive quality and germination percentage of pulses (Mendki *et al.* 2001). Turpentine oil and fly ash has mostly good attribute at all utilization dose in contrast to other component for management.

6. Botanicals:

Shukla, *et al*., (2007), reported about 6 plant powders apply for finding of were taken from the leaves of *S. cumini* L., *A. marmelos* L., *E. cannabinum* L., *M koenigii* L., *A. subulatum Roxb, C. medica* L. Then most effective powder was significantly over control with regards to attraction and repellent of pulse beetle. It is calculate that percent repellent reduce by increase in days after treatment *M. koenigii* and *E. cannabinum* leaf powders obstruct to attraction of adult effectively than the other treated powders. *A. subulatum* found least effective than others with non significantly different from each other. All treatments records 25.07 to 80.03% death rate within 5 days of treatment *E. cannabinum* offered highest mortality (80.03%) followed by *M. koenigii* (75.07%) and *C. medica* (65.01%). *S. cumini* and *A. marmelos* give 34.98% and 45.04% mortality respectively. Mean oviposition ob chickpea seeds mixed with different leaf powders are shown in. *M. koenigii* most significant and effective reducing 86.15% oviposition deterrence of pulse beetle on chickpea followed by *E. cannabinum* (82.50%), *C. medica* (72.58%) and *A. marmelos* (71.27%).

Elhag (2000) reported on egg laying deterrence of 9 plant component on *C. maculatus* recorded seed tested with 0.1% crude extract outcomes effective reduction in oviposition by the bruchid. Treated with 10 percent powder formulation of roots and leaf of *Tephrosia* recorded effective for decrease total eggs deposition by bruchids (Ghei, 2001). Savitri and Subbarao (1976) noted that NSKE mixed directly with paddy at 1 and 2% get significant in decreasing oviposition by *R. dominica* and *S. cerealella* respectively. Application of 10% powder suspension and aqueous extract of bark of *Prosopis sp*. recorded effective for oviposition of *C. chinensis* (Negi and Shailja, 2007)

T.ammi, A. graveolens and *N. sativa* essential oil component helpful for decrease oviposition capability of insects give outcomes against *Sitophilus oryzae* when utilize essential oils alone or in balanced combinations .Quick effect of essential oils against insect is indicative of their neurotoxic mode of action interfering with neuromodulator octopamine (Kostyukovsky *et al*., 2002) or with GABA-gated when fumigated with sub-lethal concentration. Ngamo et al. (2007) have reported similar results in the concentration of essential oils against insects is indicative of their neurotoxic mode of action interfering with neuromodulator ocopamine (Kostyukovsky *et al*., 2002) or with GABA-gated chloride channels (Priestley *et al.*, 2003).

7. Conclusion:

Bruchids are valuable pests of leguminous crops in Asia and Africa from field to storage condition. It has been determined to reason reduction of weight, affected germination capacity in

fields, decrease in commercial value of the seeds. Serious issues of germplasm resistance by insect pests, resurgence, and residual content in seed, phytotoxin, animal toxicity, significant habitat risks and growing value of utility of the nowadays used chemical pesticides governed the want for successful biodegradable chemical utilize in protection of storage.

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