Comparative Analysis of Six Plant Botanicals in the Control of *Challosobruchus chinensis* in green gram *Vigna radiata* (L)

Dr Anjali Bhartiya, Lecturer,

Department of Botany, Rameshwari Devi Girls College, Bharatpur (Raj.)

Abstract

In present investigation, the efficacy of six plant materials namely six plant materials namely *Syzygium cumini* L. (fam. Myrtaceae), *Aegle marmelos* L. (fam. Rutaceae), *Eupatorium cannabinum* L. (fam.Asteraceae), *Murraya koenigii* L. (fam.Rutaceae), *Ammomum subulatum* Roxb. (fam. Zingiberaceae), *Citrusmedica* L. (fam. Rutaceae)at twodoses 0.5 mg and 0.25 mg per 100 g seeds (w/w) were evaluated against stored grain pest, *Callosobruchus chinensis* (Fab.) in the laboratory. The result revealed that the effectiveness of grain damage by *C. chinensis* was in the order of *M. koenigii* powder (88.0%)>*E. cannabinum* (80.33%)>*C. medica* (72.0%) >*A. marmelos* (69.0%).All the plant materials were found to be move effective at higher dose in comparison to the lower one. Further,all the plant material causes more than 25% egg mortality. The adult mortality ranged from 93% (*M. koenigii*) to 85% (E. *cannabinum*). However, more than 23% reduction in seed weight has beenobserved in all the treatments.

Key words: Plant materials Moong bean seed *Callasobruchus chinensis* and egg mortality

INTRODUCTION

India is the largest producer [18.5 million tons] of pulses in the world. It also imports around 3.5 million tons annually on an average to meet its ever increasing consumption needs. According to Indian Institute of Pulses Research's Vision document, India's population is expected to touch 1.68 billion by 2030 and the pulse requirement for the year 2030 is projected at 32 million tons with anticipated required annual growth rate of 4.2% (India 2015). So the pest control in stored pulses is highly desirable.

Integrated pest management is now a widely accepted strategy in pest control including post harvest infestation control which involves the use of chemical (contact/residual) insecticides along with fumigants. The use of synthetic chemical insecticides is either not permitted or used restrictively because of the residue problem and health risks to consumers.

Food grain losses due to insect infestation during storage are a serious problem, particularly in the developing countries Talukder *et al* 2004, Dubey *et al* 2008. Losses caused by insects include not only the direct consumption of kernels, but also accumulation of exuviae, webbing, and cadavers. High levels of the insect detritus may result in grain that is unfit for human consumption and loss of the food commodities, both, in terms of quality and quantity. Insect infestation-induced changes in the storage environment may cause warm moist “hotspots” that provide suitable conditions for storage fungi that cause further losses.

Rearing of insects

Insect rearing was carried out in department of Zoology, R.D. Girls College, Bharatupur under the prevailing environmental conditions of 30 ± 2 C and 70 ± 5 RH (Talekar, 1988).

To obtain newly emerged pulse beetles of same generation, 25 insects were released in a plastic container having 250 g of chickpea seeds covered by a muslin cloth. After 24 hours all the adults were removed and egg laid seeds were maintained at required temperature and humidity. The insects emerged after four weeks were used in the entire investigation. Insect eggs were counted by using hand lens.

REVIEW OF LITERATURE

The resistance and residue of pesticides and contamination of the biosphere associated with large-scale use of broad spectrum synthetic pesticides have led to the need for effective biodegradable pesticides with greater selectivity. This awareness has created a worldwide interest in the development of alternative strategies, including the discovery of newer insecticides Heyde *et al* 1984, Dayan *et al* 2009. However, newer insecticides will have to meet entirely different standards. They must be pest specific, nonphytotoxic, nontoxic to mammals, ecofriendly, less prone to pesticide resistance, relatively less expensive, and locally available Hermawan *et al* 1997. This has led to re-examination of the century-old practices of protecting stored products using plant-derivatives, which have been known to resist insect attack Talukder 2006, Lale 1992, Ewete *et al* 1996 and Sahayaraj 2008. Plant derived materials are more readily biodegradable, less likely to contaminate the environment and nay be less toxic to mammals. There are many examples of very toxic plant compounds. Therefore, today, researchers are seeking new classes of naturally occurring insecticides that might be compatible with newer pest control approaches Dubey *et al* 2008, Talukder and Howse 1995, Yingjuan *et al* 2008.

MATERIAL AND METHOD

Stored product

Moong bean *Vigna radiate* seeds (variety-Mum-2) were obtained from the local market. Healthy and fresh seeds were used to avoid any pre storage infestation or egg laying of bruchids.

Plant products

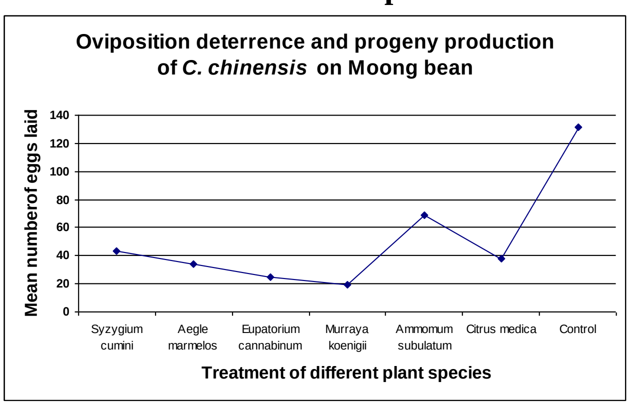
Six plant powders used in this investigation were taken from the leaves of *Syzygium cumini* L. (fam. Myrtaceae), *Aegle marmelos* L. (fam. Rutaceae), *Eupatorium cannabinum* L. (fam.Asteraceae), *Murraya koenigii* L. (fam.Rutaceae), *Ammomum subulatum* Roxb.

(fam. Zingiberaceae), *Citrusmedica* L. (fam. Rutaceae). Leaves were dried in Webcon's hot air oven at 40°C for 2 days and milled with electric grinder topowder. The resulting powder was passed through a 25-mesh sieve to obtain afine dust and used at the dose of 2% (w/w).

Table- Oviposition deterrence and progeny production of *C. chinensis* on Moong bean seeds treated with different leaf powders

Treatment 2%(w/w)	Mean number of eggs laid	% deterrency	Mean number of F1 emerged	0/0 deterrency	% FDI
Syzygium cumini	43.45 ± 4.58c	61.79	13.78 ± 2.54c	52.	40.39 ± 1.14c
Aegle marmelos	33.86 ± 6.54cd	69.	9.85 ± 2.61cd	65.	60.79 ± 1.22bc
Eupatorium cannabinum	24.66 ± 4.78d	80.33	4.54 ± 1.28d	85.	89.78 ± 1.49a
Murraya koenigii	19.55 ± 5.22d	88.	3.55 ± 2.25d	93.	97.66 ± 1.55a
Ammomum subulatum	69.14 ± 6.74b	43.	25.88 ± 4.66b	25.	12.74 ± 1.35d
Citrus medica	38.28 ± 9.35cd	72.	9.54 ± 1.89cd	69.	78.15 ± 0.88ab
Control	131.55 ± 7.39a		34.18 ± 4.35a		

Oviposition deterrence and progeny production of *C. chinensis* on Moong bean seeds treated with different leaf powders



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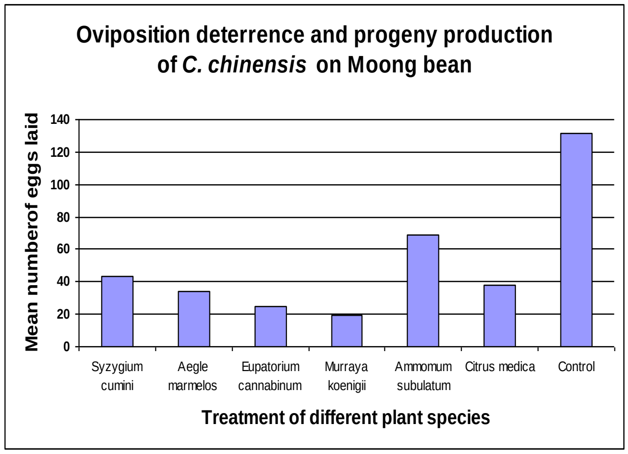

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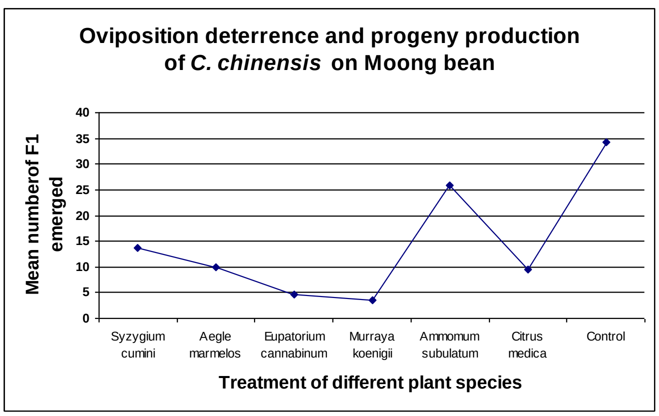

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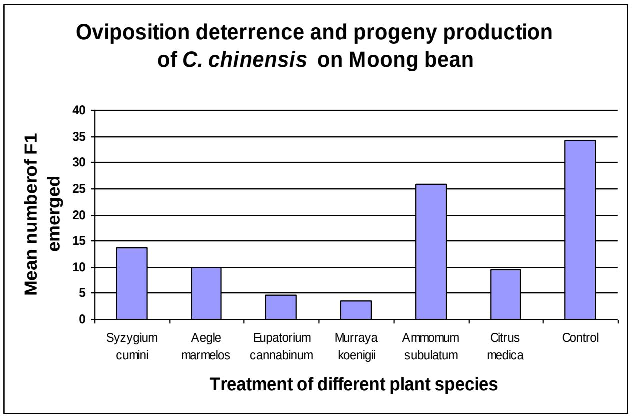

The effect of different plant powders on mortality of adult *C. chinensis* after 30 days of treatment is showed in Table. All treatments showed 25.0 to 85.0% mortality during 30 days of exposure. *M. koenigii* offered maximum mortality (88.0%) followed by *E. cannabinum* (80.33%)and *C. medica* (72.0%). *S. cumini* and *A. marmelos* showed 61.79% and 69.0% mortality respectively.

Mean number of eggs laid on moong bean seeds treated with different leafpowders are shown in Table. *M. koenigii* powder was significantly more effective causing 93.0% oviposition deterrence of bruchids on moong bean followed by *E. cannabinum* (85.0%), *C. medica* (69.0%) and *A. marmelos* (65.0%). It was visually observed that the eggs laid on seeds in treated sets were smaller in size than on untreated seeds. In addition, the eggs of treated sets were not firmly attached with the seeds. The F1 emergence of adult beetles was also found to be reduced in treatment sets.

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