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Research Article

EVALUATION OF TRADITIONAL KNOWLEDGE OF PLANT RESOURCES TO CONTROL STORE FOOD GRAIN PEST- *CALLOSOBRUCHUS MACULATUS* F.

Patil P.V.[1], *D.K. Kulkarni[2] and S.P. Taware[3]
[1]*Department of Horticulture A.T. College, Bhor, 412 206*
[2]*BAIF Development Research Foundation, Pune 411 058*
[3]*Agharkar Research Institute, Pune- 411 004*
**Author for Correspondence*

ABSTRACT
Storage losses are recognized as being one of the critical constrains upon food security among the local people of Bhor and Mahad region of Western Maharashtra. Traditionally farmers have used various plant resources for the control of store grain pest/insect infestation is a major contributor to the quality deterioration of store grain food. Store food grain includes cereals, pulses and dried seeds.
Rural people from Bhor and Mahad region of Pune and Raigad district of Western Maharashtra have been using more than 10 plants for controlling insects / pests on food grains. The present paper deals with the laboratory evaluation of plant leaf powders on common pest Pulse beetle *Callosobruchus maculatus* Fab. Efficacy of different plant leaf powders were tested on the basis of their toxicity to adult beetles and effects on egg laying, hatching of eggs, percentage of loss in grain weight and progeny adult emergence. Laboratory experimental results showed that leaf powders of *Gnidia glauca, Eucalyptus globulus, Catunaregam spinosa, Vitex negundo, Azadirachta indica, Madhuca longifolia* and *Pogostemon benghalensis* showed the mortality of adults and also reduction in oviposition and suppress adult emergence. This traditional information is a natural source and will be use at village level.

Keywords: Callosobruchus maculatus, Storage, Food Grains

INTRODUCTION
In developing countries, food grain production and consumption often fall below demand as a result of post harvest loses caused by pests and other spoilage agents. Insects/ pestshas been damaging stored grains in large quantities, resulted in to major economic losses in India. Pulses are important source of protein, fats, carbohydrates, sugars and vitamin B. *Calosbruchus chinensis* L. (Coleoptera: Bruchidae) is one of the most destructive and serious insect pests of stored grain in tropical and subtropical region of the world (Khanam *et al.*, 2008). Grain loss caused by storage pests such as cow pea beetle (*Callosobruchus maculatus* F), threatens food security. Over production of pests due to various ways is a serious problem in developing countries in the tropics due to favorable climatic conditions and poor storage structures (Bekele *et al.*, 1997).
There is serious need to find out effective biological material to protect stored produce, that are readily available, affordable, relatively less poisonous and less detrimental to the environment had stimulated interest in the development of alternative control strategies and the re-vitalization of traditional botanical pest control method (Niber, 1994; Talukder and Howse, 1995).

Resource poor farmers in developing countries use different plant materials to protect stored grains pest infestation by mixing grains with protectants made up of plant products. Local and tribal people from Western Maharashtra have traditional knowledge of plant resources for controlling different types of pest (Kulkarni and Kumbhojkar, 1996). Some farmers from Maharashtra use crushed leaves of *Combretum ovalifolium* Roxb to control beetles (*Carabus nemoralis*) in millet fields. Others use the leaves of *Aristolochia bracteata* Retz for driving the beetles away. Farmers in Tamil Nadu use the liquid extracted from the latex of *Ficus spp* mixed together to drive away the rhinoceros beetle (*Oryctes rhinoceros*) which is one of the most dangerous pests, causing mortality of coconut (*Cocos nucifera*) trees (Sinha and Bhatia, 1997). Musa *et al.*, (2009) tested the leaves powders of *Vernonia amygdalina* L. and *Ocimum*

gratissimum Del. against *Callosobruchus maculatus* at the crop protection laboratory of the University of Horin, Nigeria. The number of eggs laid in cow pea seeds treated with *Vernonia amygdalina* and *Ocimum gratissimumalone* orin mixed proportions of the plants compared to the control. On this background present studyon documentation of natural resources for food grain pest control have been carried out in Bhor and Mahad region. Experimental part of bioassays to evaluate the efficacies of ten local spices *Eucalyptus globules* Labillis, *Gnidia glauca* (Fresen.) Gilg, *Madhuca longifolia* (Koen.) Macbr., *Meliadubia* Cav, *Pongamia pinnata* (L.) Pierre, *Pogostemon benghalensis* (Burm.f.) O. Ktze, *Tectona grandis* L., *Vitex negundo* L., *Catunaregam spinosa* (Thunb.) Tirveng., *Azadirachta indica* A. Juss have been carried out at Agharkar Research Institute, laboratory against *Callosobruchus maculates* F. Findings of the laboratory trials on Cow pea are discussed.

MATERIALS AND METHODS

Laboratory experiments were carried at Agharkar Research Institute, Pune. Selections of plants are based on survey in 41 and 35 villages of Bhor and Mahad region respectively.

Table 1: Plants used for Laboratory Testing

Sr. No.	Local Name	Botanical Name	Family	Plants part used	Locality
1	Bakana limb	*Melia dubia* Cav.	Meliaceae	leaf	Bholawade
2	Gelphal	*Catunaregam spinosa* (Thunb.) Tirveng.	Rubiaceae	fruits	Taliye
3	Kadulimb	*Azadirachta indica* A. Juss.	Meliaceae	leaf	Velvand
4	Karanj	*Pongamiapinnata*(L.) Pierre	Fabaceae	leaf	Ambeshivthar
5	Moha	*Madhuca longifolia* (Koen.) Macbr.	Sapotaceae	leaf	Vadgaon
6	Nilgiri	*Eucalyptus globulus*Labillis	Myrtaceae	leaf	Nigudghar
7	Nirgudi	*Vitex negundo* L.	Verbenaceae	leaf	Natambi
8	Phangali	*Pogostemon benghalensis* Burm. f.	Lamiaceae	leaf	Waki
9	Rametha	*Gnidia glauca* (Friesen.) Gilg.	Thymelaeceae	leaf	Kankwadi
10	Sag	*Tectona grandis* L.	Lamiaceae	leaf	Ambade

Traditionally local people used plant leaf powders for control of insects. Same method was used in the laboratory evaluation. Culture of pulse beetle, *Callosobruchus maculatus* F. was maintained in the laboratory on cow pea grains. Leaf powders of 10 plant species were mixed with 10 g of healthy non-infested cow pea grains @ 1, 3 & 5% w/w. Three replicates were maintained in plastic vials. Ten one-day old unsexed adults were released in each plastic vial. A control without any treatment was maintained in 3 replicates and ten one-day old unsexed adults were released. Adult mortality was recorded at 24, 48 & 72 hrs after release of adults. Number of eggs laid was counted at 10 days after release of adults (sterile & fertile eggs counted separately). Adult emergence & percent weight loss was recorded in all treatments along with control. Data were averaged and statistically analyzed as per completely randomized design by using Agrobase 99 software. Results obtained were documented periodically.

RESULTS AND DISCUSSION

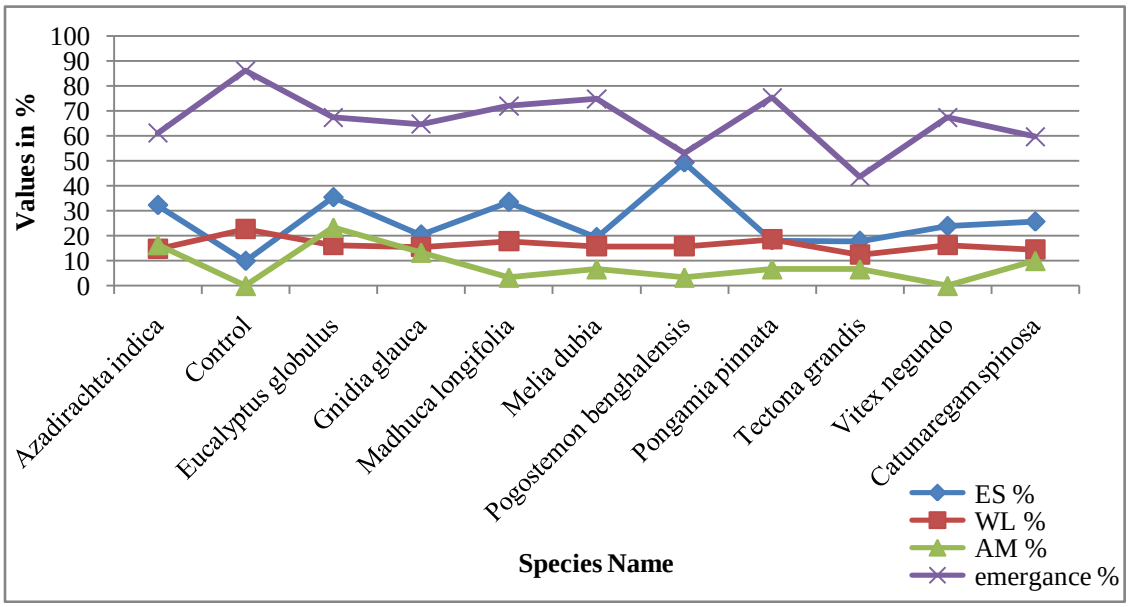
Traditional knowledge and wisdom of the local people is very important to document our heritage. Traditional agriculture exists worldwide in all communities covering varied areas. Agriculture and natural resource management are of prime importance to know the agro-ecosystem of the region. Asia in general and India in particular has a unique distinction with respect to this area. A large amount of what may be

considered as traditional knowledge pertaining to agriculture has today been destroyed and replaced due to modern agricultural practices. Rich traditional knowledge of selection of wood resources for agricultural implements were confirmed with scientific data (Patil *et al*., 2014). During the survey of traditional resources used to control store grain pest, 10 different villages visited from Bhor and Mahad regions and local informants were given information. Oral tradition of local people was confirmed by scientific method.

Efficacy of different plant leaf powders were tested on the basis of their toxicity to adult beetles and effects on egg laying, hatching of eggs, percentage of loss in grain weight and progeny adult emergence.

The average percentage mortality recorded 72 hrs after release of adults indicate 33.33 per cent adult mortality in *Gnidia glauca* (Friesen.) Gilg. powder at 5% level, followed by *Eucalyptus globules* Labillisand *Catunaregam spinosa* (Thunb.) Tirveng. leaf powder at 3% and 5% levels. *Vitex negundo* L. powder at 3% level did not show any toxicity against bruchids. *Madhuca longifolia* (Koen.) Macbr. at 3% and 5% and *Pogostemon benghalensis* Burm. f., at 3% showed minimum adult mortality of 3.33%. *Azadirachta indica* A. Juss., at all three levels shows remarkable adult mortality.

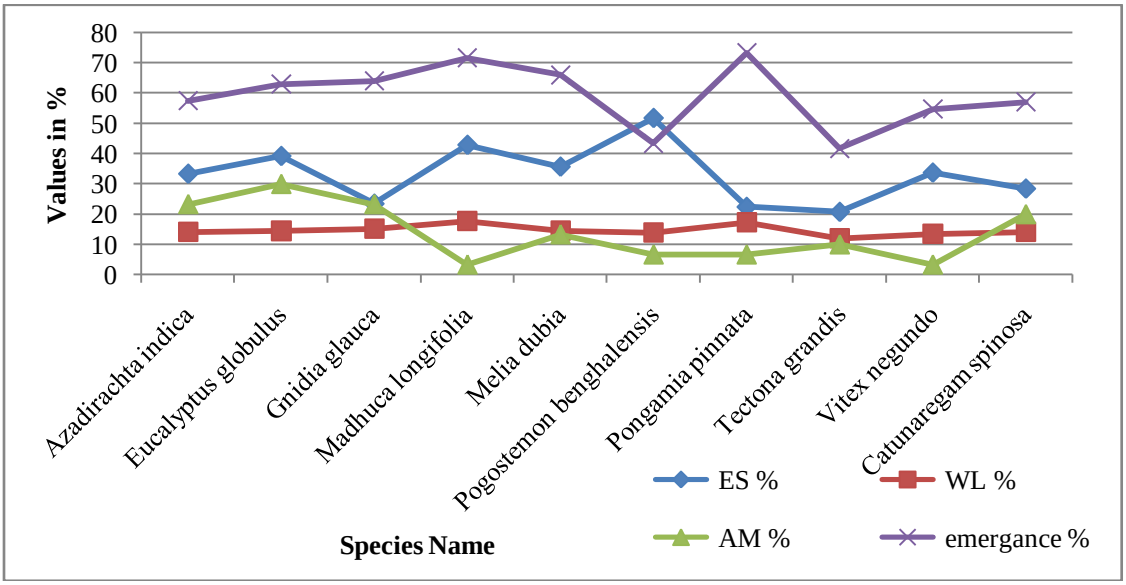
Treatments resulted in significantly, lower number of eggs than the control. Adult emergence shows significant difference compare to the control. In present laboratory experiment adult emergence, mortality, loss in weight are studied and results are encouraging.



Graph 1: Anova analysis of 1% treatment

On this background leaf powders of *Vitex negundo*, *Annona squamosa*, *Nicotiana tabacum* and leaf, bark and seed kernel of *Azadirachta indica* were tested against pulse beetle. The eggs laid by both the species of bruchids were significantly decreased in *A. indica* seed kernel power. A very few adults were emerged at seed kernel treatment (Khalequzzaman and Osman goni, 2009).

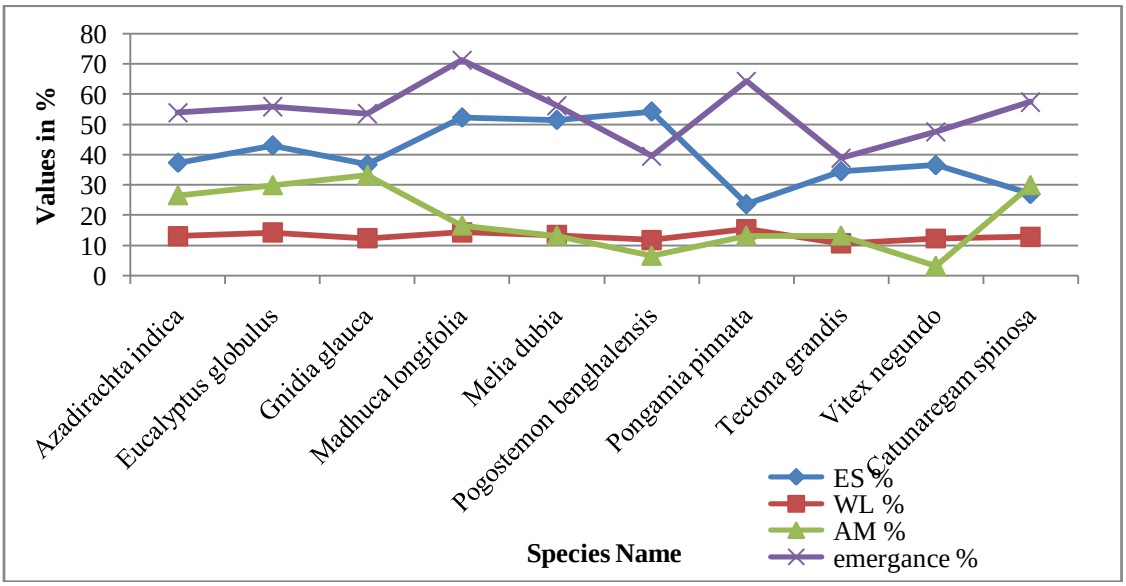
Observations recorded on the average number of eggs laid on different treatments indicated the minimum number of eggs on the seeds treated with 5%. *Azadirachta indica* leaf powder (32.33 egg /10 gm seed). The maximum number of eggs was recorded on the *Pongamia pinnata* leaf powder treatment at 3% level (175 eggs/10 gm seed). Similarly leaf powder of *Madhuca longifolia*, *Meliadubia*, *Pogostemon benghalensis*, *Tectona grandis*, *Vitex negundo* and fruit powder of *Catunaregam spinosa* also showed a significant reduction in egg laying. A less number of eggs laid in the treatment having with high adult mortality. These findings in respect of egg laying are in correlation with that of dosage applied.



Graph 2: Anova analysis 3% treatment

An average number of adults emerged was found to be significantly reduced in the different treatments. The adult emergence was considerably inhibited in *Tectona grandis* L. and *Pogostemon benghalensis* leaf powder treatment. Low emergence of adult was observed in *Azadirachta indica* leaf powder treatments. *Meliadubia*, *Pongomia pinnata* and *Madhuca longifolia* leaf powder fail to protect cowpea from bruchid attack, though some reduction was observed in *Catunaregam spinosa*, *Eucalyptus globulus* and *Gnidia glauca* leaf powder treatment. Lalea and Abdurahanb (2004) reported relative efficacy of plant resources in reducing reproductive potential of cowpea seed bruchid *C. maculatus* in stored cowpea.

The average percentage of loss in grain weight due to attack of *Callosobruchus maculatus* was lowest in *Tectona grandis* leaf powder while the maximum percentage of loss was observed in *Pogostemon benghalensis* treatment (11.58%) at 5% level. The percentage of loss in grain weight in *Vitex negundo* and *Gnidia glauca* leaf powder treatment was found to be less than fifty percent of that observed in the control. Following graphs gives detail results of treatments.



Graph 3: Anova analysis of 5% treatment

Thus, laboratory experimental studies showed that leaf powders of *Gnidiaglauca, Eucalyptus globulus, Catunaregam spinosa, Vitex negundo, Azadirachta indica, Madhuca longfolia* and *Pogostemon benghalensis* showed the mortality of adults, and also reduction in oviposition and suppress adult emergence. Bhagat *et al*., (2011) studied insecticidal properties of three Jatropha species against store grain pest in ARI laboratory. Bhagat and Kulkarni (2013) reported *Jatropha nana, J. gossypifolia* and *J. glandulifera* were showing anti-feedant and oviposition deterrent activity on stored grain pest *Callosobrchus chinensis* L. These results of plants used for control of stored grain pest are useful in industrial sector and proved the wisdom of traditional knowledge associated among local or tribal people is worth.

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