Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
JPP 2019; 8(3): 2428-2430
Received: 05-03-2019
Accepted: 06-04-2019

Lalsingh Rathod
Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

AR Sasane
Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

PR Kawre
Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

GG Chaware
Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

PK Rathod
Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Correspondence
Lalsingh Rathod
Department of Agricultural Entomology, Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola, Maharashtra, India

Effect of botanicals on pulse beetle and per cent seed germination of stored green gram

Lalsingh Rathod, AR Sasane, PR Kawre, GG Chaware and PK Rathod

Abstract
An experiment was conducted to test the efficacy of botanicals against pulse beetle in stored green gram at the laboratory of AICRP on PHET and Seed Technology Research Unit (STRU), Dr. Panjabrao Deshmukh Krishi Vidyapeeth, Akola (MS) during the month of June to January in the year 2016-17. Eight treatments including untreated control, comprising of clove powder (3g/kg grain), tulasi leaf powder (3g/kg), black pepper powder (3g/kg), *Acorus calamus* rhizome powder (10g/kg), sesame oil (5ml/kg), soybean oil (5ml/kg), and castor oil (5ml/kg) were used against adult pulse beetle, *Callosobruchus chinensis* in stored green gram seed. Botanically treated seeds are taken into the 250 ml plastic vial and into which 5 pairs of newly emerged adult pulse beetles were released to record the percent seed germination at monthly interval for the six month of storage period. Higher rate of percent seed germination recorded in all the botanically treated seeds over untreated control. The order of per cent seed germination, i.e. maximum per cent seed germination was recorded in the seed treated with *Acorus calamus* rhizome powder (94.00%) followed by black pepper powder (93.00%), clove powder (92.00%), castor oil (89.00%), sesame oil (87.00%), soybean oil (86.00%), tulasi leaf powder (82.00%) and untreated control (79.00%).

Keywords: Pulse beetle, green gram, botanicals, per cent seed germination

Introduction
Green gram is popularly known as “Moong dal” in India and it is basically a tiny circular shaped bean that is green in colour. Green gram is one of the main pulse crop in the India, it is widely cultivated throughout the Asia, including India. Green gram is an excellent source of high quality protein (25%) having high digestibility. It is consumed as whole grains as well as "Dal" in a variety of ways in our food. Green gram is also used as green manure crop. It being a leguminous crop has capacity to fix the atmospheric nitrogen (30-40 kg N/ha). It also helps in preventing soil erosion. These crops grow quickly, generate good profit for farmers and contribute to agricultural and environmental sustainability.

Marginal increase in production in the last 4 decades, and astronomical losses during post-harvest storage, attributable to the pulse beetle (PB) *Callosobruchus chinensis* (L.) (Coleoptera: Bruchidae) (Mendki *et al*., 1999) [6], are other possible reasons for importing pulses [6]. Globally, 840 million people are undernourished mainly on account of inadequate intake of proteins, vitamins and minerals in their diets. The reason for that is out of total 12.6 million tonnes, 8.5 per cent is lost due to the non-availability of proper storage facilities with the farmers and vulnerability of pulses to store grain pests. *Callosobruchus* spp. are important pests of pulses. In tropical developing countries, where legume seeds are often the main source of protein in the human diet, the losses caused by these insects are of major significance. Infestation may start in the pods before harvest and carry over into storage where substantial losses may occur**.** In India, there are about 200 species of pest insects which cause damage to stored grains and grain products in storage. *Callosobruchus chinensis* is a major, economically important pest of all pulses and causes 40-50% losses of pulses in storage (Gosh and Durbey, 2003) [5]. Knowledge of the host range and biology of the pest species are essential to minimize the incidence. Pesticides are the most powerful tool available for pest control, despite these credentials, the long and indiscriminate use of pesticides has been found ecologically unsound. Insecticides were found to cause toxic effects on the produce intended for consumption. So it is also not safe to mix insecticide with food grain for protection against insects (Bekele *et al*., 1995) [1]. At the same time plant-derived materials are more readily biodegradable, relatively specific in the mode of action and easy to use (Das, 1986); they are environmentally safe, less hazardous, less expensive and readily available [3]. Some are less toxic to mammals, may be more selective in action, and may retard the development of resistance. Therefore, plant materials should be explored to protect stored products against pest infestation.

Keeping all those things in the view the following investigation "Evaluation of different botanicals against pulse beetle (*callosobruchus* spp.) in stored mung bean" has been undertaken, to prevent the *Callosobruchus chinensis* infestation during pulse seed storage.

Materials and methods

A Laboratory experiment was conducted on "Evaluation of different botanicals against pulse beetle (*callosobruchus* spp.) in stored mung bean " at the laboratory of AICRP on PHET and Seed Technology Research Unit (STRU), Dr. P.D.K.V. Akola (M.S) under laboratory conditions lasting for a period of 180 days during year 2016-17.

Rearing of test Insect in the laboratory

To obtain adequate culture of *Callosobruchus chinensis* the adults were collected from the Pulses Research Unit, Dr. PDKV, Akola along with pulses on which eggs were laid by pulse beetle and released into plastic container contains healthy green gram seed. The top was covered with muslin cloth secured firmly by rubber band. After emergence of new adults, the beetles were introduced in to green gram variety Kopergaon. Some adults were transferred into another set of containers containing fresh green gram seed and such procedure was repeated to mention the culture throughout the period of research. These cultures were grown in laboratory under ambient conditions.

External determination of male and female bruchids

Males and females can be identified on the basis of their antennae. Males are having strongly serrate antennae and pygidium without dark patches. While females are having weakly serrate antennae and pygidium with two dark patches, one on each side of the mid-line. Generally female is slightly larger than male. The length of male adult measured with an average 3.25 ± 0.23 mm and breadth is 2.16 ± 0.05 mm whereas the length and breadth of female adult measured with an average 3.60 ± 0.08 mm and 2.02 ± 0.04 mm respectively (Devi and Devi, 2013) [4].

Application of treatment

Mass culture of *C. Chinensis* was maintained in the laboratory for experimental purpose. One kg of freshly harvested certified seed with very high percentage of germination and low moisture content (<10%) was taken for each treatment. Required quantity of botanicals and oils were taken, to treat the seed with oil and powder of various plant products. 1000 g of seeds for each treatment were filled in high density polythene bag of 2 kg capacity and the plant products were mixed thoroughly by shaking the polythene bag. The procedures were repeated thrice for each treatment. Then the one kg of treated seed was packed in four kg capacity plastic container and was stored under ambient condition. Every month 100 g of green gram seed were taken out from treated seed in to the plastic container of 250 ml capacity and into which 5 pairs of adult bruchids (newly emerged) were released to record the percent seed germination at monthly interval for the six month of storage period.

Per cent seed germination

For recording per cent seed germination, the pulse beetle damaged seeds, from 250 ml capacity plastic container has been taken out, after one month of pulse beetle introduction. To work out per cent seed germination, 100 grains were kept on moist paper towel, replicated thrice and kept in seed germination at 25^0C temperature and 70 % RH. The observation were recorded on seventh day and per cent seed germination was calculated as below.

$$\text{Per cent seed Germination} = \frac{\text{No. of normal seedling}}{\text{Total no. of seed kept}} \times 100$$

Table 1: Treatments details

S. No.	Treatment	Dose/kg seed
1.	Clove powder	3 g
2.	Tulasi leaf powder	3 g
3.	Black pepper seed powder	3 g
4.	*Acorus calamus* rhizome powder	10 g
5.	Sesame seed oil	5 ml
6.	Soybean oil	5 ml
7.	Castor oil	5 ml
8.	Untreated control	---

Table 2: Effect of botanicals on per cent seed germination of stored green gram seed damaged by *Callosobruchus chinensis* (L.)

S. No.	Treatments	Doses g or ml /kg seed	Per Cent Seed Germination					
			In 1st month	In 2nd month	In 3rd month	In 4th month*	In 5th month*	In 6th month*
1	Clove powder	3 g	92.00 (9.59)	89.00 (9.43)	86.00 (9.27)	85.00 (67.22)	84.00 (66.43)	83.00 (65.66)
2	Tulasi leaf powder	3 g	82.00 (9.06)	81.33 (9.02)	78.00 (8.83)	76.00 (60.67)	72.00 (58.05)	71.00 (57.42)
3	Black pepper seed powder	3 g	93.00 (9.64)	90.00 (9.49)	88.00 (9.38)	87.00 (68.88)	85.00 (67.22)	84.00 (66.43)
4	*Acorus calamus* rhizome powder	10 g	94.00 (9.70)	93.00 (9.64)	89.00 (9.43)	89.00 (70.64)	87.00 (68.88)	85.00 (67.22)
5	Sesame seed oil	5 ml	87.00 (9.33)	87.00 (9.33)	85.00 (9.22)	82.00 (64.90)	81.00 (64.16)	81.00 (64.16)
6	Soybean oil	5 ml	86.00 (9.27)	84.00 (9.17)	83.00 (9.11)	79.00 (62.73)	79.00 (62.73)	77.00 (61.35)
7	Castor oil	5 ml	89.00 (9.43)	89.00 (9.43)	87.00 (9.33)	84.00 (66.43)	83.00 (65.66)	83.00 (65.66)
8	Untreated/control	-	79.00 (8.89)	74.00 (8.60)	70.00 (8.37)	67.00 (54.94)	63.00 (52.54)	58.00 (49.61)
	F' test		Sig.	Sig.	Sig.	Sig.	Sig.	Sig.
	SE(m) ±		0.03	0.03	0.03	0.44	0.43	0.54
	CD at 5 %		0.09	0.09	0.10	1.33	1.28	1.61
	CV		0.57	0.56	0.60	1.19	1.17	1.50

Figures in parenthesis are corresponding Square root transformation value
*Figures in parenthesis are corresponding Arc sign transformation value

Results and Discussion

Results presented in table 2 revealed that all treatments were found statistically superior over untreated control. Generally germination is the combined effect of botanicals treatment as well as *Callosobruchus chinensis* infestation. But we have not found any adverse effect of botanicals on seed germination, at the same time there are no references on effect of botanicals on germination of seeds.

The order of per cent seed germination, i.e. maximum per cent seed germination was recorded in the seed treated with *Acorus calamus* rhizome powder @ 10 g/kg seed (94.00%) followed by black pepper powder @ 3 g/kg seed (93.00%),

clove powder @ 3 g/kg seed (92.00%), castor oil @ 5 ml/kg seed (89.00%), sesame oil @ 5 ml/kg seed (87.00%), soybean oil @ 5 ml/kg seed (86.00%), tulasi leaf powder @ 3 g/kg seed (82.00%) and untreated control (79.00%) in 1st month, while after 6 months, cumulative mean of per cent seed germination (of entire six months data) was derived and it was found that similar order of effectiveness of botanicals on per cent seed germination even after six months. These findings derive support from Channabasanagowda *et al.* (2008) [2] and reported that sweet flag rhizome powder @ 10.0g/kg of seed found better by recording significantly higher germination percentage (87.00) over untreated control at the end of 10th month of storage. Miah *et al*. (2013) reported 90% germination of green gram seed treated with castor oil @ 8 ml/kg after 50 DAT [7].

Conclusions

We have found that all the botanicals are safer, cheaper and preferable for preventing *Callosobruchus chinensis* infestation over a six month of storage period. At the same time we have observed that there was no one botanical has shown adverse effect on percent seed germination of green gram seeds.

Acknowledgements

Authors are thankful to AICRP on PHET, Seed Technology Research Unit (STRU), and Head, Department of Entomology Dr. P.D.K.V. Akola (M.S) for providing necessary facilities.

References

1. Bekele AJ, Oforiand DO, Hassanali A. Products derived from the leaves of *Ocimum kilimandscharicum* (Labiatae) as post harvest grain protectants against the infestation of three major stored product insect pest. Bulletin of Entomological Research. 1995; 85:361-367.
2. Channabasanagowda NK, Patil B, Ninganur BT, Patil BN, Hunje R, Awaknavar JS. Effect of botanical seed treatment on storability of wheat. Karnataka Journal Agricultural Science. 2008; 21(3):361-365.
3. Das GP. Pesticidal efficacy of some indigenous plant oils against the pulse beetle, *Callosobruchus chinensis* Linn. (Coleoptera: Bruchidae). Bangladesh Journal Zoololgy. 1986; 14(1):15-18.
4. Devi MB, Devi NV. Study on morphometric of *Callosobruchus* spp. Ann. Pl. Protec. Sci. 2013; 22(1):190-239.
5. Gosh SK, Durbey SL. Integrated management of stored grain pests. International book Distribution Company. 2003, 263.
6. Mendki PS, Maheshwari VL, Kothari RM. Pesticidal activity of certain plant extracts to control stored grain pest *Callosobruchus chinensis*. Pestology. 1999; 12:64-68.
7. Miah MA, Ali MR, Husna A, Mollah MMI. Efficacy of some botanicals against pulse beetle, *callosobruchus maculatus* (fab.) on stored green gram, *Vigna radiata*. Bangladesh J Entomol. 2013; 23(1):11-20.