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STUDY OF CHICKPEA VARIETIES AGAINST PULSE BEETLE (CALLOSOBRUCHUS CHINENSIS) IN STORAGE

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ABSTRACT

Maximum fecundity was found on genotype RVSSG-38. The adult emergence on different genotypes ranged from 7.0 to 18.0. Genotype RVSSG-44 recorded maximum percent loss in seed weight. Genotype RVSSG-43 had minimum percentage of seed infestation. Susceptibility index of pulse beetle on different genotypes of chickpea showed that there were no significant differences among different genotypes. Infestation percentage positively and significantly associated with protein content in fresh seed and infested seed. Seed size and seed shape of the genotypes did not influence the fecundity, adult emergence, total development period and susceptibility index of pulse beetle.

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KEY WORDS : *Callosobruchus chinensis*, Chickpea, *Cicer arietinum* L., Plant extracts, Pulse beetle,

Introduction

India ranks first in the global chickpea production and area by contributing around 70 percent to the world's total chickpea production[7]. It has the highest nutritional compositions and free from anti-nutritive components compared to any other dry edible legumes. In India, Madhya Pradesh is the single largest producer in the country accounting for over 40 percent of total national production of chickpea[2]. Despite the high total production, yields of chickpea are low due to many biotic and abiotic constraints.

Among the constraints, the Pulse beetle, *Callosobruchus chinensis* L. is one of the serious insect pests that attack chickpea in storage. Bruchids are a major and growing problem in stored chickpea in all regions. While crops may be infested in the field, infestations are often too low to detect at harvest. Bruchids are most often not detected until seed has been stored for a reasonable period of time (for longer than three months). Bruchids breed rapidly in storage and by the time they are detected, the infested grain is usually unmarketable.

The grub feeds and develops exclusively on the seed, while the adult does not require food or water and spends its limited lifespan in mating and laying eggs on seeds[4]. Efficient control of stored grain pests has long been the aim of entomologists throughout the world and synthetic chemical pesticides have been used for many years to combat these pests[1]. Even currently, pest control measures in storage rely on the use of synthetic insecticide and fumigants, which is the quickest and surest method of pest control[8]. In order to reduce both over dependence on chemical for control and seed loss due to the bruchid attack, the search for host plant resistance in chickpea seeds has increasingly become the option of choice in recent years. This study seeks to evaluate the susceptibility of these genotypes/varieties to infestation and damage by *C. chinensis* with the aim to select those with inherent resistance/tolerance for inclusion in breeding programme.

Material and Methods

Investigation on the, "Reaction of certain Bengal Gram (*Cicer arietinum* L.) genotypes to *Callosobruchus chinensis* L. (Coleoptera: Bruchidae)" was carried out under laboratory conditions in the Department of Entomology, College of Agriculture Gwalior (M.P.) during 2015-2016.

Stock culture of the beetle was maintained on the seeds of *Kabuli* and *Desi* variety of chickpea. The variety genotype was used throughout the study period, provided by the chickpea breeder, AICRP on chickpea, Gwalior (M.P). Adult beetles were released on the seeds through plugged with non-woven fabric (muslin cloth) mounted with the help of rubber band on the lid. The trough was kept in dark at a rat-proof place. Insects were reared for several generations in conditions favoring the distinct prevalence of normal morphs before their use in the current trials. Aspirator was used for transferring and handling of the beetles to avoid injury to them. Freshly emerged beetles of 24 hours were used in the experiment.

TABLE-1: Evaluation of chickpea genotypes against *Callosobruchus chinensis* L.

Genotypes	Fecundity*	Adult emergence*	Developmental period (days)	Weight loss (%) **	Infestation (%) **	Susceptibility Index
RVSSG-30	36 (6.0)	10 (3.16)	27.6	24.84 (29.79)	83.30 (66.05)	3.62
RVSSG-31	43 (6.56)	14 (3.74)	28.3	26.50 (30.89)	80.00 (63.55)	4.04
RVSSG-36	35 (5.92)	12 (3.46)	25.8	23.81 (29.15)	83.31 (65.99)	3.69
RVSSG-42	32 (5.66)	8 (2.83)	26.3	22.41 (28.16)	86.66 (68.78)	3.43
RVSSG-43	33 (5.74)	13 (3.61)	27.4	17.42 (24.50)	73.33 (58.93)	4.06
RVSSG-44	27 (5.20)	18 (4.24)	25.8	29.20 (32.65)	83.31 (66.05)	4.18
RVSSG-32	48 (6.93)	12 (3.46)	27.1	19.30 (25.98)	93.33 (75.48)	3.98
RVSSG-35	52 (7.21)	15 (3.87)	25.9	21.70 (27.69)	80.00 (63.51)	4.53
RVSSG-38	70 (8.37)	7 (2.65)	26.1	14.86 (22.83)	86.66 (68.77)	4.5
RVSSG-41	43 (6.56)	9 (3.00)	26.4	15.12 (22.72)	83.31 (66.13)	3.2
ICC-4812	57 (7.55)	16 (4.00)	26.2	16.56 (23.81)	86.66 (68.70)	4.59
JG-130	55 (7.42)	11 (3.32)	26.3	20.89 (27.09)	76.66 (61.16)	3.95
SEm (±)	(0.28)	(0.41)	1.50	(2.69)	(3.06)	1.03
C.D. at 5 %	(0.58)	(0.85)	NS	(5.56)	(6.32)	NS

* Figures in parentheses are square root transformed value

****Figures are angular transformed data**

The bioassay was performed on twelve genotypes of chickpea having variation in seed size, colour, shape and texture of seed test. Clean and undamaged seeds of chickpea genotypes were acquired from the chickpea breeder, College of Agriculture, Gwalior, (M.P). The seeds of each genotype were examined under binocular microscope to make sure that these are free from any pre-storage infestation or egg laying by any pest. These seeds were then conditioned to a room temperature before being used for bioassay.

Studies were conducted with 12 genotypes of chickpea having variation in seed size, seed coat colour and seed shape. The genotypes were categorized as under:

1. Seed size (on the basis of weight of 100 seeds)

(i) Very small (less than 18 g / 100 seeds)

(ii) Small (18 to 22 g / 100 seeds)

(iii) Medium (more than 22 g / 100 seeds)

2. Seed coat colour (on the basis of visual observations)

(i) Ivory

(ii) Green

(iii) Brown

3. Seed shape (on the basis of visual observations)

(iv) Angular

(v) Owl's head

(vi) Pea shaped

Results and Discussion

Data recorded on fecundity on different genotypes showed significant differences among different genotypes. Minimum fecundity was recorded on genotypes RVSSG-44 which was found significantly less than the eggs laying on genotypes RVSSG-36, RVSSG-30 and RVSSG-31 & RVSSG-41. On the other hand, maximum fecundity was recorded on genotypes RVSSG-38 which was found

significantly higher than the eggs laid on rest of the genotypes. The present study was in accordance with findings of[3] in different experimental conditions.

Adult emergence

Significant differences were observed among different genotypes with regards to number of adults emerged from different genotypes of chickpea. Minimum number of adults (7.0) was emerged from RVSSG-38 which was found at par with the genotypes RVSSG-42, RVSSG-4. Whereas, maximum number of adult (18.0) was emerged in genotype RVSSG-44, which was found significantly higher than the number of adult emerged from rest of the genotypes, except ICC-4812, RVSSG-35. On the basis of oviposition and adult emergence, that some chickpea varieties were classed to be the least susceptible and some were highly susceptible[9].

Weight loss (%)

Percent loss in weight was in range of 14.86 to 29.20 in different genotypes with significant difference. Significantly less percent loss in seed weight was observed in genotype RVSSG-38 than rest of the genotypes, except RVSSG-41, ICC-4812, RVSSG-43, RVSSG-32, JG-130, RVSSG-35 and RVSSG-42. On the other hand genotype RVSSG-44 recorded maximum. Similar results were reported by those[6], who observed more damage in the varieties having large yellow seeds with smooth and thin seed coat than small brown seed with hard seed coat.

Seed infestation (%)

Significant differences were observed among different genotypes of chickpea with regards to percent seed infestation. Genotype RVSSG-43 had minimum percentage of seed infestation which was significantly less than rest of the genotypes, except JG-130 and RVSSG-31 & RVSSG-35. On the other hand genotype RVSSG-32 recorded maximum.

Susceptibility Index

Data recorded on susceptibility index of pulse beetle on different genotypes of chickpea showed that there were no significant differences among different genotypes. However, the susceptibility index ranged from 3.20 g in RVSSG-41 to 4.59 g in ICC-4812. Genotypes of dark brown in colour to be tolerant against pulse beetle which collaborate with the present findings[5].

Developmental period

The developmental period (number of days taken by the adult to emerge since the oviposition) was in range of 25.8 to 28.3 days in different genotypes with no significant differences among them and were similar. Small size grain to be tolerant against pulse beetle[5].

References

1. Ani D. Screening of some biopesticides for the control of *Callosobruchus chinensis* in stored Black Beans (*Vigna mungo*) in Imo State. *J. of American Soc.* 2010; **6** : 186-188.
2. Anonymous. Project Coordinator's Report. AICRP on Chickpea, IIPR, Kanpur. 2015; 36
3. Kazemi Fatemeh Talebi, Ali Asghar, Fathipour Yaghoub, Farahani Samira. A comparative study on the effect of four leguminous species on biological and population growth parameters of *Callosobruchus maculatus* (F.) (Col.; Bruchidae). *Adv. in Environ. Bio.* 2009; **3** (3) : 226.
4. Kergoat GJ, Silvain JF, Delobel A, Tuda M, Anton KW. Defining the limits of taxonomic conservation in host-plant use for phytophagous insect: Molecular systematic and evolution of host-plant associations in the seed beetle genus *Bruchus Linnaeus* (Coleoptera; *Crysomelidae: Bruchidae*). 2007; **43** : 251-259.
5. Muhammad Aslam Shaheen F A, Abbas MA, Anbreen Saba. Management of *Callosobruchus chinensis* Linnaeus through use of resistance in stored chickpea varieties. *World J. of Agric. Sci.* 2012; **2** (1) : 82-84.
6. Rai PC, Singh J. Relative susceptibility of chickpea *Cicer arietinum* L. varieties to pulse beetle *C. chinensis* (L.). *Ind. J. of Agric. Sci.*1989; **59** (2) : 135 – 136.
7. Sandhu JS, Singh Sarvjeet Bains TS, Singh Inderjit Gill BS, Ashok Kumar, Dhaliwal Inderpreet. Progress in Varietal Development in Pulse Crop. In**:** Souvenir Annual Group Meet on Rabi Pulses (Chickpea and MULLaRP) and Brain Storming Meeting on Promotion of Pulses in Indo-Gangetic Plains of India. 31 August- 3 September, 2015. PAU, Ludhiana. 2015; 4-10.
8. Shaheen FA, Khaliq A. Management of pulse beetle, *Callosobruchus chinensis* L. (Coleoptera; Bruchidae) in stored chickpea using ashes, red soil powder and turpentine oil. *Pak. Entomologist.* 2005; **27** : 19-24.
9. Sharvale TG, Borikar PS. Relative resistance of some important varieties of chickpea to damage by pulse beetle. *Ind. Agriculturist.* 1995; **39** (2) :143-146.