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Effect of different chickpea varieties on development of the pulse beetle, *Callosobruchus chinensis* (L.)

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ABSTRACT

Studies conducted on growth and development of the pulse beetle, *Callosobruchus chinensis* (L.) on 11 chickpea varieties in Department of Entomology, G.B. Pant University of Agriculture and Technology Pantnagar during June- September, 2014 revealed that the fecundity of the pulse beetle female varied significantly on different chickpea varieties, minimum being on PBG 1 (59.0 eggs/100 seeds) and maximum on PKG 1 (81.0 eggs/100 seeds). The development period for eggs (5.33-7.0 days), larva (17.0-18.67 days) and pupa (5.67-7.33 days) on different varieties did not differ significantly however, significant variation in the total development period from eggs to adult (28.67-32.33 days) was recorded in different varieties. Similarly the growth index of the pulse beetle varied significantly on various varieties (0.52-0.71). The results of study showed that the chickpea variety PKG 1 was most suitable for growth and development of the pulse beetle.

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INTRODUCTION

Pulse beetle, *Callosobruchus chinensis* L., is one of the most destructive pests of chickpea in storage. It is cosmopolitan and a serious pest of mung, peas, cowpeas and lentil and has also been reported attacking cotton seed, sorghum and maize (Ahmed *et al.*, 2003). In India over 200 species of insects have been recorded infesting various pulses. Out of five known species of *Callosobruchus, Callosobruchus chinensis, C. maculatus* and *C. analis* are most common species of pulse beetle found in India to infest stored legumes (Raina, 1970). One of the major constraints in production of pulses is the insect pests which inflict severe losses both in the field and storage (Mookherjee *et al*., 1970). In case of severe infestation cent per cent damage is caused by the pest (Pruthi and Singh, 1950). Earlier, the biology of the pulse beetle has been studied by several workers (Howe and Currie, 1964; Raina, 1970 and Sharma and Thakur, 2014). It is well known fact that food constituents play a vital role in the survival and reproduction potential of the insects. The grain

characters, which also interfere the normal physiology or feeding of the insect, affects the biology of the pest adversely and these make a variety resistant to insect attack (Jat *et al.*, 2013). Present study was carried out to evaluate the effect of various chickpea varieties on growth and development of the pulse beetle with a view to find out varietal resistance against this beetle.

MATERIAL AND METHODS

Experiments were conducted in the laboratory of Department of Entomology, Department of Entomology, College of Agriculture at G.B. Pant University of Agriculture and Technology, Pantnagar, Uttarakhand. To study growth and development of pulse beetle, *C. chinensis,* hundred number weighed seeds of eleven varieties (PG 4, PG 186, PKG 2, PG 372, PG 3, PBG 1, BGM 547, BG 1003, PG 114, BG 1053 and PKG1) were kept separately in half liter plastic jar and single pair of one day old adults of *C. chinensis* was released in the plastic jar separately. The mouth of the plastic jar was covered with double folded muslin cloth fastened with rubber band. The jars were placed in incubator at a temperature of 30±02^0 C and 70±5 per cent relative humidity. This experiment was replicated thrice for each variety. Adults were removed from these plastic jars after their death and total number of eggs laid by a female on chickpea seeds, incubation period, developmental period (larval and pupal) and total developmental period were recorded. Observations on incubation, larval and pupal period inside the grain were recorded by breaking the whole grain with the help of the needle and observing the stage of insect with the help of magnifying glass. The growth index of the pulse beetle on different varieties was also worked by recording development period and adult emergence following data thus obtained was analyzed statistically in Completely Randomized Design.

RESULTS AND DISCUSSION

Data was pertaining to the biology of the *C. chinensis* on chickpea varieties is presented in Table 1. The number of eggs laid/ female ranged from 59.00 to 81.00 with an average of 71.33 eggs per female. Maximum (81.00 eggs / female) egg laying was in PKG 1 while minimum in PBG 1 (59.00 eggs/ female) which was different significantly. The incubation period varied from 5.33 to 7.00 days with an average of 6.27 days. The larval period of *C. chinensis* on chickpea seeds ranged from 17.00 to 18.67 days with an average of 17.66 days. The maximum time for larval development was recorded in PG 4 and PBG 1 (18.67 days) and minimum time for larval development was recorded in PG 1053 and PKG 1 (17.00 days). Pupal period of *C. chinensis* in different varieties of chickpea varied from 5.67 to 7.67 days. The longest pupal period 7.67 was obtained in PBG 1 whereas the shortest (5.67 days) was found in PKG 1. The total development period from egg

Table 1 : Development and growth of pulse beetle of life cycle of pulse beetle (*C. chinensis*) reared on different chickpea varieties in storage condition

Chickpea variety	Mean number of eggs/ 100/female laying/female	Development period (days)				Growth index
		Eggs	Larva	Pupa	Total development period	
PG 4	68.33	7.00	18.67	6.33	32.33	0.60
PG 186	62.00	6.67	18.33	6.33	31.33	0.56
PKG 2	72.26	6.33	17.67	5.67	29.67	0.63
BG372	63.00	6.67	17.33	7.33	31.33	0.58
PG 3	61.67	6.33	17.66	7.33	31.00	0.60
PBG 1	59.00	6.33	18.67	7.67	32.67	0.52
BGM 547	65.33	6.00	17.33	6.67	30.33	0.53
BG1003	77.33	5.33	17.33	6.00	28.67	0.62
PG 114	67.00	6.33	17.33	6.67	30.33	0.55
BG 1053	79.67	6.00	17.00	6.00	29.00	0.62
PKG 1	81.00	6.00	17.00	5.67	28.67	0.71
Mean	68.78	6.27	17.66	6.51	30.48	0.56
S.E.±	0.494	-	-	-	0.145	0.01
C.D. (P=0.05)	1.458	NS	NS	NS	0.428	0.03

NS=Non-significant

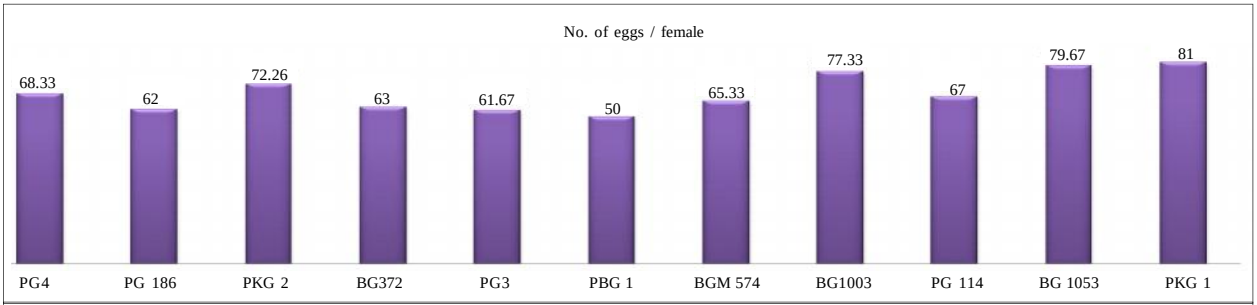

Fig. 1 : Number of eggs/female of *C. chinensis* on different varieties of chickpea

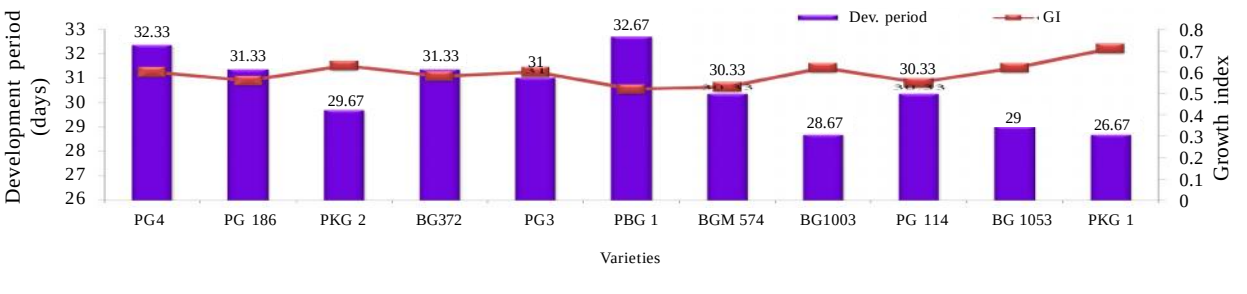

Fig. 2 : Total development period of *C. chinensis* on different varieties of chickpea

to adult was found to be highest in PBG 1 (32.67days) and lowest in PKG 1 and BG 1003 (28.67 days). The variety PBG 1 was the least suitable host and PKG 1 was the most preferred host for *C. chinensis* among the chickpea varieties tested (Fig. 1 and 2). The difference in the duration for larval, pupal period and hatching of the eggs might be either due to non preference or some other antinutritional plant secondary metabolite in the seeds of the chickpea varieties. The average incubation period, combined larval and pupal period were 3.5 to 5.0 and 18.8 days, respectively for C. *chinensis* (Raina, 1970).

The growth index for *C. chinensis* on different chickpea varieties varied from 0.52 to 0.71. The variety PBG 1 was found to be least susceptible to the attack by *C. chinensis* showing lowest growth index (0.52) which was *at par* with BGM 547 (0.53) and PG 114 (0.55). The growth index was also found to be low on PG 186 (0.56) which significantly differed from PG 3 (0.60) and PKG 2 (0.63). Maximum growth index of the pulse beetle was recorded on variety PGK 1 (0.71) which significantly differed from all other varieties.

There were highly significant variations in growth index which is a value derived from both adult emergence and developmental period among the varieties. It also showed that PBG 1, BGM 547 and PG 114 varieties were the least preferred ones exhibiting a considerable moderately resistance to *C. chinensis.* Growth index was highest in PKG 1 which showed that it is the highly susceptible of all the varieties. These results are supported by the findings of Tripathi *et al.* (2013) who reported growth index of C. *maculatus* ranging from 0.42- 0.68 in cowpea genotypes. Sharma and Thakur (2014) reported high growth index ranging from 1.28 to 2.13 on different chickpea genotypes for *C. chinensis.*

On basis of observations recorded on the developmental time, and oviposition of *C. chinensis,* it is concluded that shorter development time and greater total oviposition on a host reflect the suitability of the host. In the future, efforts should be devoted to the physiology and biochemistry of chickpea seeds to develop resistance to damage by *Callosobruchus chinensis* L.

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