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Studies on the Development of pulse beetle, *Callosobruchus chinensis* in different chickpea genotypes under laboratory conditions

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ABSTRACT
Studies conducted on growth and development of the pulse beetle, *Callosobruchus chinensis* (L.) on 15 chickpea genotypes in Department of Entomology, Dr. Rajendra Prasad Central Agricultural University, Pusa during June- September, 2017 revealed that the fecundity of the pulse beetle female varied significantly on different chickpea genotypes, minimum being on C1021 (46.82 eggs/100 seeds) and maximum on C1025 (97.22 eggs/100 seeds). The development period for eggs (4.33-6.67 days), larva (16.0-17.67 days) and pupa (4.57-6.74 days) on different genotypes did not differ significantly. However, significant variation in the total development period from eggs to adult (24.90- 30.06 days) was recorded in different genotypes. Similarly the growth index of the pulse beetle varied significantly on various genotypes (2.09-3.10). The results of study showed that the chickpea genotype C1120 was most suitable for growth and development of the pulse beetle which showed shorter development time and greater total oviposition reflecting the suitability of the host.
Key words: *Callosobruchus chinensis*, genotypes, chickpea

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INTRODUCTION
The pulse beetle, *Callosobruchus chinensis* (L.) (Coleoptera: Bruchidae) is one of the three species that cause significant damage to the stored legumes causing up to 55.7 per cent of damage in severe infestation [3]. It has a capability to infest not only cultivated host plant in the field and stored chickpea but also a few other legumes [4] Feeding of larvae on the cotyledons causes significant loss in seed weight and viability. It reduces the biochemical characters for seed quality which leads to lack of storability of seeds in storage. The larvae of bruchid feed on the pulse seed contents reducing their degree of usefulness making them unfit either for planting or for human consumption [2]. The seed in case of severe infestation become completely hollow and are unmarketable but tolerant/resistant varieties can tolerate the effect of pulse beetle [6]. 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 [5]. 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, Dr. Rajendra Prasad Central Agricultural University, Pusa (Samastipur). To study growth and development of pulse beetle, *C. chinensis,* hundred number weighed seeds of fifteen genotypes (C1088, C1064, BG372, C1021, C1121, C1147, C1156, BG256, C1022, C1120, C1063, C1160, C1023, C1025 and C1165) 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±020 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 genotypes 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 genotypes is presented in Table 1. The number of eggs laid/ female ranged from 46.82 to 97.22 with an average of 61.87 eggs per female. Maximum (97.22 eggs / female) egg laying was in C1025 while minimum in C1021 (46.82 eggs/ female) which was different significantly. The incubation period varied from 4.33 to 6.67 days with an average of 5.53 days. The larval period of *C. chinensis* on chickpea seeds ranged from 16.00 to 17.67 days with an average of 16.89 days. The maximum time for larval development was recorded in C1088 and C1147 (17.67 days) and minimum time for larval development was recorded in C1021 and C1120 (16.00 days). Pupal period of *C. chinensis* in different varieties of chickpea varied from 4.57 to 6.74 days. The longest pupal period 6.74 was obtained in C1165 whereas the shortest (4.57 days) was found in C1120. The total development period from egg to adult was found to be highest in C1021 (30.06 days) and lowest in C1120 (24.90days). The genotype C1021 was the least suitable host and C1088 and C1147 were the most preferred host for *C. chinensis* among the chickpea genotypes 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 genotypes. The average incubation period, combined larval and pupal period were 3.5 to 5.0 and 18.8 days, respectively for C. *chinensis* [7].

The growth index for *C. chinensis* on different chickpea genotypes varied from 2.09 to 3.10. The genotype C1021 was found to be least susceptible to the attack by *C. chinensis* showing lowest growth index (2.09). Maximum growth index of the pulse beetle was recorded on genotype C1120 (0.71) which significantly differed from all other genotypes.

There were highly significant variations in growth index which is a value derived from developmental period among the genotypes. It also showed that C1088, C1064, BG372, C1021, C1121, C1147, C1156, BG256, C1022, C1063, C1160, C1023, C1025 and C1165 genotypes were the least preferred ones exhibiting a considerable moderately resistance to *C. chinensis.* Growth index was highest in C1120 which showed that it is the highly susceptible of all the genotypes. These results are supported by the findings of Ahmad *et al.* [1] who reported growth index of C. *chinensis* ranging from 0.52 to 0.71 in chickpea varieties. Sharma and Thakur [8] 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 *C. chinensis* (L.).

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

Chickpea genotype	Mean no. of eggs laid on 100 seeds	Development period (days)				Growth index
		Incubation	Larva	Pupa	Total development period	
C1088	51.33	6.06	17.67	6.33	25.67	2.34
C1064	54.88	5.24	17.00	6.00	28.24	2.29
BG372	53.43	6.67	17.61	6.33	29.61	2.27
C1021	46.82	4.33	16.00	6.00	30.06	2.36
C1121	55.71	5.00	16.67	6.37	28.04	2.48
C1147	60.25	6.33	17.67	5.45	29.45	2.19
C1156	63.89	5.11	16.67	5.33	27.11	2.34
BG256	47.78	6.33	17.33	6.40	29.06	2.09
C1022	56.50	5.33	17.00	5.07	27.40	2.76
C1120	79.20	4.33	16.00	4.57	24.90	3.10
C1063	70.84	5.10	17.00	6.14	28.24	2.56
C1160	50.32	5.22	16.33	6.67	27.22	2.21
C1023	79.59	5.00	16.33	5.67	26.00	2.46
C1025	97.22	6.33	17.07	6.67	29.07	2.12
C1165	60.29	6.67	17.00	6.74	29.41	2.26
Mean	**61.87**	**5.53**	**16.89**	**5.98**	**27.94**	**2.38**
SEm±	**2.95**	-	-	-	**0.93**	**0.19**
CD at 5%	**7.58**	NS	NS	NS	**2.80**	**0.58**

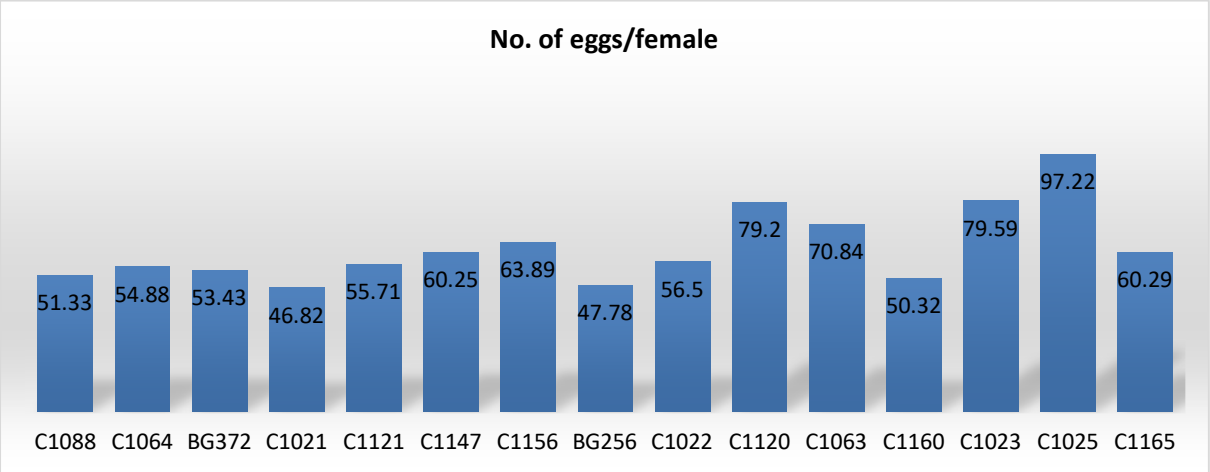

Fig. 1: Number of eggs/female of *C. chinensis* on different varieties of chickpea

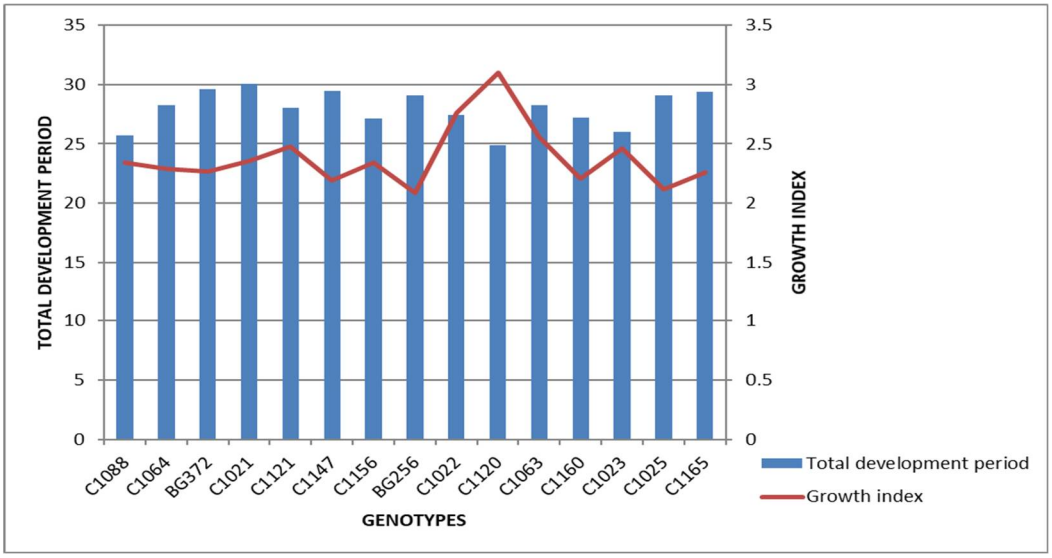

Fig. 2: Total development period of *C. chinensis* on different varieties of chickpea

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