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Development of *Callosobruchus chinensis* in Certain Vegetable Seeds[1]

by

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Introduction : Unlike other insects associated with stored grains and seeds, the pulse beetle, *Callosobruchus chinensis* is rather specific in its food habits. The natural hosts of this species have been listed by Chittenden (1898), Lefroy (1909), Fletcher (1914), Rao (1917), Fletcher and Ghosh (1919), Black (1922), Ghosh (1937) and Pruthi and Singh (1950). In India it has been found to feed only on a particular group of host seeds belonging to the Natural Order Leguminosae. During surveys of insect pests of vegetable seeds in stores and certification of the vegetable seed samples, this pest has been intercepted from almost every kind of the important leguminous vegetable seeds. It was observed that this beetle laid eggs freely in all such seeds but its further development in these seeds was not uniform, which was also noticed by Ghosh (1937). In some, it developed very fast while in others it could hardly subsist and even died without entering the seed.

These general observations led us to investigate the ability of this beetle to reproduce in and damage the different host seeds. This information will facilitate fixing entomological standards for the seeds which are being sold in the market. Certain seeds may be declared infested on account of the presence of bruchid eggs on them but due to the negative food value or the unfavourable physical make up, the pest may not be able to injure them. This information will further help in understanding the numerical increase of this pest in different hosts in stores. Moreover, not much is known regarding the effect of the various foods on the development of this bruchid which is one of the most serious pests of legumes in stores. Hence, this paper will also serve as a preliminary scientific report on the relative food value of some of the important vegetable legumes to this insect.

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Material and Method : Experiments were conducted during June to August, 1957, at room temperature using single pair culture of *Callosobruchus chinensis* bred on cowpea (Pusa Barsati), where the average development period from egg to adult stage was about 25 days. The insect was reared on the following recorded hosts and their effect on the development of this beetle was observed.

Seed	% *Moisture*
Canavalia gladita (Sword bean)	10·2
Dolichos lablab (Hyacinth bean)	11·3
Vigna sinensis (Cowpea, K 700)	11·6
,, ,, (Desi)	11·3
,, ,, (K 397)	11·2
,, ,, (Pusa Barsati)	11·5
Cyamopsis tetragonoloba (Cluster bean)	9·8
Vicia faba (Broad bean)	10·3
Phaseolus vulgaris (Kidney bean. red)	10·7
,, ,, (Kidney bean, Desi)	11·1
,, ,, (,, Stringless)	11·2
Cicer arietinum (Chick pea)	10·5
Pisum sativum (Garden pea)	11·4
Glycine max (Soy bean)	11·8

The moisture content of the seed was determined by the usual oven method. Twenty-five grams of seeds from each kind were sorted free from bruchid eggs on them and placed in 6" petri-dishes. Twenty pairs of newly emerged adults (24 hours emergence) were then introduced in each seed lot. The next day (after 24 hours) the number of eggs laid on each kind of seed were counted and the seeds bearing eggs were transferred to 4" petri-dishes. The effect of the different seeds on the development of the pest was judged by the time taken by the eggs to develop into adults. The real growth period is from the hatching of the eggs to the formation of pupae but as the larvae bore directly from the egg-shell to the seed and the pupation also takes place inside the seed, it is ordinarily not possible to fix the exact date either for hatching of the eggs or the pupation of the larvae without injuring them. In order to overcome this difficulty the growth period was calculated from the date of laying of eggs to the date of the emergence of adults. The eggs were kept under observation for two months and the emergence of adults in each seed lot was regularly noted.

Results: The results are tabulated in the accompanying table where the percentage of eggs becoming adults is given together with the average time taken to complete the development. The growth index was calculated as worked out by Singh and Pant (1955) in their nutritional studies of the Khapra beetle. In this experiment this was obtained by dividing the percentage of eggs becoming adults with the average time taken to complete the development. The greater the value of the index figure the better suited was the seed for the growth of the insect.

TABLE 1

Rate of development of *Callosobruchus chinensis* in different vegetable seeds.

Seed	% eggs becoming adults	Range in days	Average	Growth index
Sword bean	0	—	—	All larvae died
Hyacinth bean	0	—	—	do.
Cowpea K 700	93·8	22—30	26·4	3·6
,, Pusa Barsati	95·9	21—30	25·2	3·8
,, K 397	99·0	21—31	25·6	3·9
,, Desi	98·4	21—31	26·3	3·7
Cluster bean	0	—	—	All larvae died before entering seed
Broad bean	2·7	26—28	27·0	0.1
Kidney bean (red kidney)	0	—	—	All larvae died
,, ,, (Stringless)	0	—	—	do.
,, ,, (Desi)	0	—	—	do.
Chick pea	100	21—32	27·4	3·6
Garden pea	33·3	21—42	32·8	1·0
Soy bean	0	—	—	All larvae died

It can be seen that the emergence of adults took place only in cowpea, broad bean, chick pea and garden pea. The newly hatched larvae were unable to penetrate the seed coat in cluster bean and died within the egg-shell. In sword bean, hyacinth bean, kidney bean and soy bean the larvae entered the seed upto a pin-point but all were found dead when seeds were dissected out at the end of the test. Among the susceptible seeds the development was very fast in cowpeas and chick pea where 93·3 - 100% successful emergence took place within an average development period of 25·2 to 27·4 days.