



Investigation on Incubation Period, Hatchability and Larval Period of Pea Weevil (*Bruchus pisorum* L.) Across Various Pea Cultivars

Ritikesh Kumar Roy, Satya Prakash Srivastava, Puja Singh

Abstract: The underlying study was conducted to examine the Incubation Period, Hatchability, and Larval Period of the Pea Weevil (*Bruchus pisorum* L.), which is one of the most detrimental stored pests of the common field pea (*Pisum sativum*). The completely randomised design (CRD)* experiment was conducted for the test insect, *Bruchus pisorum*, with three replications (R1, R2, and R3) under storage conditions on pea grains, and the incubation period, hatchability, and the larval period were observed during its growth and development. The present investigation was carried out to examine the population dynamics of the pea weevil, *Bruchus pisorum*, on pea (*Pisum sativum*), and to observe growth parameters in the research laboratory from October 2024 to December 2025. The incubation period of the pest on various pea cultivars ranged from 3.96 (Malviya pea - 15) – 8.97 (Rachna) days, the hatchability percentage in the pea varieties ranged from minimum 93.30 percent (Rachna) to maximum of 96.81 per cent (Malviya pea - 15), and the larval periods ranged from 24.67 days (Malviya pea - 15) to 36.33 days (Rachna). The Rachna variety was found to be highly resistant, whereas the Malviya pea-15 was highly susceptible to the insect pest *Bruchus pisorum*. IPFD 9-2 come out as slightly less resistant than Rachna. IPFD 13-2 is moderately to highly susceptible; IPFD 12-8 and Pant – 5 are moderately susceptible, while IPFD 10-12, IPFD 13-2, IPFD 6-3, and Malviya-2 are moderately susceptible to the insect pest.

Keywords: *Bruchus Pisorum* L., Pea Weevil, Incubation Period, Hatchability, Susceptible, Resistant.

Nomenclature:

CRD: Completely Randomised Design

I. INTRODUCTION

The agricultural economies of different countries are enhanced by pulses, which play a significant role. Pea is regarded as one of the most important legumes due to its high protein content and widespread use in human diets. It is believed that the common field pea (*Pisum sativum*) originated in the Middle East, including northwest India and

Afghanistan, the Near East, and Ethiopia. Pea (*Pisum sativum* L.), belonging to the family Leguminosae, is an annual grown as both a garden and a field crop.

It is a major source of plant-based dietary protein for animals and is a common, popular, and economically beneficial legume. It serves as a staple food for millions of people in the country and, through exports, becomes a source of foreign currency, enhancing the nation's economy. In India, Uttar Pradesh is the leading contributor to pea production, accounting for 48% of the country's total production and producing around 2700 tonnes per year (ICAR-IIPR (2022) [1]). The farmers face difficulties storing peas because the peas are infested with *Callosobruchus rhodesianus*, *Bruchus pisorum*, *Agrotis ypsilon*, *Exelastis atmoza*, *Melanagromyza obtusa*, *Helicoverpa armigera*, etc. The result is a loss of product quality and quantity, as well as the farmer's economy. Among the above pests, *Bruchus pisorum* is very noxious. It is a member of the family Chrysomelidae of order Coleoptera: Bruchidae and class: Insecta of phylum Arthropoda, commonly known as pea weevil and is a primary limiting factor for worldwide production of field pea, *P. sativum*. Pea weevil is a univoltine bruchid first described by Linnaeus (1758) as *Dermestes pisorum*. *B. pisorum* is a major pest of *P. sativum* in most regions of the world where field peas are grown. It was first described in 1752, but was known as an important pest of dry peas in North America as early as the 1740s (FAOSTAT, 2018) [2]. The larval stage causes losses in crop yield and quality by consuming seeds. In addition, infested seeds have lower viability and germination rates.

II. MATERIAL AND METHODS

Under laboratory conditions in the Research Lab, Department of Zoology, Pt. Prithi Nath (PG.) In College, Kanpur, a completely randomised design (CRD) experiment was conducted for the test insect *Bruchus pisorum* with three replications (R1, R2, and R3) under storage conditions on pea grains, and the incubation period, hatchability, and the larval period were observed during its growth and development. The present investigation was carried out to examine the population dynamics of the pea weevil, *Bruchus pisorum*, on pea (*Pisum sativum*), and to observe growth parameters in the research laboratory from October 2024 to December 2025.

A. Test Insect Collection

The test insect pest, *Bruchus pisorum*, was collected from Naubasta galla mandi and Purani dal mandi in Nayaganj, Kanpur Nagar, Uttar Pradesh.

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B. Maintenance of Stock Culture

The stock culture of *B. pisorum* L. was initiated in the laboratory conditions on pea grains. The culture was maintained in plastic jars containing pea grains and was provided periodically to support the development of pea weevils. A pure culture of the pea weevil was developed by

infesting insect-free pea grains with a freshly emerged single mating pair. The culture was maintained in plastic jars and in a 10-litre glass jar. This culture was used to study the biology of *B. pisorum* L. Seed damage was higher in years with lower precipitation during the pea-growing season (Kalpin V.G. et al., 2019) [3].



[Fig.1: A Laboratory View of an Experiment Conducted (October 2024 to December 2025) During the Study Incubation Period, Hatchability, and Larval Period of the Insect Pest *Bruchus Pisorum* at the Department of Zoology, Pt. Prithi Nath (PG.) College, Kanpur]

C. Test Insect

Pea weevil, *Bruchus pisorum* (Coleoptera: Bruchidae), is both a field pest and a storage pest (appearing in storage after emergence), and is a major pest of field peas. The pea weevil, *B. pisorum*, is a seed-feeding chrysomelid beetle and is not, as its common name would imply, a true weevil, but a bruchid beetle (Voice, D.G. et al., 2022) [4]. They invade mature pods and seeds during storage and, to some extent, farm fields, thereby reducing the net yield of crops (Mishra, S.K. et al., 2018) [5]. The average size of an adult pea weevil is 2.5 mm in width and 5 to 7 mm in length, and the shape is globular with long legs. In general, pea weevils are brownish, with patches of grey, white, or black, and their antennae can reach up to one-third of their total length. Adults of *B. pisorum* emerging from these seeds were sexed by the presence (male) or absence (female) of a small spine on the tibia of the middle leg (Aznar-Fernández T et al., 2019) [6]. The last tergum is exposed because the elytra do not cover the abdomen's end. Instead of being covered by elytra, black and white setae cover its last abdominal part, and the hind femur contains a single spine, which is located in its inner ridge of the ventral margin. The females are slightly larger than the males. The tibia of the middle leg in males contains a spine at its distal end, and this presence of a spine distinguishes them from females. Precocity and low seed weight were associated with lower infection rates across the various studies. However, temperature, rainfall, and humidity appeared to be the environmental factors most strongly influencing faba bean seed weevil infestation (Carrillo-Perdomo et al., 2019) [7]. It is believed that the common field pea (*Pisum sativum*) originated in the Middle East, including northwest India and

Afghanistan, as well as the Near East and Ethiopia. The eggs are nearly 1.5 mm long and have a vivid golden colour. The creamy-coloured, limbless, curled pea weevil larvae can reach a maximum length of 5 mm. Larvae are C-shaped and can grow as long as 5 mm, with a brown head and creamy white coloured body with reduced legs. The eggs are bright orange and about 1.5 mm in length.

- Egg:** The egg is yellow, cigar-shaped and measures 1.5 mm by 0.6 mm. Females lay eggs on young pea pods, and emerging larvae penetrate through the pods into the seeds (Aznar-Fernández T (2020) [8]. The insects rely on plant VOCs to locate the crop or the host plant, after which specific mixtures act as oviposition stimulants. (Frérot B. et al, 2017) [9].
- Larva:** The larva is a legless, curled, cream grub which grows to about 5- 7 mm long.
- Pupa:** Pupation takes place inside the pods. The pupal stage lasts 1-3 weeks, depending upon the season.
- Adult:** The adult is a chunky beetle about 5 to 7 mm long, generally brownish flecked with white, black and grey patches. The tip of the abdomen extends beyond the wing covers and is white, marked with two black oval spots.

III. RESULT AND DISCUSSION

A. Incubation Period, Hatchability and Larval Period

The present investigation was carried out to study the Incubation



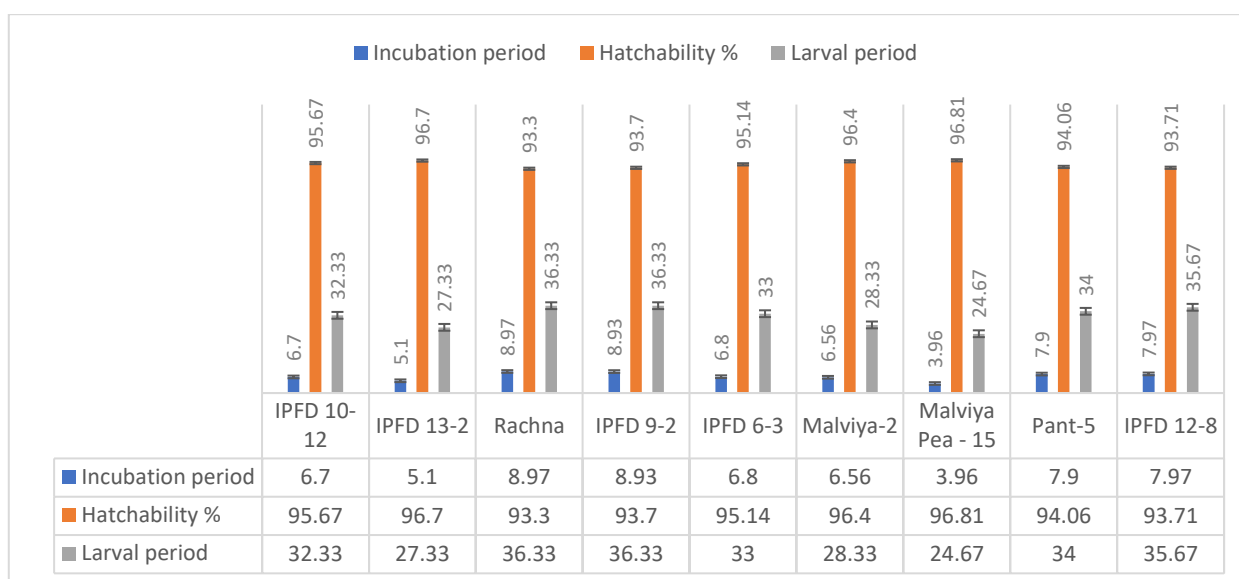


Period, hatchability, and Larval Period of Pea Weevil (*Bruchus pisorum* L.). The results of this study are presented in Table I.

Table I: Incubation Period, Hatchability and Larval Period of *B. Pisorum* in Different Pea Varieties.

Variety	Incubation Period	Hatchability %	Larval Period
IPFD 10-12	6.7	95.67 (78.03) *	32.33
IPFD 13-2	5.1	96.7 (79.53)	27.33
Rachna	8.97	93.3 (75.00)	36.33
IPFD 9-2	8.93	93.7 (75.46)	36.33
IPFD 6-3	6.8	95.14 (77.21)	33.00
Malviya-2	6.56	96.4 (79.06)	28.33
Malviya Pea - 15	3.96	96.81 (79.70)	24.67
Pant-5	7.9	94.06 (76.56)	34.00
IPFD 12-8	7.97	93.71 (75.46)	35.67
S.E. $\pm$ (M)	0.674	2.834	3.021
C.D.(P=0.05)	1.984	6.721	1.934

* Figure in parentheses is the angular value



[Fig.2: Graphical Representation of Incubation Period, Hatchability and Larval Period of *Bruchus Pisorum* in Various Pea Varieties]

Observation recorded on the incubation period of *Bruchus pisorum* presented in Table I and graphically represented in Fig. 2, revealed that the minimum incubation period of 3.96 days in pea variety Malviya Pea - 15. The maximum incubation period of 8.97 days was found in the variety Rachna, at par with 8.93 and 7.97 days in the varieties IPFD 9-2 and IPFD 12-8, respectively. The remaining varieties showed an intermediate response to the incubation period. The incubation period ranged from 4-7 days by Raj P. et al. (2022) [10] and 3-6 days by Solanki Dinesh Kumar et al. (2018) [11], who reared pulse beetle under laboratory conditions and recorded the incubation period. The data recorded in Table I show that the maximum hatchability of eggs laid by the insect pest *Bruchus pisorum* on the pea variety Malviya Pea - 15 (96.81%) was followed by varieties IPFD 13-2, Malviya-2, and IPFD 10-12, with hatchabilities of 96.7, 96.4, and 95.67, respectively. The 93.3% hatchability of variety Rachna is the minimum and is at par with varieties IPFD 9-2 and IPFD 12-8, with hatchability percentages of 93.7 and 93.71, respectively. The remaining varieties exhibit an intermediate response. The results obtained are supported by a field experiment that showed that Adet was highly susceptible to pea weevils and had over 90% seed damage caused by the pest (Mendesil E. et al., 2016) [12]. The

minimum larval period observed on pea variety Malviya Pea - 15 (24.67 days). In this investigation, two pea varieties, Rachna and IPFD 9-2, were found to have the longest larval period, 36.33 days. The pea varieties IPFD 12-8, Pant-5, IPFD-13-2, IPFD 10-12, Malviya-2, and IPFD 13-2 were 35.67, 34, 33, 32.33, 28.33, and 27.33 days, respectively (Table I). The total larval period is 24-28 days, according to Raj P. et al. These findings are partially similar to those of Kumar et al. on the biology of the pulse beetle, *Callosobruchus*, under storage conditions in gram. Seed infestation and larval development were assessed in each environment and subjected to a heritability analysis. (Aznar-Fernández, T. & Rubiales, D. (2018)) [13]. The larval period ranges from 23 to 30 days during winter (February to March), corroborating our finding from the study of the biology of *B. pisorum* L. According to Gadi V. et al. (2018) [14] Biology, Ecology, and Management of the Pea Weevil (Coleoptera: Chrysomelidae), the developmental biology of the pea weevil and the total larval period is 28-32 days. The pea weevil is a major pest in many pea-growing countries. The larval stage causes losses in crop yield and quality by consuming seeds. When the parasitoids *D. basalis* and *T. luteipes* were released six days after the

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application of *A. campestris* oil, the parasitism rates reached 13.6% and 80.3% for *C. maculatus* and *B. rufimanus*, respectively. (Faten Titouhi *et al.*, 2017) [15]. Transgressive segregants with increased resistance and susceptibility compared with the parentals were observed for DS resistance criteria over the years and conditions. (Barilli, E. *et al.* (2018)) [16]. As resistance to insect pests is often chemically based, metabolomics has been rapidly adopted as a tool to explore plant species and varieties for hitherto unknown sources of sustainable resistance (Macel *et al.*, 2018) [17].

IV. CONCLUSION

The present study on the incubation period, hatchability, and larval period of *Bruchus pisorum* across various pea cultivars demonstrates that the Rachna variety is highly resistant. Malviya pea – 15 is highly susceptible, as the incubation period, hatchability, and larval period of both these varieties are 8.97 days, 93.3 % and 36.33 days and 3.96 days, 96.81% and 24.67 days, respectively. IPFD 9-2 come out as slightly less resistant than Rachna. IPFD 13-2 is moderately to highly susceptible; IPFD 12-8 and Pant – 5 are moderately susceptible, while IPFD 10-12, IPFD 13-2, IPFD 6-3, and Malviya-2 are found to be moderately susceptible to the insect pest *Bruchus pisorum*.

DECLARATION STATEMENT

After aggregating input from all authors, I must verify the accuracy of the following information as the article's author.

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