



ISSN (E): 2277-7695  
ISSN (P): 2349-8242  
NAAS Rating: 5.23  
TPI 2022; 11(9): 1392-1395  
© 2022 TPI

[www.thepharmajournal.com](http://www.thepharmajournal.com)

Received: 08-06-2022

Accepted: 16-07-2022

#### Pushp Raj

Department of Entomology,  
School of Agriculture, Abhilashi  
University, Mandi, Himachal  
Pradesh, India

#### Vinod Kumar

Department of Entomology,  
School of Agriculture, Abhilashi  
University, Mandi, Himachal  
Pradesh, India

#### Anupam Kumar

Department of Plant Pathology,  
School of Agriculture, Abhilashi  
University, Mandi, Himachal  
Pradesh, India

#### Alok Kumar

Department of Seed Science and  
Technology, School of  
Agriculture, Abhilashi  
University, Mandi, Himachal  
Pradesh, India

#### Kailash Sati

Department of Horticulture,  
School of Agriculture, Abhilashi  
University, Mandi, Himachal  
Pradesh, India

#### Sachin

Department of Entomology,  
School of Agriculture, Abhilashi  
University, Mandi, Himachal  
Pradesh, India

#### Arjun Thakur

Department of Entomology,  
School of Agriculture, Abhilashi  
University, Mandi, Himachal  
Pradesh, India

#### Corresponding Author:

#### Vinod Kumar

Department of Entomology,  
School of Agriculture, Abhilashi  
University, Mandi, Himachal  
Pradesh, India

## Biology of *Bruchus pisorum* L. on pea grains under laboratory condition

**Pushp Raj, Vinod Kumar, Anupam Kumar, Alok Kumar, Kailash Sati, Sachin and Arjun Thakur**

#### Abstract

*Bruchus pisorum* L. (Coleoptera Bruchidae) is a major stored pest of pea crop in India. Biology of pea weevil *B. pisorum* L. was studied at Abhilashi University Mandi Himachal Pradesh during 2021-2022 in the laboratory condition. The average of egg period ranges from 4 to 7 days with mean of  $4.50 \pm 0.017$  days, and total larval period range from 24-28 days with an average of  $26.40 \pm 0.044$  days, and the total pupal period range from 6 to 9 days with mean of  $6.50 \pm 0.024$  days. the total life cycle from egg to adult as 90 to 98 days in males with an average of  $98.82 \pm 0.0086$  days and 119 to 143 days with mean of  $125.10 \pm 0.096$  days in females during the winter with 4 instars.

**Keywords:** Pea weevil, pea, *Bruchus pisorum*, biology

#### Introduction

Pea (*Pisum sativum* L.) belonging to family Leguminosae, is an annual grown as both garden and field. Its grain is a major source of plant-based dietary protein for animals. Pea is considered a cool season crop with planting taking place from winter to early summer depending on the site (Zaki *et al.* 2016) [17]. The total area, production and productivity of pea in India in 2017-18 was 540.48 thousand ha, 5422.14 thousand MT and 10.0 MT/ha respectively. The major pea growing states are Uttar Pradesh, Madhya Pradesh, Jharkhand, Punjab, Himachal Pradesh, West Bengal, Haryana, Bihar, Uttarakhand, Orissa and Karnataka. Himachal Pradesh is 5th leading pea producing state of India with total production of 294.96 thousand metric tonnes during the year 2017-18.

The pea weevil, (*B. pisorum* L. Coleoptera: Bruchidae), is a primary limiting factor for worldwide production of field pea, *P. sativum* L. *B. pisorum* L. Commonly known as pea weevil is a univoltine bruchid first described by Linnaeus (1758) as *Dermestes pisorum* (Pesho *et al.*, 1977) [3]. Pea weevil attacks seeds of growing crops, but not dried or stored seeds. It is the larval stage which inflicts losses in crop yield and quality by consuming the seed. In addition, infested seeds have lower seed viability and germination. Losses also occur due to shattering during threshing/harvesting (Brindley *et al.*, 1956; Baker, 1998; Armstrong and Matthews, 2005) [7, 8, 1]. Females must feed on pollen before they can lay eggs and pea pollen is most effective in promoting oogenesis (Clement *et al.* 2002) [6]. The larvae feeding inside the developing dry pea seed cause damage. Weevil infestations ranges between 30-70% in untreated crops with high level presence of the pest already. Affected peas are unfit for human consumption and their seed germination rate decreases, which in turn diminishes the market value. (Gadi *et al.* 2018) [12]. Heavy infestation of adults and larva of pea weevil causes post-harvest losses.

#### Materials and Method

##### Maintenance of stock culture

The stock culture of *B. pisorum* L. was initiated in the laboratory condition on pea crop. The culture was maintained in plastic boxes containing the pea grains. Pea grains were provided periodically for the development of pea weevil.

##### Maintenance of pure culture

Pure culture of the weevil was developed by infesting insect free pea grains with freshly emerged single mating pair. The culture was maintaining in the plastic boxes. This culture was used to study the biology of the *B. pisorum* L.

### Recording of Temperature and Relative Humidity of the experimental laboratory

The pure culture was started in BOD Incubator to maintain the temperature and relative humidity for the better development of the *B. pisorum* L. The BOD Incubator temperature was 30 °C and relative humidity was 60-75% for the growth of weevil.

### Duration of different stages of Maize weevil

Study on the biology of Pea weevil, *B. pisorum* L. The procedure followed to study the different stages of Pea weevil, *B. pisorum* L. under laboratory condition. Thirty pea weevils were enclosed with pea grains in each petri plates kept under ambient conditions. Infested grains were replaced every morning with uninfested grains. Grains containing eggs were separated out by examining under microscope and were used for further study. Pea grains with pea weevil eggs were maintained in petri plates for incubation. Daily twenty grains from the day of oviposition to egg hatching were dissected to determine the incubation period. On the hatching the grub of pea weevil was allowed to feed inside the grains. Twenty grains per day were dissect out to check the different larval instars. The dissection of the grains was made up to pupal stage. The period between larvae to pupal stage was observed. The pupal period of the insect was studied by observation the same larvae for pupation inside the grains. This was maintained and the observation was made up to adult emergence. The period between formation of pupae up to adult was observed as pupal period. The ability of the adults of *B. pisorum* L. to live in the presence or absence of food was determined by enclosing male and female adults obtained from culture separately. Petri plates were maintained for each of the male and female with food and without food.

### Statistical analysis

Data of each experiment will be subjected to suitable statistical methods of analysis. The statistical methods followed in experiments are Analysis of Variance (ANOVA) technique in CRD (Panse and Sukhame, 1967) and ‘t’ test (Snedecor and Cochran, 1989). Transformation of data will be done whenever necessary.

### Result and Discussion

Biology of the *B. pisorum* L. under temperature was 30°C and Relative Humidity was 60-75% during the month during

winter (November 2021 to January 2022). The results along with description of brief biology of various developmental stages are presented as follow.

### Egg Period

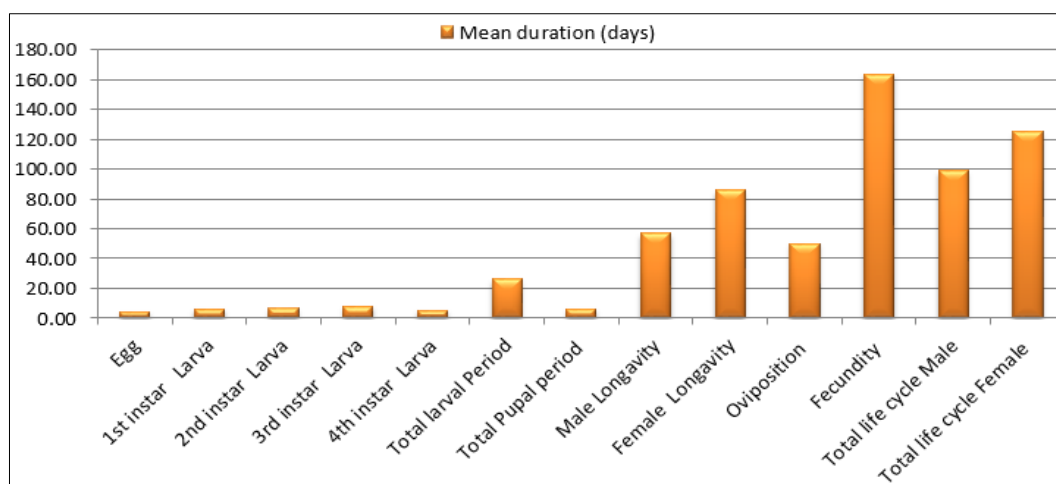
Egg were laid outer side of green pea pods in petri plates. Egg is bright yellow in colour, oval-shaped. During winter the incubation period ranged from 4-7 days with mean of 4.50±0.017 days. These findings are partially similar with the findings of Kumar *et al.* (2018) [9] reared pulse beetle in laboratory condition and recorded incubation period from 3-6 days.

### Larvae Period

The larvae developed through four instars to observed during winter. The newly hatched were creamy white, with a brown head C-shaped, legless. The total larval period 24 to 28 days with an average 26.40±0.044 days. These findings are partially similar with the findings of (Kumar *et al.* 2018) [9]. The larval period range from 23-30 days during winter (February to march) corroborates with our finding of the study of biology of *B. pisorum* L. According to (Gadi V. *et al.* (2018) [12] the development biology of pea weevil and the total larval period from 28-32 days.

**Table 1:** Biology of *B. pisorum* L. On Pea grains under laboratory condition

Stage	Range (Days)		Mean ± SE (Days)
	Min	Max	
Egg	4.10	7.12	4.50±0.017
<b>Larva</b>			
1st instar	5.50	8.00	6.20±0.02
2nd instar	5.00	6.50	6.70±0.021
3rd instar	7.50	9.00	8.20±0.024
4th instar	4.50	7.00	5.30±0.018
Total larval Period	23.50	30.50	26.40±0.044
Total Pupal period	6.00	7.00	6.50±0.024
<b>Adult longevity</b>			
Male	54.00	60.00	56.83±0.065
Female	81.00	101.00	85.88±0.08
Oviposition	32.00	63.00	50.24±0.061
Fecundity	121.00	266.00	163.79±0.272
<b>Total life cycle</b>			
Male	90.45	98.96	98.82±0.086
Female	119.89	143.96	125.10±0.096



**Fig 1:** Biology of *B. pisorum* L. on Pea grains under laboratory condition.

### Pupal period

Pupal of pea weevil *B. pisorum* L. was darker brown and yellowish colour. Pupa was exarate type with clearly visible head, thorax and abdomen. Pupal period occupied 6-9 days with mean of  $6.50 \pm 0.024$  days. These findings are partially similar with the findings of Kumar *et al.* (2018) <sup>[9]</sup> recorded the pupal period range from 6-7 days which substantiates report of winter study of biology. According to (Gadi V. *et al.* (2018) <sup>[12]</sup> reported that the developmental biology of pea weevil on pea grain the total pupal period 14 days.

### Adult, Adult longevity

Pea weevil *B. pisorum* L. adult is five to seven mm long, and two and a half mm wide. The females are slightly bigger than males. Globular shaped, the weevil has long leg and a short head. The adults were brownish in colour flecked with white, black and grey patches. The end of the abdomen is white with two black oval spots and extends beyond the wing covers. The adult longevity in the present study was ranged from 54 to 60 days with an average mean of  $56.83 \pm 0.065$  days for males and for females' adult longevity ranged from 81 to 101 days with an average mean of  $85.88 \pm 0.08$  days. These findings are partially similar with the findings to Kumar *et al.* (2018) <sup>[9]</sup> observed adult male longevity ranged from 55 to 60 and observed female longevity range from 81 to 101 days.

### Total development period

The total development period from incubation period, larval period and pupal period with an average  $56.83 \pm 0.065$  days in male and female total larval period  $125.10 \pm 0.096$ .

### Total life cycle

The total life cycle from egg to adult occupied 90 to 98 days in males with an average of  $98.82 \pm 0.086$  days and in females the total life cycle from egg to adult occupied 119- 143 days with an average mean of  $125.10 \pm 0.096$  days. These findings are partially similar with the findings of Kumar *et al.* (2018) <sup>[9]</sup> observed male total life cycle range 91 to 99 days and female total life cycle 117 to 140 days.

### Summary and Conclusion

Biology of the *B. pisorum* L. On pea grains under laboratory condition during winter 2021-2022 (November- January) was carried out and it was recorded that the egg period of *B. pisorum* L. Varied from 4-7 days with mean  $4.50 \pm 0.017$  days during winter. The total larval period ranged from 23-30 days with a mean of  $26.40 \pm 0.044$  days in winter. The 1st, 2nd, 3rd and 4th instar ranged from 5 to 8, 5 - 7, 7 -9, 4-7 days with mean  $6.20 \pm 0.02$ ,  $6.70 \pm 0.021$ ,  $8.20 \pm 0.024$  and  $5.30 \pm 0.044$  respectively in winter. The pupal period occupied 6 to 7 days with average of  $6.50 \pm 0.024$  days in winter. The total life cycles from egg to adult occupied during winter while it occupied 90 to 99 days in males with mean of  $98.82 \pm 0.086$  and 119 to 143 days in females with mean of  $125.10 \pm 0.096$  days.

The biology of *B. pisorum* L. concluded that the incubation period, larval period, pupal period, and adult each having with mean of  $4.50 \pm 0.017$ ,  $26.40 \pm 0.044$ ,  $6.50 \pm 0.024$  and  $56.83 \pm 0.065$  (Male),  $85.88 \pm 0.08$  (Female) and complete life cycle in Male  $98.82 \pm 0.086$  and in Female  $125.10 \pm 0.096$  respectively. Adult longevity of female was higher than that of males with food.

### Acknowledgement

Author is thankful to, Department of Entomology, School of Agriculture, Abhilashi University Mandi-175028, Himachal Pradesh (India), to provide necessary facility and valuable suggestion during investigation.

### Reference

1. Armstrong E, Matthews P. Managing pea weevil. Pulse point. 2005;470(1):36-41
2. Panse VG, Sukhatme. Statistical method for Agriculture workers, 2nd Edition, Indian council of Agriculture Research, New Delhi; c1967.
3. Pesho GR, Muehlbauer FJ, Harberts WH. Resistance of pea introduction to the pea weevil Journal of Economic entomology. 1977;70(1):30-33.
4. Clement SL. On the function of pea flower feeding by *B. pisorum* L., Entomologia experimentalis et applicate. 1992;63:115-12.
5. Clement SL, Evans MA, Lester DG. Settling and Feeding Responses of Pea Weevil (Coleoptera: Bruchidae) to Flowers of Selected Pea Lines., Journal of economic entomology. 1996;89(3):775-779.
6. Clement SL, Hardie DC, Elberson LR. Variation among accessions of *P. fulvum* for resistance to pea weevil., Crop science. 2002;42:2167-2173.
7. Brindley TA, Chamberlin JC, Schopp R. The pea weevil methods for its control., farmers' Bulletin, US Department of Agriculture; c1956. p.1-24.
8. Baker G. Pea weevil: Fact sheet. Primary Industries and Resources, South Australia, and the South Australian Research and Development Institute, Australia; c1998.
9. Kumar SD, Kumar MD. Biology of pulse beetle *Callosobruchus* in storage condition in gram., International journal of Agriculture science. 2018;10(7):5682-5686.
10. Clement SL, McPhee KE, Elberson LR, Evans MA. Pea weevil, *B. pisorum* L. (Coleoptera: Bruchidae), resistance in *P. sativum* X *P. fulvum* interspecific crosses., Plant Breed. 2009;128:478-485.
11. Fernandez TA, Rubiales D. Flower and pod source Influence on pea weevil (*B. pisorum* L.) Oviposition Capacity and Preference. Journal Frontiers in plant science. 2019;10:491.
12. Gadi VP, Sharma RA, Gadi RL. Biology, Ecology, and Management of the Pea Weevil (Coleoptera: Chrysomelidae) Annals of the Entomology Society of America. 2018;11(4):161-171.
13. Kalpin VG, Katyuk AI, Vasin VG, Belousova OA, Vasin AV. Development and harmfulness of the pea weevil, *B. pisorum* L. in the forest-steppe of middle volga region. Journal of Entomological review. 2019;98(3):445-446.
14. Mendesil E, Rämert B, Marttila S, Hillbur Y, Anderson P. Oviposition preference of pea weevil, *Bruchus pisorum* L. among host and non-host plants and its implication for pest management, Front. Plant Sci. 2016;6:1186.
15. Mithiretu E, wale M. Effect of Harvesting and Threshing Time and Grain Fumigation of Field Peas (*Pisum sativum* L.) on Pea Weevil (*Bruchus pisorum* (L.)) (Coleoptera: Bruchidae). Development and Damage Ethiopian Journal of science and technology. 2013;4(1):13-24
16. Nikolova I, Georgieva N. Evaluation of damage caused by *Bruchus Pisorum* L. on some parameters related to

- seed quality of pea cultivars. J Mountain Agric. Balkans 2015;18:452-477.
17. Zaki, Haitham EM, Mohmoud M, Youssef Y, Abd EA, Adel M, Hammad, *et al.* Studies on pea (*Pisum sativum* L.) growth and productivity under agroforestry system Vegetative growth, chemical composition and nodulation status of pea under alley cropping system with two types of trees., Journals of Basic and Applied Research. 2016;2(4):596-605.