Original Research Article

Evaluation of life cycle ofgram pod borer *(Helicoverpaarmigera,*Hubner*)*on vegetable Pea

Abstract

Helicoverpaarmigera (Hübner) (Noctuidae) is a key pest of agriculture that attacks many crops throughout Asia, Europe, Africa, Australia, and South America. Pod borer is arguably the major biotic constraint to the global production of pulse crops. Study of their life cycle revealed that total larval period were recorded (20.00±3.21) daysfrom 1st instar to 6th instar under laboratory conditions at 26° C with 65 % relative humidity revealed.The mean duration was (2.66±0.33), (2.66± 0.33), (2.33± 0.33), (3.66± 0.88), (4.33± 0.66), and (4.33±0.88) days of 1st , 2nd , 3rd, 4th ,5th and 6th larval instar respectively during April-May 2022.The average incubation period of egg ranged from(4.66±0.88) days.The pod borer passes through six larval instars to become an adult.

Key words- Pea Pod Borer , Life Cycle, *Helicoverpaarmigera*, control condition

Introduction

Vegetable Pea(*Pisumsativum*), also called garden pea, herbaceous annual plant in the family Fabaceae, grown virtually worldwide for its edible seeds. Peas can be bought fresh, canned, or frozen, and dried peas are commonly used in soups. Some varieties, including sugar peas and snow peas,produce pods that are edible and are eaten raw or cooked like green beans; they are popular in East Asian cuisines. The plants are fairly easy to grow, and the seeds are a good source of protein and dietary fibre.Origin - Mediterranean Region of Southern Europe and Western Asia.The mature seeds are used as whole or split into dal and put to use in various ways for human consumption.Pea is a highly nutritive vegetable. Pea pods have high nutritive value for human consumption and contain 7.2 % , 19.2 % carbohydrate, 0.8 % mineral matters, 80 % phosphorus and 1.8 % iron in fresh pea. While in dried pea it contains 19.7 % protein, 56.6 % carbohydrate, 2.1%mineral matters and 4.4 % iron. Pea is an important vegetable grown all over the country. It is mainly grown as off season vegetable and is an important source of income for the farmers. But, at the same time it is attacked by a large number of insect pests throughout the growth period. *Helicoverpaarmigera*which belongs to order Lepidoptera and family Noctuidae are the major insect pests of pea and it is polyphagous in nature. The pod borer is responsible for causing up to 90% damage in pea due to its regular occurrence from the vegetative growth to the

pod formation.It feeds on 300 species belonging to 68 plant families around the world.Pest of this group are very destructive in nature and can cause high damage to the crop that results in major loss of crop yield of pea, also decreases its economicalvalue.It cause severe damage to crop and field which not only decrease the yield of the crop but also deceases the quality if the pea crop. Larva in its second instar stage is very dangerous and single lava only can destroy many fruits by making bores in it and the damage chances is more in the month of March to June.

Material and method

The biology of*Helicoverpaarmigera*were carried out under lab conditions in year 2021-2022 at Department of Entomology as well as in Plant Protection Laboratory, College of Horticulture, Bharsar, PauriGarhwal, Uttrakhand. The standing crop was scanned properly and *Helicoverpaarmigera* was found as one of the serious pest. Eggs were collected from the crop fields and were kept in the lab condition for incubation in petri dishes. Newly hatched larvae were be transferred to other Petri-dishes which will lined by moist filter paper and provided with fresh pea pods. Filter paper and food were changed after every second day. Larva was observed daily and data recorded with regards to moulting, duration and size of each larval instar. Observations of life stages were recorded. Data of incubation period was measured by the time period from egg laying to first instar larva comes out from egg**.**

Results and Discussion:

Biology of *H. Armigera*was studied on vegetable pea under laboratory condition during April-May.The description of various stages namely egg, larval instar, pupa and adult are detailed as under.The freshly laid eggs were collected from the Vegetable Research and Demonstration Block Department of Vegetable Science, College of Horticulture, VCSG UUHF, Bharsar. The experiment on biology of vegetable pea pod borer *(H.armigera)* was conducted at laboratory of Entomology, College of Horticulture.

Incubation period (in days): The female laid egg in masses on various part of plants and upper and lower side of the leaves of pea. Eggs are commonly laid singly and close together. The

freshly laid eggs were spherical and creamy white and have a ribbed surface. Just before hatching, the colour of the egg turned to dark brown. At the time of hatching, the egg shell open out at one end, allowing a cap like flap of the shell to separate out remained loosely attached to it one place. The average incubation period of egg ranged from (4.66±0.88) days during April-May. The larval instar moulted 5 time to attain the maturity.The newly hatched larva was bright orange with red eyes. As it developed the color changed to reddish brown and just before moulting it turns red. The duration of incubation period range from 3-6 days with an average of (4.66±0.88) days. The result of our experiments are in the accordance with the studies made by Chakarvarty*et al.,* (2018) also reported the incubation period range from 3.26±0.15 days.

Larval stage: The pod borer passes through six larval instars to become an adult. The larva which hatched together at same time did not grow and moult uniformly. The newly hatched larva was bright orange with red eyes. As it developed the color changed to reddish brown and just before moulting it turns red. The duration of first instar lasted for (2.66±0.33) days during *Zaid* season in hills. Represented in table (1). The second instar was reddish brown with dark brown hair and scarlet red eyes. The body color changed to dirty red before moulting. Duration of the second instar lasted for (2.66±0.33) days. The third instar was pale brown in color with blackish marking on the abdomen. The colour of the third instar larvae turned pale brown. The skin took granular appearance and body surface was covered with stiff hairs. The dorsal side consisted of a pale white strip. The instar occupied a period of (2.33± 0.33) days. The colour of the fourth instar larvae was greenish yellow. The body surface was covered by close set of minute tubercles. The narrow dark bands with varying colour appeared on the middle of the back. This instar occupied about (3.66± 0.88) days. The body colour of the fifth instar larva was just similar to fourth instar larvae. The head was reddish yellow or light brown in colour. This instar occupied about (4.33± 0.66)day. The full-grown sixth instar larva was greenish with dark broken grey lines along the side of the body. These lines vary in width and in intensity of colour. Their colour was variable like green, straw coloured, yellow and reddish brown or black. The head was greenish yellow. On each segment there was number of inconspicuous tubercles from which a short hair arise.The sixth instars occupied about (4.33±0.88) days.Total larval period was considered first instar to the end of sixthinstars. Duration of from birth of total larval period lasted for (20.00±3.21) days and total pupal period range for (14.00±0.57) days.

The investigation revealed that under laboratory condition the duration of 1st instar lasted for 2-3 days with an average of (2.66±0.33) days. The duration of the 2nd instar lasted for 2-3 days with an average of (2.66± 0.33) days. The duration of the 3rd instar lasted for 2-3 days with an average of (2.33± 0.33) days The duration of the 4th instar lasted for 2-5 dyas with an average of (3.66± 0.88) days. The duration of the 5th instar lasted for 3-6days with average of (4.33± 0.66) days. The duration of the 6th instar lasted for 3-5 day with an average of (4.33±0.88) days. Total larval period was considered from birth of first instar to the end of sixth instar the duration of total larval period lasted for 14-25 days with an average of (20.00±3.21) days. Our result are comparable with the result of Chauhan*et al.,* (2018) who reported that total larval period of pod borer 17-22 days with an average of 19.20±1.29 day. Baikar*et al.* (2016) also reported average larval period of 19-25 days.

Total pre pupal and pupal period (days): Total pre pupal period last for 1-3 days with an average of (2.22±0.66) days. Total pupal period range for 13-15 days with an average of (14.00±0.57) days. The result of our experiments are in the accordance with the studies made by Nasreen and Mustafa (2000) who observed that total pre pupal and pupal period under lab condition varied in 1-4 days and 14-17days with an average of 2.1±0.158 and 15.4±0.50 days respectively.

Adult longevity: Adults of *H. armiger*a were extremely variable in colour and markings. The colour of the adult varied from buff to brown with a dark brown circular spot half way between the base and apex of the forewings and a smaller spot near the base. The hind wings were white with some dark spots and have strongly marked veins and a dark margin with two lighter spots on it . The forewing of the freshly emerged male moth was deep olive-buff with dark brown spot, while it was reddish brown with blackish brown spot in case of female adult. The shape of abdomen of female moth was broad and it was pointed in case of male moth.The male can be distinguished from the female by its smaller size. The female lived longer with ranged between (46.33±1.76) days and longevity of male ranged between (44.00±2.64) days. The adults of *H. armiger*a were extremely variable in colour and markings. The colour of the adult varied from buff to brown with a dark brown circular spot half way between the base and apex of the forewings and a smaller spot near the base. The hind wings were white with some dark spots and have strongly marked veins and a dark margin with two lighter spots on it. The female lived

longer with ranged between (46.33±1.76) days and longevity of male ranged between (44.00±2.64) days. Our result are comparable with the result of Chauhan*et al.,* (2018) who reported that the total life span of female and male of *H.armigera* were 46.33±1.76 and 44.00±2.64 days respectively.

Total developmental period: Total developmental period range from 31-49 days with an average of 41.33± 5.36 days. Chakarvarty*et al*., (2018) also reported the total life span of male and female adult in 39-48 days and 42-51 days respectively with an average of 45.64±1.49 and 48.76±1.56 days respectively .

Conclusion:

The information generated out of this investigation are summarized and concluded as follows. The incubation period of egg ranged from(4.66±0.88) days during (April- May).The pod borer passes through six larval instars to become an adult.The mean duration was (2.66±0.33), (3.00± 0.57), (2.33± 0.33), (3.66± 0.88), (4.66± 0.88), and (4.00±0.57) days for the 1^{st} , 2^{nd} , 3^{rd}, 4^{th} ,5^{th} and 6^{th} larval instar respectively during April-May 2022. Total larval period was considered from birth of 1^{st} instar to the end of 6^{th} instar. The duration from birth of total larval period lasted for (20.33±3.48) days.Total pre pupal period last for (2.33±0.66) days. Total pupal period range for (21.33±0.88) days.The adults of *H.armigera* were extremely variable in colour and markings. The colour of the adult varied from buff to brown with a dark brown circular spot half way between the base and apex of the forewings and a smaller spot near the base. The hind wings have strongly marked veins and a dark margin with two lighter spots on it . The female lived longer with ranged between (46.33±1.76) days and longevity of male ranged between (44.00±2.64) days.Theperiod from egg to adult emergence is known to be total development period. Developmental period from egg deposition to adult emergence ranges from (25.00±4.35) days.

Table 1. Duration of life cycle of *Helicoverpaarmigera* on vegetable pea crop in *Zaid* season in hills.

S.NO	STAGES	DURATION (Days)	MEAN ±SE(m)

01	Incubation period	3.0-6.0	4.66±0.88
02	**Larval period**		
(A)	1ST instar	2.0-3.0	2.66±0.33
(B)	2nd instar	2.0-3.0	2.66±0.33
(C)	3rd instar	2.0-3.0	2.33±0.33
(D)	4th instar	2.0-5.0	3.66±0.88
(E)	5th instar	3.0-5.0	4.33±0.66
(F)	6th instar	3.0-6.0	4.33±0.88
03	**Total larval period**	14-25	20.33±3.21
04	Pre –pupal period	1.0-3.0	2.33±0.66
05	Pupal period	13-15	14.00±0.57
06	**Adults**		
(A)	Male	39-48	44.00±2.64
(B)	Female	43-49	46.33±1.76
07	Total developmental period	31-49	41.33±5.36
	SE(d)	-	2.13
	C.D(0.05)	-	4.44

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