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BIOLOGY AND MORPHOMETRICS OF FALL ARMYWORM, *SPODOPTRA FRUGIPERDA* ON MAIZE PLANT

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Abstract

The study was conducted in the laboratory of the Department of Entomology, Sher-e-Bangla Agricultural University (SAU), Dhaka, Bangladesh to observe the biology and morphometrics of fall armyworm, *Spodoptra frugiperd* (Lepidoptera: Noctuidae) during winter (December-February) and summer (March-May) seasons. The fall armyworm larvae were collected from the maize field of BARI, Gazipur and SAU research fields. The collected larvae were brought to the laboratory and reared on maize plant at room temperature. The female moths laid eggs in clusters under or upper surface of the maize leaf which were hatched in 4.01 and 2.45 days at winter and summer, respectively. The larvae passed through six instars with the total larval period of 29.17 and 14.80 days, respectively at winter and summer. The pupa took 17.63 days in winter and 9.34 daysin summer for emergence into adult. During winter season the longevity of female and male moths were 15.47 and 13.98 days respectively. But in summer the adult longevity for female and male was 10.03 and 8.19 days, respectively. The male-female sex ratio in winter was 1:1and 1:2 in summer. The total life cycle was completed within 64.79 days (male) and 66.28 days (female) in winter and that was 34.86 days (male) and 36.70 days (female) in summer. Larva was gradually increased in size with instars having a square shaped four black spots on 8th and 9th abdominal segments and Y-shaped line on the frons. The male pupa (16.53 mm) was slightly larger than the female (15.81 mm) with a bit longer distance between genital opening and anal slot. Body length of the adult male measured 13.75 mm and that of the female was 12.77 mm. The percent of survival was maximum at 6thinstar larval stage (94.55 %) and least survival percent was at 1st instar larval stage (79.53%). On the other hand, percent of mortality was maximum at 1stinstar larval stage (20.47%) and least mortality was at 6th instar larval stage (5.45 %).

Keywords: Biology, Morphometrics, Fall Armyworm, *Spodoptra frugiperda*, Maize, *Zia mays.*

Introduction

Maize (*Zea mays* L.) of the family poaceae, is one of the most important worlds' widely grown cereal crops and contributes to food security in most of the developing countries. It has high yield potential, there is no cereal on the earth which has so immense potentiality and that is why it is called "queen of cereals. Maize is the 2nd most important crop in terms of area and production after rice in Bangladesh and in 2020-21 maize was produced 41.16 lakh metric tons from an area of 4.80 lakh hectares with average yield of 8.57 t/ha (Anonymous, 2022).

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Maize is the most important staple cereal crop grown of which, 90% of production is used as food, industrial material and major component of animal feed. The fall armyworm (FAW), *Spodoptera frugiperda* (J.E Smith), is the most important noctuid pest in North and South America and has recently become an invasive pest in Africa (Montezano *et al*., 2018). It has been spread around 38 courtiers till now and in Bangladesh, the caterpillar was first detected on two different crops, cabbage and maize in different districts (Palma, 2020). Fall armyworm larvae can feed on a large number of plant species, including maize, rice, sorghum, millet, sugarcane, vegetable crops and cotton, and can cause significant yield losses.

Fall armyworm is a polyphagous pest and numerous alternative hosts outside the production season of main crops. Larvae feed on the surface of leaves leaving only white papery patches on young maize called window panes. Older larvae consume more tissues, with stronger mandibles, cut large portions of plant tissues with high silica content and includes seedlings, foliage, tassels, cobs, husks, and developing kernels. Yield losses due to FAW in maize crops vary from 22 to 67% in different parts of the world (Day *et al*., 2017).

FAW has several generations per year, whose life cycle consists of egg, six larval instars, pupa, and adult (IITA, 2016). Information about biology and life table parameters of FAW such as survivorships, mortality rates, longevity, fecundity, life expectancy, the population distribution, economic importance, seasonal abundance, host plants, life history are essential for natural, cultural, genetic, and chemical controls of fall armyworm. These vary depending on the different stages in particular hosts and metrological parameter of the country. FAW can migrate long distances on prevailing winds, but it can also reproduce continuously in areas that are climatically suitable (Prasanna *et al.*, 2018). *S. frugiperda* has a high reproductive capability, a relatively short generation time and great disperse ability (Montezano *et al*., 2018) which has raised an extreme awareness against this insect that is threaten for food security. To prevent this enormous invasion, fundamental knowledge of its biology and morphological features are very crucial. However, obtaining that information seems to be complicated and still limited in Bangladesh context. Thus, the aim of this studyis to generate data on the biological and morphological parameters of *S. frugiperda* population growth under laboratory at room temperature-to know the growth and development of different stage of fall armyworm on maize and to determine morphometry at specific growth stage.

Materials and Methods

Collection and rearing of the insects

The study was conducted in the laboratory at ambient weather condition (Table1) in the Department of Entomology, Sher-e-Bangla Agricultural University during December, 2020 to May, 2021.

Infested maize plants (30 days after emergence) was collected from different locations *viz*. BARI research field, SAU research field and farmers field of Kalatia, Keranigonj, Dhaka during growing season (winter and summer). The collected larvae were brought to the laboratory and kept in plastic cages (18 cm height x 25 cm diameter) with sufficient soil for mass rearing. Some larvae were reared until pupation using maize leaves (variety MK 40). Pupae were observed daily until moths emerged. The cages were covered with a fine mesh net to prevent the moths from escaping. The maize leaves and stems were replaced every day and inspected for egg laying. All set-ups were kept under laboratory at room temperature.

Table 1. Monthly average room temperature and relative humidity during study period

Months	Average temperature (^{0}C)	Range	Relative humidity (%)	Range
Winter season				
December / 2020	17.53^{0}C	10^{0}C - 25^{0}C	60.00	57 – 62%
January / 2021	16.72^{0}C	10^{0}C - 25^{0}C	53.13	42 – 64%
February / 2021	18.66^{0}C	10^{0}C - 30^{0}C	45.11	41 – 49%
Summer season				
March / 2021	24.13^{0}C	14^{0}C - 35^{0}C	48.93	42 – 65%
April / 2021	26.80^{0}C	18^{0}C - 34^{0}C	59.10	55 – 63%
May / 2021	26.35^{0}C	20^{0}C - 33^{0}C	68.29	63 – 74%

Biology of fall armyworm

Life cycle of fall armyworm was observed in two seasonal conditions such as winter (December-February) and summer (March-May). An adult male and a female were confined in pair kept in plastic cages (21 cm height x 10 cm diameter). Ten pairs were prepared in this manner. The female moth was laid eggs on maize leaf. They were provided with soaked cotton pads in 10% sugar solution as food source in small plastic caps placed inside the cage and replaced daily. From the progeny of these parental stock, 10 neonates (newly-hatched) larvae were individually transferred to fresh maize leaves and reared in plastic cages (18 cm height x 25 cm diameter) containing moistened filter paper, a fresh maize leaf and required amount of soil until pupation. In each cage, pupae were observed daily until moths emerged. After that adult moth (male and female) were kept into the other plastic cage for further rearing with aforesaid manner to observe the developmental period at different stages of fall armyworm. In this study, eggs collected within 1 hr after oviposition were placed in plastic cages (19 cm height x 18 cm diameter) with moist filter paper maintained at room temperature. There

were 4 replications with one egg mass for each cage. The morphological features of the different instars were observed and recorded along with incubation period, development period from the first instar to the sixth instar, pupal period, pre-oviposition period (the time adult female emerged to the time the first mass of eggs is laid), Oviposition period (egg laying period), post oviposition period (the time female stopped laying eggs till death), longevity of male and female adults (the time from adult emergence till their death), fecundity (number of egg-masses and number of eggs per egg-mass laid in the lifetime of adult females), hatchability of eggs and the number of neonates that hatched from all egg-masses laid by a female in her lifetime. All periods of observations were taken in days.

Morphometry of the different life stages

Morphometric measurements of the different life stages such as different instar larvae, pupae and adult length, width and weight were taken. The measurement of3rd, 4th, 5th, and 6thinstar larvae, pupae and adults were measured using a digital Slide Caliper. The measurement of1stand 2ndinstar larval length and width were also taken by using stereomicroscope. The length and width of the larvae was measured as well as the width of the head capsule. The male and female pupae were likewise measured from the tip of the head down to the tip of abdomen and the widest width of the body. Male and female adults were pinned, wings expanded and dried. The wing expansion of the forewings was measured and body length from the tip of the head to the tip of the abdomen was taken. The larvae, pupae and adults were weighted to use an electric balance. The measurement of each stage was done by using ten individuals for each stage.

Adult longevity

The study was conducted as a completely randomized design with 5 replications. Each cage represented one replication. After emergence, the adult male and female were confined separately for an hour and randomly selected and transferred into plastic cage (21 cm height x 18 cm diameter) covered with fine mesh net. Each cage contained 5 adults with soaked cotton pads in 10% sugar solution as food source in small plastic caps placed inside the cage and replaced daily. But in case of unfed condition, no food was provided.

Data Analysis

Data on biological parameters were analyzed by MS office excel 2016 and fed and unfed adults' data were analyzed by the R version 4.1.1 software. Mean separation of treatments was calculated by Fisher's LSD test at 5% level of probability.

Results and discussions

Female moth laid eggs in clusters under or upper surface of the maize leaf, base of the plant, in whorls and lid of plastic cage (Plates 1, 2). Newly laid eggs were pink to greenish grey in colour and become darker with age towards larval eclosion. Fall armyworm eggs were oblate-spheroidal shape, flattened and curve and also clearly marked with ridges. Eggs were covered with greyish scales by the female moth, giving them a downy appearance. Similar report was also reported by (Shylesha *et al*., 2018). On higher magnification, shining reticulated surface could be easily noticed. Incubation period ranged from 3.00–5.00 days with a mean of 4.01 days and ranged from 2.00–3.00 days with a mean of 2.45 days, at winter and summer, respectively (Table 2).

First instar larvae were greenish with a black head, and turned greenish brown in the second instar (Plate 4). The third instar was brownish with three dorsal and lateral white lines beginning to form. Fourth to sixth instar had a reddish-brown head, were mottled with white and the brownish body bears three white dorsal lines and a pale lateral line. Black tubercles were found dorsally on the body which bears spines. The arrangement pattern of black spots was square on 8th and trapezoidal on 9^{th} segment of larva (Plate 5). The frons had a white inverted Y-shaped line (Plate 6). Each larva passed through six distinct instars over a period ranged 24-33 days with a mean 29.17 days and ranged 11-18 days with a mean of 14.80 days (Table 2) observed at winter and summer respectively. Larvae are most active in the early morning and tend to hide themselves during the brightest time of the day. Duration the larval stage tends to be about 14 days in warm weather and 30 days in cool weather (Hardke *et al.* 2015). Sharanabasappa *et al.* (2018) also revealed that larva passed through six distinct instars over a period of 15.9 ± 1.45 days that also supports this result.

At the time of prepupal period the full-grown larva stopped feeding, turned greenish and the bright brown colour. Duration of the pupal period was 1.28 ± 0.28 in winter and 1.06 ± 0.31 days in summer (Plates 7, 8). Similar results were reported by Montezano *et al.* (2019), as they also claimed that the prepupal stage of *S. frugiperda* was completed in 1-3 days on different food diets. Duration of the pupal period was about 17.63 ± 1.65 days (range12.78 - 22.09 days) in winter and 9.34 ± 0.99 days (range 8.00 to 11.00 days) in summer (Table 2).The pupal period ranges between 8 - 9 days in summer and 20 - 30 days in winter was also reported by other researcher which is supported the present study. The distance between genital opening and anal slot was greater in female than the male (Plate 9, 10) which can be used to identify the female and male pupa of fall armyworm.

Plate 1. Egg mass

Plate 2. Egg mass (after 24h old)

Plate 3. Newly hatch larvae

Plate 4.1st to 6th instar larvae

Figure 5. 6th instar larva

Figure 6. 6thinstar larva

Plate7. Pre pupa

Plate8. Pupa

Plate9. Female Pupa

Plate10. Male Pupa

Plate 11. Male moth

Plate 12. Female moth

Male and Female moths can be identified by the forewing colour and spot. Forewing of male is shaded with gray and brown, with triangular white patch at the apical region and circular spot at the center of the wing (Plate11). These characters are similar as reported earlier by Sharanabasappa *et al*. (2018). The forewings of females are uniform grayish brown to a fine mottling of gray and brown (Plate12) in the present study. Adult hind wing is silver-white with a narrow dark border in both male and female. Pre-oviposition, oviposition and post oviposition period ranged 4-5, 5-8 and 4-5 days, respectively in winter and those ranged from 2-3, 4-5 and 2-3 days, respectively in summer (Table 2). The female adult longevity was 15.47 days with a range of 11-22 days compared to male 13.98 days with a range of 10-21 days in winter. On the other hand, the female adult longevity was 10.03 days with a range of 9-12 days compared to male 8.19 days with a range of 7-10 days in summer. The total life cycle of male and female ranged from 59-73 and 61-73 days, respectively in winter and 31-37 and 33-40 days, respectively in summer (Table 2). Adult male longevity was shorter than that of the female moths. Sharanabasappa *et al.* (2018) reported that the development cycle of *S. frugiperda* male and female takes 37.50 and 40.50 days on average at 27^0 C. This is also slightly slower than the total development period of 66.5 days at 18^0 C and 18.3 days at 35^0 C.

Table 2. Duration (in days) of the different developmental stages of *Spodoptera frugiperda* reared on maize leavesin laboratory at room temperature.

Developmental Stage (Days)	Winter		Summer	
	Mean ± SD	Range	Mean ± SD	Range
Incubation period	4.01 ± 0.79	3.00 – 5.00	2.54 ± 0.44	2.00 – 3.00
Larva				
I inster	4.19 ± 0.75	2.53- 7.00	2.40 ± 0.50	1.19 - 3.14
II inster	4.31 ± 0.77	3.00 - 7.00	2.03 ± 0.67	1.17 - 3.00
III inster	4.47 ± 0.53	4.00 - 6.00	2.13 ± 0.58	1.23 - 3.00
IV inster	4.45 ± 0.51	4.00 - 5.89	1.69 ± 0.53	1.00 - 3.00
V inster	4.98 ± 0.97	4.00 - 7.88	2.58 ± 0.97	1.00 - 4.21
VI inster	5.61 ± 0.99	5.00 - 8.00	2.75 ± 0.68	2.00 - 5.00
Pre-pupa	1.28 ± 0.28	1.00 - 2.00	1.06 ± 0.31	1.00 - 1.97
Total larval period	29.17 ± 0.97	24.00 - 33.00	14.80 ± 0.93	11.00 - 18.00
Pupal period	17.63 ± 1.65	12.78 - 22.09	9.34 ± 0.99	8.00-11.00
Male adult longevity	13.98 ± 2.95	10.00 - 21.00	8.19 ± 0.91	7.00-10.00
Female adult longevity	15.47 ± 2.89	11.00 - 22.00	10.03 ± 0.92	9.00-12.00
Pre oviposition period	4.78 ± 0.43	4.00 – 5.00	2.97 ± 0.46	2.00 – 3.00
Oviposition period	6.51 ± 0.94	5.00 – 8.00	4.61 ± 0.41	4.00 - 5.00
Post oviposition period	4.95 ± 0.13	4.00 - 5.00	2.16 ± 0.38	2.00 – 3.00
Total life cycle (egg-adult) Male	64.79 ± 3.45	59.00 -73.00	34.86 ± 1.61	31.00 - 37.00
Female	66.28 ± 2.79	61.00 -73.00	36.70 ± 1.56	33.00 - 40.00

The female moth laid eggs ranged from 690-819 eggs and 893–1261 eggs in winter and summer respectively (Table 3). The mean number of eggs production was 789.29 ± 33.67 eggs/ female and 1071.08 ± 95.07 eggs/ female in winter and summer, respectively (Table 3). Usually, egg mass covered with a protective, hair-like layer of scales (setae) from the female abdomen. The number of egg masses laid per female ranged from 4-9 egg masses and 6-9 egg masses in winter and summer, respectively. The mean number of eggs/egg mass was recorded as 105.35 ± 14.60 and 121.65 ± 30.96 at winter and summer, respectively. In another study, the eggs of *S. frugiperda* are laid in groups or clusters of 20-350 and total egg production per female average about 1500, with a maximum of over 2000.

Table 3. Number (mean ± SD) of eggs/ female, egg masses/ female, number of eggs/egg mass, % egg hatch number of egg layer/ egg mass and sex ratio of *S. frugiperda* on maize

Different Stages (Number)	Winter		Summer	
	Mean ± SD	Range	Mean ± SD	Range
Number of eggs female^{-1}	789.29 ± 33.67	690- 819	1071.08 ±95.07	893 - 1261
Number of egg mass female^{-1}	7.13 ± 1.72	4 – 9	8.00 ± 0.92	6 -9
Number of eggs egg mass^{-1}	105.35 ± 14.60	46 – 165	121.65 ± 30.96	76 – 201
% Egg hatching	88.51 ± 11.95	65.00 - 96.88	91.63 ± 3.68	80.65 - 99.41
Number of egg layer egg mass^{-1}	2.13 ± 0.87	1 – 4	2.20 ± 0.9	1 – 4
Sex ratio (M: F)	1:1		1:2	

Mean percent of egg hatching was 88.51 ± 11.95 and 91.63 ± 3.68 in winter and summer, respectively. The female deposits eggs in egg masses ranged from 1-4 layers both winter and summer (Table 3). Three to four layers of egg in an egg mass was observed in the present study. The sex ratio was observed 1:1(M: F) and 1:2(M: F) in winter and summer, respectively. Ahir *et al*. (2019) observed less male population than female (1:1.30 male and female sex ratio) of the fall armyworm. Environmental factors could have influenced on seasonal variations of male and female sex ratio fall armyworm. Lekha *et al*. (2020) earlier mentioned that biology of fall armyworm was influenced by growing temperature, relative humidity, host, artificial diet.

Life cycle of fall armyworm was observed under two seasonal conditions such as winter (December-February) and summer (March-May). Average temperature was found 17.5^{0}C, 16.7^{0}C and 18.6^{0}C for January, February and March, respectively as well as humidity ranged from 41- 64%. On the other hand, average temperature was 24.1^0, 26.8^{0}C and 26.3^{0}C for March, April and May, respectively and the

humidity ranged from 42-74% (Table 1) during this period. Variation of weather parameters might be influenced on the life cycle of fall armyworm. Lekha *et al*. (2020) mentioned that biology of fall armyworm was influenced by temperature, relative humidity, host, artificial diet.

Morphometry of the different life stages

Data on morphometry of different developmental stages of *S. frugiperda* have been demonstrated in Table 4. Width of head capsule as well as body length, width and weight of different instars of larvae were increased with instars. The width of head capsule of the six larval instars were 0.24 mm, 0.36 mm, 0.62 mm, 0.94 mm 1.48 mm and 2.09 mm, respectively in first, second, third, fourth, fifth and sixth instar. The width of head capsules of the larvae was a slowly increased during first, second and third instar and significantly increased during the fourth, fifth and sixth instars. Larval body length was gradually increased with instars. Similarly, width and weight of larvae was markedly increased with instars and the highest width (1.15 mm) and weight (359.02 mg) were observed for sixth instar larva. The average body length of male and female pupae was 16.53 mm and 15.81 mm, respectively (Table 4). Male pupae little bit longer than female pupa. Similar findings were also reported by Marcela and Mario (2020).

Adult male body length was 13.75 mm with a wing expanse of 33.46 mm and body weight was 83.52 mg. Female body length was 12.77 mm with a wing expanse of 34.14 mm and body weight was 75.66 mg. The male was slightly bigger than the female although the general trend in arthropods is that males are smaller. But adult female wing expanse is slightly bigger than the male. These characters are more or less similar as reported earlier (Marcela and Mario,2020), who recorded13.33mm body length with a wing expanse of 32.66mmfor male and body length 12.20 mm with a wing expanse of 32.81 mm for female. Zeeshan (2021) reported that male and female body length was more or less similar (16.3±0.39 mm and 16.52±0.25mm for male and female, respectively) which is different from present study**.**

Table 4. Morphometric measurements (mm) of larval instars, pupae and adults of *Spodoptera frugiperda* reared on maize under laboratory in room temperature

Developmental Stage	Parameter	Mean ± SD	Range
Larva- 1st instar			
Head capsule	Width (mm)	0.24 ± 0.06	0.18 - 0.36
Body	Length (mm)	1.54±0.17	1.11 - 1.73
	Width (mm)	0.24±0.04	0.18 - 0.30
	Weight (mg)	8.28 ±0.39	7.00 - 8.90

Developmental Stage	Parameter	Mean ± SD	Range
2nd instar			
Head capsule	Width (mm)	0.36 ±0.04	0.33 - 0.49
Body	Length (mm)	3.03 ±0.15	2.71 - 3.71
	Width (mm)	0.41±0.03	0.34 - 0.48
	Weight (mg)	19.44 ±0.66	18.30 - 20.40
3rd instar			
Head capsule	Width (mm)	0.62±0.01	0.60 - 0.63
Body	Length (mm)	6.75±0.54	5.75 - 7.90
	Width (mm)	0.85±0.031	0.77 - 0.89
	Weight (mg)	139.39±1.18	136.89 - 141.55
4th instar			
Head capsule	Width (mm)	0.94±0.01	0.92 - 0.95
Body	Length (mm)	14.69±0.53	12.95 - 15.19
	Width (mm)	0.91±0.044	0.84 - 0.99
	Weight (mg)	191.49±2.66	185.89 - 194.71
5th instar			
Head capsule	Width (mm)	1.48±0.04	1.40 - 1.56
Body	Length (mm)	27.84±1.49	25.25 - 30.54
	Width (mm)	1.04±0.06	0.98 - 1.15
Weight (mg)	280.48±2.67	275.88 - 283.92	
6th instar			
Head capsule	Width (mm)	2.09±0.18	1.00 - 2.16
Body	Length (mm)	34.28±1.30	32.27 - 36.79
	Width (mm)	1.15±0.16	0.18 - 1.23
	Weight (mg)	359.02±15.77	322.99 - 378.64
Pupa			
Male	Length (mm)	16.53±0.14	16.25 - 16.75
	Width (mm)	5.02 ± 0.08	4.90 - 5.15
	Weight (mg)	181.441±19.18	170.61 - 250.79
Female	Length (mm)	15.81 ± 0.10	15.65 - 15.95
	Width (mm)	4.92 ± 0.07	4.80 - 5.05

Developmental Stage	Parameter	Mean ± SD	Range
	Weight (mg)	174.16 ± 9.62	167.91- 209.38
Adult			
Male	Length of body (mm)	13.75 ± 0.09	13.59 - 13.88
	Body weight (mg)	83.52 ± 5.25	70.00 - 90.00
	Wing expanse (mm)	33.46 ± 0.45	32.87 - 34.50
Female	Length of body (mm)	12.77 ± 0.05	12.69 - 12.86
	Body weight (mg)	75.66 ± 2.12	72.00 - 79.21
	Wing expanse (mm)	34.14 ± 1.81	28.00 - 39.35

The percent survival and mortality varied at different growth stages of fall armyworm (Figure 1). Figure expressed that, 152 eggs from a single egg mass were fully fresh but number of alive 1st instar larvae were 127 out of 152 that means egg mortality was (16.45%), whereas the percent of mortality was maximum found in (20.47%) 1st instar larva. Minimum percent of mortality (5.45%) was observed at 6thinstar larva then also found 4th and 5th instar larva which were 12.5% and 12.70% respectively. On the other hand, maximum percent of survival was found (94.55%) at6thinstar larval stage and least survival was recorded at 1stinstar larval stage (79.53%).

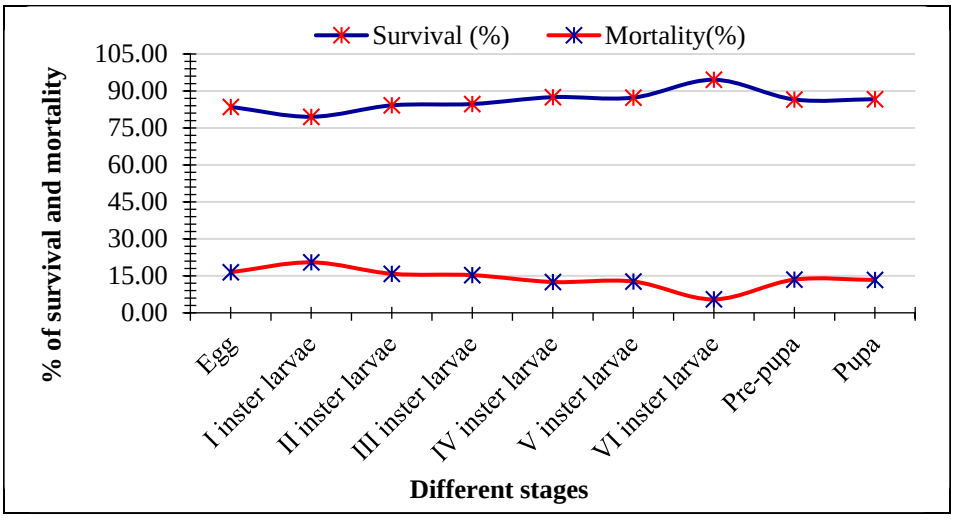

Fig. 1. Different stage-specific percent of survival and mortality of *S. frugiperda* onmaize.

Similar trend of different stage-specific survival and mortality was reported by Ashok *et al*. (2020) with maximum mortality of FAW in the first instar larva and egg stage, whereas mortality reduce in later larval instar with minimum mortality recorded in 6th larval instar. Another results of these studies of FAW conducted by Priyanka *et al*. (2021) under laboratory conditions reveals that the maximum apparent mortality of 33.82% in the 1st larval instar, whereas minimum mortality was recorded in pupae, 4th, 5rd, and 6th larval instars. Unfed adult longevity was much shorterthan fed adult, as shown in (Figure 2). The average longevity of the fed female and male moths was recorded as 16.08 days and 14.12days, respectively and that was4.69 days and 3.95 days, respectively for unfed female and male moths of fall armyworm. Lekha *et al.* (2020) observed an adult male and female longevity of 4.50-8.00 and 7.00-10.33 days on different hosts; while Kalyan *et al*. (2020) observed this as 10.67- 13.00 days.

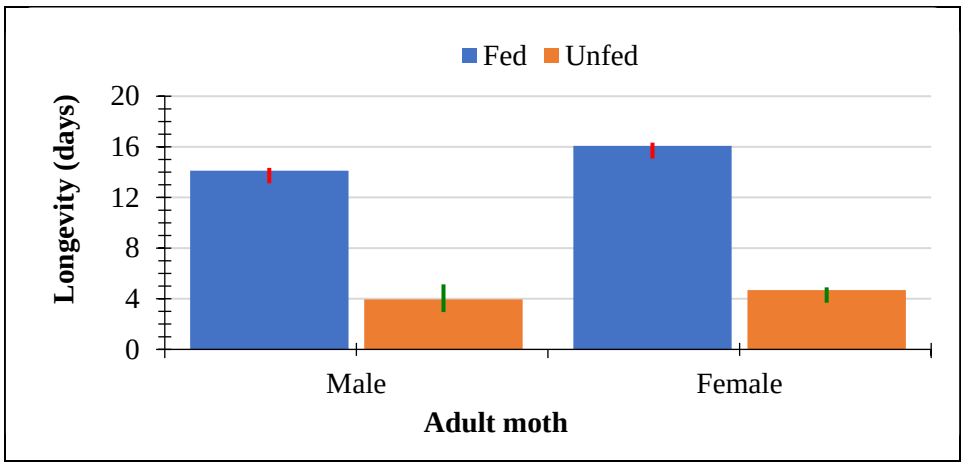

Fig. 2. Longevity (days) of fed and unfed adults of fall armyworm (*Spodoptera frugiperda*).

Conclusion

The results on biology and morphometry of fall armyworms revealed that fall army worm had four stages such as egg larva, pupa and adults in its life cycle. Eggs are laid in cluster which consisted higher number of eggs in summer than winter. The incubation period, duration of different developmental periods and total life cycle were longer in winter than summer. Larva transformed into pupa through six instars and the size of larva was gradually increased with instars. Larva had a white inverted Y-shaped line on frons and a square of black spots on 8th and trapezoidal on 9th segment. Male pupa was slightly bigger than female one with longer distance between genital opening and anal slot. Adult male was also a bit larger than female and adult moths feeding with sugar solution lived more days than unfed moths.

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