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Comparative Biology of Fall Armyworm, *Spodoptera frugiperda* on Different Host Plants under Laboratory Conditions

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ABSTRACT: Fall Armyworm, *Spodoptera frugiperda* (J. E. Smith) (Lepidoptera, Noctuidae) was recently reported for the first time in India in May, 2018 as a new invasive pest of maize. A detailed record of *S. frugiperda's* host plants is essential to better understand the biology and ecology of this pest, conduct future studies, and develop Integrated Pest Management programmes. Therefore, present study were undertaken to study biology on three different natural host plants *viz.*, maize, sorghum, sugarcane along with artificial diet as control under laboratory conditions during *kharif*, 2019 at Department of Entomology, College of Agriculture, Rajendranagar, Hyderabad. During the experiment, newly hatched larvae were fed with respective host plants and artificial diet. Duration of development from larva to adult and oviposition were evaluated. The results revealed that, significant lowest larval developmental period of 12.28 ± 0.05 days was noticed on artificial diet, while it was maximum (16.82 ± 0.06 days) on sugarcane. Similar trend was observed in pre pupal and pupal period. Significantly highest male and female adult longevity (7.59 ± 0.056 and 11.36 ± 0.128 days, respectively) was found on sugarcane followed by sorghum (7.53 ± 0.033 and 11.27 ± 0.163 days, respectively) and maize (7.50 ± 0.065 days and 10.17 ± 0.082 days, respectively), while shortest male and female adult longevity of 6.34 ± 0.084 days and 8.78 ± 0.130 days was recorded on artificial diet. The total developmental period of males and females adults was longer on sugarcane (36.81 ± 0.16 and 40.56 ± 0.93 days, respectively) followed by sorghum (34.35 ± 0.22 and 39.00 ± 0.24 days, respectively) and maize (33.35 ± 0.20 and 35.63 ± 0.37 days, respectively). Shortest developmental period was observed on artificial diet (30.33 ± 0.1 and 32.58±0.18 days, respectively). Maximum fecundity was recorded when larvae were fed with artificial diet compared to natural host plants *i.e.*, maize, sorghum and sugarcane. The number of eggs oviposited was highest on artificial diet (1846.36 ± 16.00 eggs) followed by maize (1008.36 ± 13.35 eggs), sorghum (686.68 ± 4.00 eggs) and lowest number of eggs were laid on sugarcane (544.18 ± 5.00 eggs).

Keywords: *Spodoptera frugiperda*, biology, maize, sugarcane, sorghum, artificial diet.

INTRODUCTION

The fall armyworm, *Spodoptera frugiperda* (J.E. Smith) (Lepidoptera: Noctuidae), which originated in the tropical and subtropical regions of America, has been identified as an notorious polyphagous pest with high migration ability, a wide range of hosts, voracious larval feeding and high fecundity; this pest is known to cause heavy economic damage to crops and pastures worldwide (Johnson, 1987; Montezano *et al.*, 2018; Westbrook *et al.*, 2016). It occurs in several maize growing countries such as Brazil, Argentina, Mexico and the Unites States of America (Prowell *et al*., 2004; Clark *et al.*, 2007). *S. frugiperda* consists of two haplotypes: corn strain and rice strain. The corn-strain haplotype mainly feeds on corn, cotton and sorghum, while the rice-strain haplotype invades rice and pastures (Dumas *et al.*, 2015). Though *S. frugiperda* is a key pest of maize, due to its polyphagous nature uses important cultivated species of poaceae as its host and has ability to reach pest status on several of them (e.g., rice, wheat, sorghum, and corn) (Luginbill, 1928; Sparks, 1979; Cruz, 1999; Capinera, 2007). FAW larvae were reported on more than 60 different species of plants, particularly graminaceous hosts, such as maize, sorghum and Bermuda grass (Mitchell, 1979). The occurrence of FAW was reported in West Africa for the first time in early 2016 (Goergen *et al*., 2016; Abrahams *et al*., 2017). In Asia, *S. frugiperda* was first detected in India in 2018 and later in other countries, which include Myanmar, Thailand, Yemen and Sri Lanka (Deshmukh *et al.*, 2018; FAO, 2020). In India, occurrence of this invasive pest was reported for the first time on maize from Karnataka by Sharanabasappa *et al*., (2018) during the month of May, 2018. Presence of FAW was observed during regular surveillance in maize fields at the College of Agriculture, Shivamogga and neighboring districts. Its occurrence was further

confirmed in Karnataka and other states like Tamil Nadu and Telangana. Molecular diversity of fall armyworm, *S. frugiperda* was studied from different states of India and indicated prevalence of R-strain. India being a subtropical cultivates most of graminaceious food crops such as maize, wheat, rice, sorghum, sugarcane and many minor millets in all parts of the country. The invasive pest though prefers maize but being polyphagous could turn out to be a potential threat to food security of the country. Moreover, the planting seasons of different crops are often overlapping or continuous in different regions of India, which could provide sufficient food resources for the occurrence and migration of *S. frugiperda.* It is well known that plant species significantly affect the survival, fecundity and population growth of herbivorous insects (Awmack *et al.*, 2002). The impact of plant species that slow or accelerate herbivore development should be taken into account when designing and developing integrated pest managements. Therefore, investigating the effects of most host crops on the growth, development, survival and reproduction of *S. frugiperda* is of great significance to make a comprehensive control strategy and predict the occurrence of the population. Jing-Fei Guo *et al.*, (2021) studied the biology of FAW on different host plants and found that larvae fed on maize exhibited significantly higher survival than those fed on potato and tobacco. Alton *et al.*, (1979) found that corn, peanuts, sorghum are favored hosts for larvae of FAW. Ribeiro *et al.*, (2020) studied the biological performance of *S. frugiperda* on different host plants and suggested that bermudagrass is the most suitable alternative host for the development of *S. frugiperda*. Silva *et al*., (2017) studied the biology of *S. frugiperda* using different food sources *viz*., soybean, cotton, maize, wheat, and oat leaves and artificial diet as the control and reported that grasses were better hosts for *S. frugiperda* development. Cotton was the least preferred food, followed by soybean.

To develop effective management strategies for *S. frugiperda* in its new invasive habitat, basic biological and ecological knowledge of this pest on different crops are crucial requirements. Reportedly, *S. frugiperda* has the potential to damage 353 species of plants belonging to 76 plant families (Montezano *et al.*, 2018). However, to our knowledge, the effects of most host plants on the biological characteristics of *S. frugiperda* have not been well studied in India. Further, presence of good number of R-strain population and the potentiality of this pest to become a major pest on other graminacious crop plants an attempt was made to know the biology of *S. frugiperda* on different graminacious plants. The results of present study could help to determine the food preferences and possible population build up of *S. frugiperda* in turn helps in designing the management strategy.

MATERIAL AND METHODS

The present investigation on "Comparative biology of fall armyworm, *S. frugiperda* on different host plants under laboratory conditions" was carried out in the Department of Entomology, College of Agriculture, Rajendranagar, Hyderabad during *kharif*, 2019-20. Biology were studied on three different natural host plants *viz.*, maize, sorghum, sugarcane along with artificial diet as control. Each of these plants were sown during first fortnight of July, 2019 in the red sandy loam soils in an area of 200 m^2. These plants were sown to provide continuous supply of food for *S. frugiperda* larvae needed for conducting the experiment. Gap filling and thinning was done after a week of germination. Crop was kept weed free through regular hand weeding. The plots were regularly irrigated, whenever the top two to three inches of soil was found dry. All the recommended agronomic package of practice were followed for raising the crops. Special care was taken to avoid application of chemical spray to the cultivated host plants.

To study the biology of *S. frugiperda* on different host plants, mass multiplication of *S. frugiperda* was taken up on artificial diet.

Experimental details. Present investigation was carried out to study the effect of different host plants and artificial diet on the development of different stages of *S. frugiperda* under laboratory. During the experimental period the average room temperature was maintained at 25 ± 2°C and the relative humidity was maintained at 70 ± 5 per cent.

Larval feeding test. Freshly hatched, neonate larvae, (0-12 hrs. old) of *S. frugiperda* obtained from the laboratory that were reared on artificial diet were used for the experiment. Neonate larvae were released individually in petri plates containing fresh leaves of selected host plants *viz.*, maize, sorghum, sugarcane along with artificial diet. The larvae were reared on host plants till pupation and adult emergence. Fresh leaves of respective host plants were brought to the laboratory in separate polythene covers. Plant leaves were cleaned in distilled water, shade dried and later sand wiched between the two layers of blotting paper for removing the water. The leaves were then cut into small discs of around 7-8 cm diameter. These leaf discs were placed in small petri plates of 9 cm diameter containing circularly cut moist filter paper, to avoid drying of leaf discs. Proper care was taken to prevent the escape of larvae by covering petri plates with tissue para film paper and the lid was tightly secured with the help of rubber band. Leftover food material along with excreta were removed daily. Fresh leaves of host plants were provided to larvae at every 24 hrs. interval. This process was continued until the larvae entered into final instar. The final instar larvae were collected and transferred into another jar containing sand for pupation. Separate jars were used for pupation of final instar larvae of *S. frugiperda* that were reared on different host plants. Pupae thus formed were collected and placed in small plastic jars and covered with muslin cloth for adult emergence. Each treatment was replicated six times with 10 larvae in each replication. Each petri plate was examined daily for recording the

observations on larval period, pre pupal period and pupal period.

Adult longevity and fecundity test. To study the impact of host plant on fecundity and adult longevity, a pair of freshly emerged healthy male and female adults that were reared on a particular host plant *viz.*, maize, sorghum, sugarcane and artificial diet were selected. The adults were then released into plastic jars for mating. The jars were lined with yellow paper as substratum for egg laying and were covered with white muslin cloth that was held in position with the help of the rubber band. The adults were fed with 10 per cent honey solution soaked in cotton swab placed in plastic cup inside the jar which was replaced daily. The eggs laid on the yellow paper and white muslin cloth were collected daily till the female stopped laying eggs. The eggs were collected daily and were placed in a separate jar for hatching. The eggs were counted daily using hand lens and were recorded. The experiment was replicated six times with ten such pairs of adults per replication. A total of sixty pairs of adults were tested for adult longevity and fecundity. Average number of eggs laid per female and percent viability of the eggs from each treatment was calculated. Observations were recorded at every 24 hrs. interval on pre oviposition period, oviposition period, post oviposition period, adult longevity of male and female, sex ratio, fecundity, incubation period etc.

RESULTS AND DISCUSSION

Comparative biology of *S. frugiperda* fed on different host plants and artificial diet as check was studied under laboratory conditions at 27 ± 2°C temperature and 65 ± 5 % RH during *kharif*, 2019-20. The results of the investigation are presented in Table 1 and Fig. 1.

Table 1: Comparative biology of fall armyworm, *Spodoptera frugiperda* on different host plants and artificial diet.

Host plant	Incubation period	Total larval period	Pre pupal Period	Pupal period	Adult longevity		Total life cycle		Fecundity
					Male	Female	Male	Female	
Maize	2.40±0.037^{b}	13.43±0.05^{c}	2.41±0.031^{b}	7.40±0.052^{c}	7.50±0.065^{a}	10.17±0.082^{b}	33.35±0.20^{c}	35.63±0.37^{c}	1009.24±13.35^{b}
Sorghum	2.47±0.021^{b}	15.30±0.07^{b}	2.45±0.022^{b}	7.88±0.031^{b}	7.53±0.033^{a}	11.27±0.163^{a}	34.35±0.22^{b}	39.00±0.24^{b}	686.68±4.00^{c}
Sugarcane	2.58±0.04^{a}	16.82±0.06^{a}	2.55±0.022^{a}	8.22±0.031^{a}	7.59±0.056^{a}	11.36±0.128^{a}	36.81±0.16^{a}	40.56±0.93^{a}	544.18±5.00^{d}
Artificial diet	2.28±0.031^{c}	12.28±0.05^{d}	2.33±0.021^{c}	6.94±0.067^{d}	6.34±0.084^{b}	8.78±0.130^{c}	30.33±0.13^{d}	32.58±0.18^{d}	1846.36±16.00^{a}
S.E ±	0.032	0.057	0.024	0.047	0.062	0.129	0.181	0.524	10.174
CD (5%)	0.094	0.170	0.072	0.139	0.184	0.380	0.534	1.540	31.689

Means followed by same letters in the column did not differ significantly by DMRT (P= 0.05%)

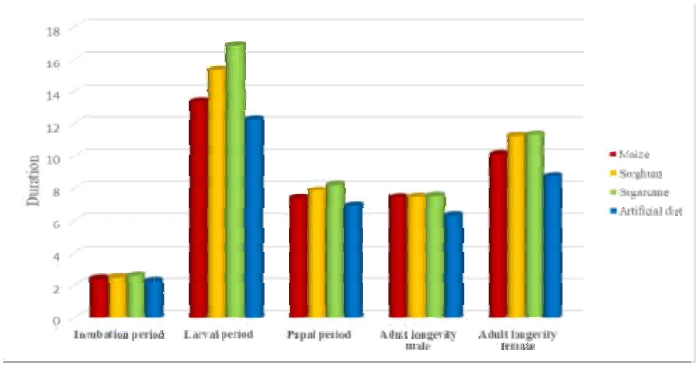

Fig. 1. Comparative biology of fall armyworm, *Spodoptera frugiperda* on different host plants and artificial diet.

Incubation period. The mean incubation period of *S. frugiperda* eggs ranged between 2.28 ± 0.031 and 2.58 ± 0.04 days on different host plants. The incubation period was significantly less for the eggs that were laid by the females fed with artificial diet while it was more for the eggs that were laid by the females fed with sugarcane. The incubation period of eggs that were laid by females fed with sorghum and maize were on par with each other but were significantly higher compared the eggs laid by females fed with artificial diet. Similar variation in the incubation period of *S. frugiperda* eggs laid by females fed with different host plants was also reported by Murua *et al.*, (2004) working on maize, Guinea grass and Bermuda grass. It was also reported that not only the nutritional variations in different host plants but also variations in the quality of nutrition in different cultivars belonging to a given host also impacts incubation period of eggs was suggested by Rosa *et al.*, (2012). According to Rosa *et al.*, (2012) the incubation period of eggs of *S. frugiperda* fed on different maize cultivars varied between 2.8 to 3.3 days. However, Azidah and Sofian-Azirun, (2006) indicated that variations in the quality of host plants did not influence the incubation period of eggs.

Total larval period. The results on total larval period of *S. frugiperda* fed on different host plants revealed that, overall larval development was significantly affected by the host plants. Data indicated that the mean larval period of *S. frugiperda* was significantly highest on sugarcane (16.82 ± 0.06 days) followed by sorghum (15.30 ± 0.07 days) and maize (13.43 ± 0.05 days). Significantly, lowest mean larval duration was recorded

on artificial diet (12.28 ± 0.05 days). It is quite evident that insect larvae consume food till their energy requirements are fulfilled. As the food consumed by the larvae has to transform into energy which helps to sustain the next active stage of the insect that is adult. The artificial diet consists of balanced nutrition *viz.,* carbohydrates, proteins, fats including essential vitamins which generate the required quantum of energy the larva needed to transfer itself to pupa. Therefore, the larva fed with artificial diet must have acquired the necessary quantum of food and energy quickly than those fed with other plant materials. This could be the probable reason for significant short larval period of *S. frugiperda* fed with artificial diet. However, significant variations in the larval periods of *S. frugiperda* fed with maize, sorghum and sugar cane may be due to variations in the nutritional composition of these plants. Maize must be possessing the nutritional composition that helps to fulfill the much-needed energy requirements to transfer itself to pupa in a short period compared to sorghum and sugarcane. Sorghum and sugarcane may be possessing little less nutritional composition compared to maize, that must have compelled larvae to consume smaller quantities of comparatively undesired food over extended period of feeding to derive the required quantity of nutrition. Maize has been preferred host to fall armyworm probably due to the presence of good nutritional composition that is suitable for the insect for its faster growth and to promote many parallel generations. The findings of the present investigations were in accordance with the findings of Xue-Ming *et al.,* (2010) who have stated that the variation in nutritional composition of host plants impacts larval developmental duration. Similar results were also put forth by Farahani *et al.,* (2011) after recording lowest larval duration of 11.98 days on mustard, 12.53 days on goosefoot, 13.10 days on soybean, 14.91 days on maize and 15.50 days on cotton by beet armyworm. FAW reared on maize exhibited the strongest performance with shorter larval developmental duration compared to potato and tobacco was also reported by Jing –Fei Guo *et al.,* (2021). Among different host plants tested, shortest larval development period (23.8±0.3days) were reported in larvae fed with maize where as it was the longest in brinjal. (Wijerathna *et al.,* 2021). Sá *et al.,* (2009) reported that there is no significant differences on FAW larval development time when reared on natural hosts *i.e*., maize, grain sorghum, Johnson grass, soybean, Brachiaria and tobacco, but it was longer for larvae reared on artificial diet. Barros *et al.,* (2010) investigated the performance of FAW on three major crops cultivated in the Cerrado *viz.,* soybean, corn, and cotton and millet and found that survival of FAW larvae caged on millet plants was higher than on other hosts. The FAW reared on millet also exhibited a net reproductive rate similar to that observed on corn, which was considered the best host for FAW.

Pre pupal and pupal period. Subsequent effects of host plants nutrition have been manifested in pre pupal and pupal development. The pre pupal and pupal development was also affected significantly by hosts. The longest mean duration of 2.55 ± 0.022 and 8.22 ± 0.031 days was recorded for pre pupae and pupae obtained from the larvae fed on sugarcane while the period was significantly low in larvae fed with sorghum and maize leaves which was recorded as 2.45 ± 0.022 and 7.88 ± 0.031 and 2.41 ± 0.031 and 7.40 ± 0.052 days, respectively. The shortest duration was recorded on artificial diet (2.33 ± 0.021 and 6.94 ± 0.067 days).

Larvae after gaining sufficient energy stops feeding compresses its body size and tries to convert itself into pupa. Lot of biochemical changes takes place during this process which are related to hormones and transformation of energy. Hormones play a vital role in the metamorphosis of insects and are synthesized by the nutrition the insects derive from its food. Though hormones are required in minor quantity to initiate the physiological or biochemical process in living organisms but in case of insect metamorphosis their titre is very important to promote from one stage to other. Therefore, it can be assessed that larvae fed with balanced nutrition (artificial diet) must have synthesized required quantity of hormones in a short period that helped them to convert itself from larva to pupa in lesser duration compared to those that fed on maize, sorghum or sugarcane. Similarly, pupa being a non-feeding resting stage of the insect conserves energy that was accumulated by the larva by feeding on food and transforms it to production of different parts of the adult insect which includes wings, antennae, apart from head, thorax and abdomen. The duration of pupa converting to adult also depends on rapid processing of biochemical and physiological process which require energy. If the quantum of energy in pupa is high the duration which the pupa takes itself to turn into adult will be less. Hence, the reduced pupal duration for those pupae derived from the larvae fed with artificial diet may be due to possession of high quantum of energy in them. Similar variations in the pre pupal periodof fall armyworm, *S. frugiperda* on different host plants was reported Rosa *et al.,* (2012). Murúa *et al.,* (2004) also reported variations in the pupal period of *S. frugiperda* fed on maize, Guinea grass and Bermuda grass. The present observations were in comparison with the studies given by Abdullah *et al.,* (2019) who reported reduced pupal development period of *S. litura* fed on maize.

Adult longevity. The results presented in the Table 1, revealed that female adults lived little longer compared to males fed on different host plants and artificial diet. The reason being quite evident in all the species that females has to find a suitable location containing ample food source to lay eggs. The data also shows that the adult longevities of males and females were on par with each other except the female adults that were derived from the larvae fed with maize. However, the male and female adult longevities were significantly different from the male and female adult longevities that were derived from the larvae fed with artificial diet. Longest male life span was recorded on sugarcane (7.59 ± 0.056 days) followed by sorghum (7.53 ± 0.033 days) and maize (7.50 ± 0.065 days) which were found to be on par with each other. Significantly shortest male life

span of 6.34 ± 0.084 days was recorded on artificial diet. Similarly, longest female life span of 11.36 ± 0.128 days was recorded on sugarcane followed by sorghum (11.27 ± 0.163 days) which were found to be on par with each other. Significantly shortest female life span was recorded on artificial diet (8.78 ± 0.130 days) followed by Maize (10.17 ± 0.082 days). However, significantly short life span of adults derived from the larvae fed on artificial diet compared to those fed on different host plants may be due to their higher fecundity in short span of time. The males and females soon after their emergence mate wherein, the males donate the sperms to females once they discharge the sperms, the males perish. The females possessing good quantum of proteins produce large number of eggs within short period of time which get fertilized using the sperms donated by males. Once the females convert their energy into eggs in a short span, they get exhausted and will perish. The longer adult longevity of males and females fed with low nutritional food may be due to low energies and slow physiological processes within them leading to delayed as well as low production of eggs. Similar results were put forth by Rosa *et al.,* (2012) who reported adult longevity of *S. frugiperda* varied between 14 to 32 days when reared on different maize cultivars. Murua *et al.,* (2004) also reported adult longevity as 16.00 ± 2.8, 17.35 ± 5.39 and 16.23 ± 4.69 days on maize, Guinea grass and Bermuda grass, respectively. Similar variability in adult longevity was also reported by Barros *et al.,* (2010) when *S. frugiperda* were fed with cotton, millet, corn and soybean. FAW reared on maize exhibited longer longevity and a higher reproductive rate in adults in preference to potato or tobacco (Jing -FeiGuo *et al.,* (2021).

Total developmental period. The total developmental period of both males as well as females reared on different host plants were significantly long compared to those reared on artificial diet. However, among different host plants *S. frugiperda* that were reared on sugarcane showed significant longer total developmental period of 36.81 ± 0.16 days followed by sorghum (34.35 ± 0.22 days) and maize (33.35 u± 0.20 days). Significantly, shortest total development period of male as 30.33± 0.13 days was recorded on artificial diet. Similar trend was observed in respect of females wherein significant longest total developmental period was observed on sugarcane (40.56 ± 0.93 days) followed by sorghum (39.00 ± 0.24 days) and maize (35.63 ± 0.37 days). Shortest female total development period of 32.58± 0.18 days was recorded on artificial diet. The total developmental period depends up on the period of egg incubation, duration of larva, duration of pre pupa, pupa and adult. The reasons cited for the increase in the duration of egg, larva, pupa and adult for the insects reared on different hosts holds valid for the probable increase in the duration of total developmental period of insects. The results on variation in the total developmental period with variation in the host plant was reported by Sharma, (1994) who observed the total developmental period of *S. litura* to be 32.67 days on germinating seeds of soybean and 43.72 days on linseed. Similarly, Farahani *et al.,* (2011) observed variation in the total developmental period of *S. exigua* reared on different hosts and reported that the lowest total development period on mustard with 34.12 days followed by soybean (35.15 days), goose foot (36.33 days), maize (38.42 days) and longest development period on cotton (39.94 days).

Fecundity. Number of eggs laid by *S. frugiperda* females fed on different host plants differed significantly. Fecundity was higher when larvae were fed with artificial diet compared to natural host plants *i.e*., maize, sorghum and sugarcane. The number of eggs oviposited was highest on artificial diet (1846.36 ± 16.00 eggs) followed by maize (1009.24 ± 13.35 eggs), sorghum (686.68 ± 4.00) and lowest number of eggs were laid on sugarcane (544.18 ± 5.00 eggs). Fecundity of female depends on the availability of proteins. As the artificial diet being rich in protein could be the probable reason for production of more eggs by the adults whose larvae were reared on it. The monocot grasses maize, sorghum and sugar cane being rich in carbohydrates with little protein content could be the reason for low fecundity of adults. Variation in fecundity of females that were reared on different host plants were also reported by Abdullah *et al.* (2019) who observed higher fecundity of *S. litura* fed with leaves of cabbage (2455.5), alfalfa (1750) compared to maize (1055.6). Similarly, Barros *et al.* (2010) reported fecundity of fall armyworm as 1144.7 ± 132.7, 1574.1 ± 177.6, 1604.2 ± 353.8 and 1590.8 ± 381.7 eggs on cotton, millet, corn and soybean, respectively. Castro and Pitre (1988) found that there is no significant difference in the fall armyworm development cycle when fed with sorghum and maize. Jing Fei Guo *et al.,* (2021) reported that females oviposited on maize in preference to potato or tobacco. Oviposition of FAW on transgenic and conventional maize was significantly higher than that on wheat, sorghum, foxtail millet, peanut and soybean while showing no significant difference between transgenic or conventional maize (Li-mei *et al.,* 2021). The highest oviposition (4.1±1.2 in Choice test and 3.6±0.7 in No-choice test) was observed in maize compared to other crops (Wijerathna *et al.,* 2021). Wang *et al*., (2020) examined the effects of six cash crops maize, wheat, soybean, tomato, cotton and Chinese cabbage on the development, survival, fecundity of *S. frugiperda* and reported that the preadult stage, adult preoviposition period and total preoviposition period were shortest on maize and wheat but were longest on tomato. Fecundity was greatest on maize and wheat but smallest on tomato.

CONCLUSION

From the present study, the comparative biology of *S. frugiperda* is important to know the best host that support the development of *S. frugiperda* and can be used for mass rearing of *S. frugiperda*. Similarly, the information of life history parameters of *S. frugiperda* on different host plant species will help to make efficient strategies to control this economic pest. The comparative biology of *S. frugiperda* on different hosts inferred that, highest mean larval period, pre pupal and

pupal period was recorded on sugarcane while, it was lowest on artificial diet. The total developmental period of both males and females was longer on sugarcane followed by sorghum and maize, while shortest developmental period was found on artificial diet. Maximum fecundity was recorded when larvae were fed with artificial diet compared to natural host plants *i.e*., maize, sorghum and sugarcane. The results clearly indicated that the larva fed with artificial diet showed significant shorter larval, pre pupal, pupal period and male and female adult longevity compared to larvae fed with host plants maize, sorghum and sugarcane. This could probably be due to the acquisition of necessary quantum of food and energy quickly than those fed with other plant materials. However, significant variations in the larval periods of *S. frugiperda* fed with maize, sorghum and sugarcane may be due to the variations in the nutritional composition of these plants. It can be concluded from the study that, among the host plants maize was the preferred host to fall armyworm. The reason for which can be attributed to the presence of good nutritional composition that was suitable for the faster growth and development of *S. frugiperda* and also to promote many parallel generations.

FUTURE SCOPE

The research provides idea and knowledge about the survival mechanism of *S. frugiperda* during off season of maize and potential alternative host plants of the pest. It identifies the possibility of moving of *S. frugiperda* into other graminaceous crops and thereby make awareness to the farmers about the pest, in turn to follow the suitable management practice against *S. frugiperda.*

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Conflict of Interest. None.

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