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From Maize to Soybean: How Fall Armyworm Thrives Across Crops

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INTRODUCTION & AIM

- Fall Armyworm (*Spodoptera frugiperda*, J.E.Smith, Lepidoptera: Noctuidae) is a major invasive pest that has rapidly spread across India since its 2018 invasion, threatening maize production and food security.
- In India, the continuous cultivation of maize, popcorn, sweet corn, sorghum, and soybean provides a steady food source, enabling FAW survival and migration.
- FAW infestation causes significant economic losses, emphasizing the need to study its demographics and damage potential. This study systematically assesses its impact across crops and threat to Indian agriculture.

METHOD

- Developmental biology and food consumption of *S. frugiperda* fed on maize, popcorn, sweet corn, sorghum, and soybean were studied using a cohort of 100 eggs under controlled conditions (25 ± 0.5°C, 14L:10D photoperiod, and 70 ± 5% relative humidity). Fresh leaves of respective host were provided daily until pupation.
- Population growth parameters and host feeding potential were assessed on different crops by recording key biological parameters and daily leaf consumption using LICOR 3100A.
- Using the TIMING computer program (Chi 2022), the population growth and leaf consumption of *S. frugiperda* were projected.

Figure 1. Damage symptoms of *Spodoptera frugiperda*

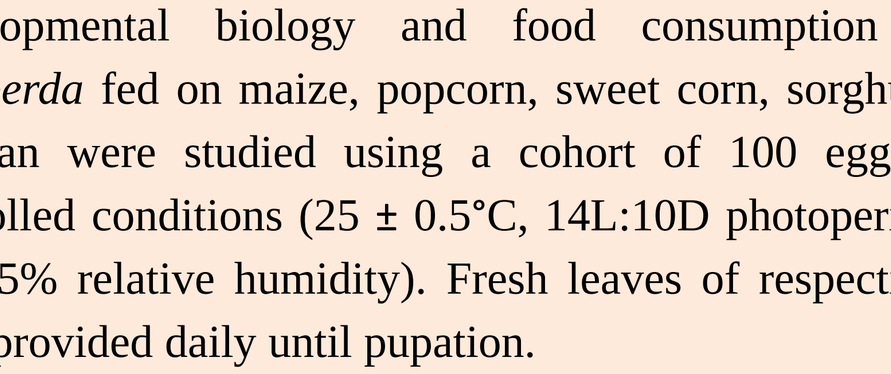
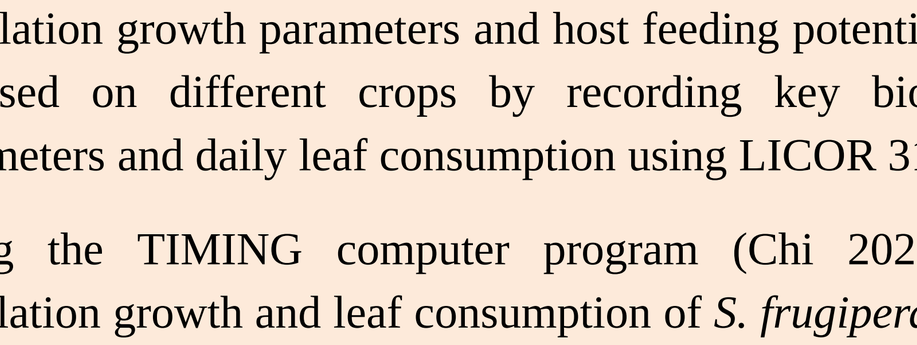


Figure 2. Identification features of *Spodoptera frugiperda* larva



RESULTS & DISCUSSION

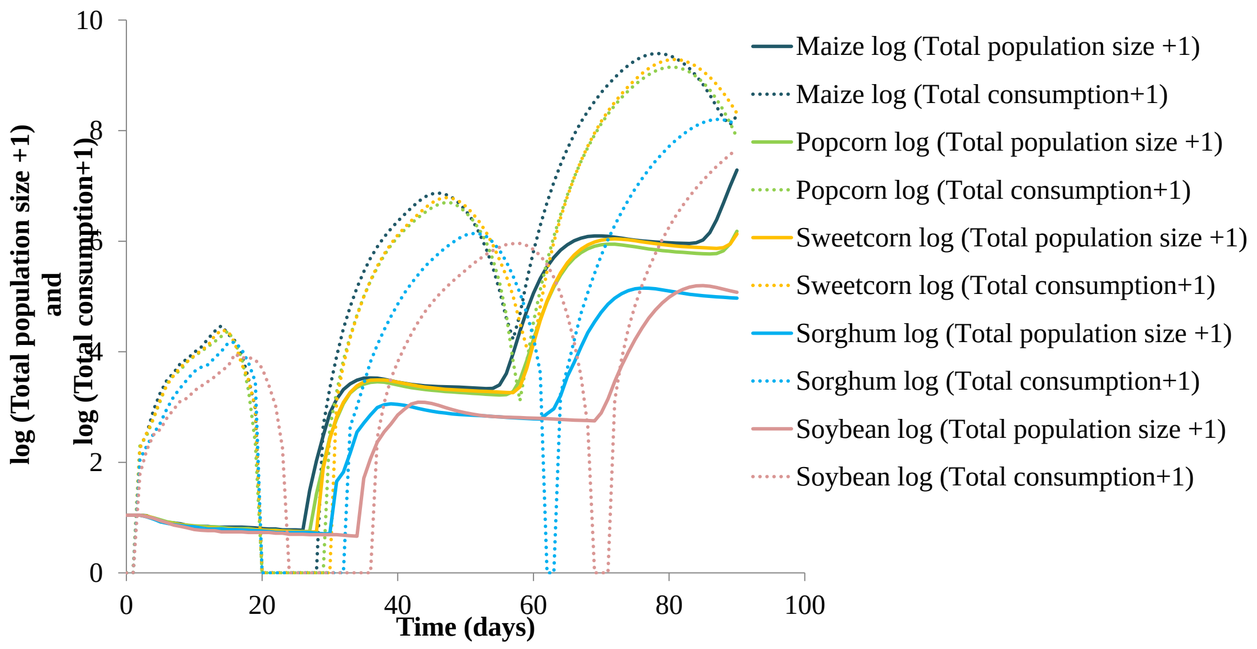
Table 1. Development of *Spodoptera frugiperda* on different hosts

Stage (Days)	N	Maize	N	Popcorn	N	Sweet corn	N	Sorghum	N	Soybean
Egg	100	2.00 ± 0.00	100	2.00 ± 0.00	100	2.00 ± 0.00	100	2.00 ± 0.00	100	2.00± 0.00
Total larval duration	57	14.57 ± 0.43d	56	15.43 ± 0.37c	53	15.17 ± 0.65cd	51	16.86 ± 0.46b	45	19.38 ± 0.56a
Pre-pupa	56	2.47 ± 0.07^{bc}	53	2.37 ± 0.07^{c}	51	2.37 ±0.07^{c}	48	2.60 ± 0.08^{b}	44	3.23 ± 0.10^{a}
Pupa	53	9.14 ± 0.3c	49	8.72 ± 0.25c	49	9.13 ± 0.28c	45	10.46 ± 0.24b	40	11.36 ± 0.26a
Pre-adult	49	28.04 ± 0.44c	46	28.02 ± 0.28c	45	28.31 ± 0.29c	41	31.20 ± 0.46b	36	34.83 ± 0.38a
Female longevity	30	12.60 ± 0.18b	24	13.25 ± 0.22a	28	13.14 ± 0.20a	13	10.69 ± 0.33c	20	9.60 ± 0.40d
Male longevity	19	9.37 ± 0.22b	22	9.95 ± 0.14a	17	10.18 ± 0.18a	28	7.14 ± 0.23c	16	6.75 ± 0.56c

Table 2. Population growth parameters and host feeding potential of *Spodoptera frugiperda* on different hosts

Parameter	Maize	Popcorn	Sweet corn	Sorghum	Soybean
Net reproductive rate (R_0) (offspring/individual)	404.46 ± 62.78a	337.36 ± 60.69a	386.71 ± 62.62a	137.83 ± 36.05b	144.36 ± 29.76b
Intrinsic rate of increase (r) (offspring/individual /day)	0.1870 ± 0.0053a	0.1759 ± 0.0058a	0.1787 ± 0.0053a	0.1375 ± 0.0081b	0.1248 ± 0.0054b
Finite rate of increase (λ) (times/day)	1.2056 ± 0.0063a	1.1924 ± 0.0069a	1.1956 ± 0.0063a	1.1474 ± 0.0092b	1.1329 ± 0.0061b
Mean generation time (T) (days)	32.11 ± 0.3c	33.09 ± 0.31c	33.34 ± 0.34c	35.83 ± 0.56b	39.84 ± 0.49a
Doubling time (DT) (days)	3.71 ± 0.11b	3.94 ± 0.13b	3.88 ± 0.12b	5.04 ± 0.32a	5.55 ± 0.25a
Net consumption rate (C_0)	16541.76 ± 1594.61a	13327.31 ± 1214.93a	14415.38 ± 1326.30a	9187.05 ± 880.45b	6647.11 ± 741.78c
Transformation rate (Q_P)	40.90 ± 5.21b	39.50 ± 6.53ab	37.28 ± 5.16b	66.65 ± 20.62a	46.05 ± 8.92ab
Stable consumption rate (Ψ)	360.06 ± 26.01a	312.04 ± 19.24a	332.55 ± 22a	245.8 ± 15.96b	168.02 ± 12.7c
Finite consumption rate (ω)	434.09 ± 33.01a	372.06 ± 24.11a	397.61 ± 27.46a	282.02 ± 19.03b	190.36 ± 14.94c

Figure 3. Projection of population growth potential and feeding potential of *Spodoptera frugiperda* reared on different hosts



CONCLUSION

S. frugiperda's ability to develop on multiple hosts, including soybean, highlights its potential threat to intercropping systems and adaptability to alternate hosts.

REFERENCES

Chi H. (2022) Timing-MS Chart: Computer program for population projection based on age-stage, two-sex life table. National Chung Hsing University, Taichung, Taiwan. http://140.120.197.173/Ecology/