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Occurrence of fruit piercing moths and its correlation with weather parameters in South Tamil Nadu

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Abstract
Studies on seasonal Occrrence of fruit piercing moths was conducted at Agricultural College and Research Institute, Madurai. The Menispermaceae plants grown in and around College orchard of Madurai campus were surveyed regularly for the collection of eggs and larvae of fruit piercing moths. Similarly, regular visits were made to guava orchards during the night hours to observe the moth activity. The results revealed that, the rainfall had significant positive association with egg (=0.725), larva (=0.703) and adult (=0.655) population of *Eudocima materna*. Similarly, relative humidity (=0.350) also exhibited significant positive association with adult population. The egg, larval and adult populations of *E. fullonia* and *E. homaena* showed significant positive association with the rainfall and the maximum temperature and minimum relative humidity exhibited significant negative association.

Keywords: Fruit piercing moth, *Eudocima*, rainfall, relative humidity, max. temperature

Introduction
Fruit crops are commercially important in contributing to the economy of many countries, including India. India stands rank second in fruit production after China. It is well known that fruit trees are commonly attacked by numerous insect pests and diseases. Among the insects, several Lepidopteran pests cause damage in their larval stages to fruits. As early in 1869, French botanist, Thozet reported that adult lepidopterans such as *Othreis fullonia* (Clerck) (Noctuidae; Lepidoptera) cause injury on ripening orange fruits at Rockhampton in Australia (Baptist, 1944) [1]. The species of fruit-piercing moths belonging to the genus *Othreis* (Syn: *Eudocima*) are considered as very serious pests of fruit crops *viz.*, citrus, guava, pomegranate, grapes, fig, sapota, mango, papaya and tomato in India (Hampson, 1894; Susainathan, 1924ab; Ayyar, 1944; Margabandhu, 1933; Cherian and Sundaram, 1936; Sontakay, 1944; Gupta, 1974; Nair, 1975) [2, 3, 4, 5, 6, 7, 8, 9, 10]. In South India, there are four species of fruit piercing moths belonging to the genus *Eudocima* and one species under the genus *Rhytia* cause severe damage to fruit crops (Sundara Babu and David, 1973; Swamiappan, 2001; Bhumannavar and Viraktamath, 2001abc) [11, 12, 13, 14, 15]. In recent years, there is severe attack by fruit piercing moths on citrus, guava and pomegranate (seed less variety) in South India with heavy fruit drops and loss in yield. Hence, the present work was undertaken at Agricultural College and Research Institute, Madurai for recording the population of fruit piercing moths and its correlation with weather parameters.

Materials and Methods
Studies on seasonal incidence of fruit piercing moths was conducted at Agricultural College and Research Institute, Madurai. The Menispermaceae plants grown in and around College orchard of Madurai campus were surveyed regularly at three days interval and outside the campus once in fifteen days for the collection of life stages of fruit piercing moths. The eggs and larvae found on the vines were recorded, brought to the laboratory and reared separately on the respective host plants for identifying different species of fruit piercing moths breeding and completing their life cycle in that locality. Similarly, regular visits were made to guava orchards during the night hours from 7.00-10.00 p.m. to observe the moth activity. A beam of torch light was focused on the moths while they feed on the fruits and the moths were located by the reflected light from the large eyes which glisten brightly. The moths were collected by sweeping insect net and they were transferred to polythene bag containing cotton swab immersed in ethyl acetate. The moths attracted to fluorescent tube lights of college buildings and hostel premises were also collected and killed by ethyl acetate.

The killed adults were pinned, carefully and set on a mounting board and preserved in the laboratory for further studies. The data recorded during the survey were subjected to simple correlation analysis in relation to the weather parameters *viz*., minimum and maximum temperatures (°C), relative humidity (RH %) and rainfall (mm). The weather data during the study period were collected from the Central Farm, Department of Agronomy, AC & RI, Madurai, for correlation studies.

Results and Discussion

Correlation of weather parameters and incidence of fruit piercing moths *Eudocima materna*

Simple correlation was worked out between weather parameters *viz*., minimum and maximum temperature (°C), minimum and maximum relative humidity (%), rainfall and the incidence of egg, larva and adult population of *E. materna* during first and second season. It showed that the rainfall had significant positive association with egg (=0.725), larva (=0.703) and adult (=0.655) population (Table 1). In addition to rainfall, maximum relative humidity (=0.350) also exhibited significant positive association with adult population of *E. materna*. Similar trend was observed during second season also (Table 2)

E. fullonia

The egg, larval and adult populations of *E. fullonia* showed significant positive association with the rainfall during the first and second season (Table 3 and 4). At the same time, the maximum temperature and minimum relative humidity exhibited significant negative association. In the case of egg and larval population of *E. fullonia* a significant positive association was noted with the maximum relative humidity recording the values of 0.512 and 0.462, respectively.

E. homaena

During first season, the rainfall influenced the population build up of egg, larva and adult population of *E. homaena*. Apart from rainfall, the maximum temperature and minimum relative humidity showed significantly negative correlation with the egg (-0.583, -0.708), larva (-0.625, -0.814) and adult population (-0.426, 0.623) (Table 5). During second season, also population fluctuation of *E. homaena* was observed as that of previous season (Table 6).

Swamiappan (2001) [12] made the collections of the larval stages of *E. materna* after rain during June-December (1997-1999) from *T. cordifolia* which was accordance with the present findings. Similarly, Bhumannavar and Viraktamath (2001) [13, 14, 15] reported the egg laying of *E. materna* continued from end of April or early May to January. The oviposition activity was at its peak during October to December at the Bangalore climatic condition. Early occurrence before monsoon rains, in summer months at Bangalore may be due to climatic variation.

Table 1: Correlation between weather parameters and the incidence of *E. materna* during first season

Stages of *E. materna*	Correlation	Temperature ºC		Relative Humidity (%)		Rainfall (mm)
		Minimum	Maximum	Minimum	Maximum	
Egg	R	0.0149	0.203	0.166	0.155	0.725
	R^2	0.00022	0.041	0.028	0.024	0.526
	Y=a ± bx	5.59 -0.048x	18.73 - 0.416x	-1.10 + 0.128x	15.918 – 0.153x	1.326 + 0.079x
	Significance					
	P=0.005*	-	-	-	-	-
	P=0.001**	-	-	-	-	**
	Non significance	NS	NS	NS	NS	
Larva	R	0.066	0.080	0.009	0.0281	0.703
	R^2	0.0044	0.006	8.48E.05	0.079	0.493
	Y=a ± bx	-1.131 + 0.211x	9.683 + 0.164x	3.734 + 0.0007x	24.80 – 0.276x	1.06 + 0.077
	Significance					
	P=0.005*	-	-	-	-	-
	P=0.001**	-	-	-	-	**
	Non significance	NS	NS	NS	NS	-
Adult	R	0.099	0.00097	0.11	0.35	0.655
	R^2	0.0099	9.44E-07	0.013	0.123	0.43
	Y=a ± bx	-9.052 + 0.656x	7.14 – 0.004x	14.74 – 0.18x	60.48 – 0.712x	1.278 + 0.147x
	Significance					
	P=0.005*	-	-	-	*	-
	P=0.001**	-	-	-	**	**
	Non significance	NS	NS	NS	-	-

Table 2: Correlation between weather parameters and the incidence of *E. materna* during second season

Stages of *E. materna*	Correlation	Temperature ºC		Relative Humidity (%)		Rainfall (mm)
		Minimum	Maximum	Minimum	Maximum	
Egg	R	0.173	0.089	0.349	0.059	0.377
	R^2	0.029	0.008	0.122	0.004	0.142
	Y=a ± bx	-5.981 + 0.372x	7.139 – 0.124x	-2.355 + 0.123x	5.253 – 0.030x	2.071 + 0.025x
	Significance					
	P=0.005*	-	-	-	-	*
	P=0.001**	-	-	-	-	-
	Non significance	NS	NS	NS	NS	-
Larva	R	0.203	0.006	0.267	0.135	0.283

	R^2	0.042	3.31E-05	0.072	0.018	0.080
	Y=a ± bx	-6.597 + 0.376x	2.271 + 0.007x	-1.027 + 0.081x	6.871 – 0.059x	1.90 + 0.016x
	Significance					
	P=0.005*	-	-	-	-	*
	P=0.001**	-	-	-	-	-
	Non significance	NS	NS	NS	NS	-
Adult	R	0.272	0.139	0.131	0.164	0.231
	R^2	0.074	0.019	0.017	0.027	0.053
	Y=a ± bx	-33.434 + 0.657x	-11.721 + 0.543x	0.906 + 0.131x	24.124 – 0.234x	5.01 + 0.043x
	Significance					
	P=0.005*	-	-	-	-	*
	P=0.001**	-	-	-	-	-
	Non significance	NS	NS	NS	NS	-

Table 3: Correlation between weather parameters and the incidence of *E. fullonia* during first season

Stages of *E. fullonia*	**Correlation**	**Temperature ºC**		**Relative Humidity (%)**		**Rainfall (mm)**
		Minimum	**Maximum**	**Minimum**	**Maximum**	
Egg	R	0.274	0.476	0.656	0.230	0.493
	R^2	0.075	0.226	0.431	0.053	0.243
	Y=a ± bx	10.869 – 0.379x	15.972 – 0.418x	-7.789 + 0.218x	-5.760 + 0.098x	0.679 + 0.023x
	Significance					
	P=0.005*	-	-	-	-	-
	P=0.001**	-	**	**	-	**
	Non significance	NS	-	-	NS	-
Larva	R	0.253	0.522	0.737	0.166	0.442
	R^2	0.064	0.272	0.544	0.027	0.196
	Y=a ± bx	12.788 – 0.444x	21.912 – 0.581x	-11.429 + 0.311x	-4.779 + 0.089x	0.889 + 0.027x
	Significance					
	P=0.005*	-	-	-	-	-
	P=0.001**	-	**	**	-	**
	Non significance	NS	-	-	NS	-
Adult	R	0.246	0.516	0.737	0.292	+0.317
	R^2	0.061	0.266	0.544	0.085	0.10
	Y=a ± bx	28.446 – 1.01x	49.915 – 1.338x	-27.278 + 0.724x	-23.636 + 0.365x	2.117 + 0.044x
	Significance					
	P=0.005*	-	-	-	-	*
	P=0.001**	-	**	**	-	-
	Non significance	NS	-	-	NS	-

Table 4: Correlation between weather parameters and the incidence of *E. fullonia* during second season

Stages of *E. fullonia*	**Correlation**	**Temperature ºC**		**Relative Humidity (%)**		**Rainfall (mm)**
		Minimum	**Maximum**	**Minimum**	**Maximum**	
Egg	R	0.315	0.693	0.860	0.512	0.718
	R^2	0.099	0.479	0.739	0.262	0.517
	Y=a ± bx	8.612 – 0.308x	15.747 – 0.435x	-4.832 + 0.137x	-7.5572 + 0.1107x	0.363 + 0.021x
	Significance					
	P=0.005*	*	-	-	-	-
	P=0.001**	-	**	**	**	**
	Non significance	-	-	-	-	-
Larva	R	0.315	0.682	0.842	0.462	0.611
	R^2	0.099	0.466	0.709	0.214	0.373
	Y=a ± bx	9.374 – 0.336x	16.921 – 0.468x	-5.159 + 0.147x	-7.359 + 0.115x	0.505 + 0.019x
	Significance					
	P=0.005*	-	-	-	-	-
	P=0.001**	-	**	**	**	**
	Non significance	NS				
Adult	R	0.234	0.577	0.737	0.362	0.514
	R^2	0.055	0.332	0.544	0.131	0.264
	Y=a ± bx	26.374 – 0.836x	47.961 – 1.328x	-15.411 + 0.432x	-19.218 + 0.304x	1.352 + 0.055x
Significance						
	P=0.005*	-	-	-	-	-
	P=0.001**	-	**	**	-	**
	Non significance	NS	-	-	NS	-

Table 5: Correlation between weather parameters and the incidence of *E. homaena* during first season

Stages of *E. homaena*	Correlation	Temperature ºC		Relative Humidity (%)		Rainfall (mm)
		Minimum	Maximum	Minimum	Maximum	
Egg	R	0.309	0.583	0.708	0.188	0.339
	R^2	0.096	.339	0.502	0.035	0.115
	Y=a ± bx	7.034 – 0.250x	11.215 – 0.299x	-4.99 + 0.138	-2.602 + 0.046x	0.554 + 0.009x
	Significance					
	P=0.005*	-	-	-	-	*
	P=0.001**	-	**	**	-	-
	Non significance	NS	-	-	NS	NS
Larva	R	0.306	0.625	0.812	0.203	0.232
	R^2	0.094	0.391	0.662	0.041	0.054
	Y=a ± bx	8.238 – 0.299x	14.278 – 0.388x	-7.295 + 0.191x	-3.661 + 0.061x	0.616 + 0.008
	Significance					
	P=0.005*	-	-	-	-	*
	P=0.001**	-	**	**	-	-
	Non significance					
Adult	R	0.224	0.4260.623	0.221	0.343	
	R^2	0.050	0.181	0.388	0.049	0.117
	Y=a ± bx	18.425 – 0.636x	29.306 – 0.768x	-15.3617 + 0.425x	-11.555 + 0.425x	1.588 + 0.033x
	Significance					
	P=0.005*	-	-	-	-	*
	P=0.001**	-	**	**	-	-
	Non significance	NS	-	-	NS	-

Table 6: Correlation between weather parameters and the incidence of *E. homaena* during second season

Stages of *E. homaena*	Correlation	Temperature ºC		Relative Humidity (%)		Rainfall (mm)
		Minimum	Maximum	Minimum	Maximum	
Egg	R	0.386	0.753	0.805	0.483	0.512
	R^2	0.149	0.568	0.648	0.233	0.262
	Y=a ± bx	6.795 – 0.250x	11.270 – 0.314x	-2.975 + 0.085x	-4.71 + 0.073x	0.371 + 0.010x
	Significance					
	P=0.005*	*	-	-	-	-
	P=0.001**	-	**	**	**	**
	Non significance	-	-	-	-	-
Larva	R	0.284	0.561	0.637	0.297	0.441
	R^2	0.081	0.314	0.406	0.088	0.195
	Y=a ± bx	4.442 – 0.163x	7.444 – 0.207x	-2.113 + 0.059x	-2.479 + 0.039x	0.209 + 0.008x
	Significance					
	P=0.005*	-	-	-	-	-
	P=0.001**	-	**	**	-	**
	Non significance	NS	-	-	NS	-
Adult	R	0.253	0.604	0.745	0.374	0.608
	R^2	0.0644	0.365	0.554	0.139	0.370
	Y=a ± bx	15.861 – 0.561x	31.222 – 0.863x	-9.526 + 0.271x	-12.233 + 0.194x	0.744 + 0.041x
	Significance					
	P=0.005*	-	-	-	-	-
	P=0.001**	-	**	**	-	**
	Non significance	NS	-	-	NS	-

Conclusion

The fruit piercing moths cause heavy damage to the guava orchards in and around Palamedu areas of Madurai region. With the lack of knowledge on favourable weather conditions suitable for the population build up of fruit piercing moths, guava farmers couldn't take preventive measures to escape from the attack of fruit piercing moths. Hence, the present findings will useful for the farmers to know the favourable seasonal conditions of fruit piercing moths to initiate the management measures to minimize the damage caused by the fruit piercing moths.

References

1. Baptist BA. The fruit-piercing moth (*Othreis fullonica* L.,) with special reference to its economic importance. Indian J Ent. 1944;6:1-13.
2. Hampson GF. The Fauna of British India Including Ceylon and Burma. Moths. 1894;11:558-563.
3. Susainathan P. Fruit-sucking moths of South India. Proc. 5th Entomol. Mtg. Pusa; c1924a. p. 23-27.
4. Susainathan P. The fruit moth problem in the Northern Circars. Agric. J India. 1924b;19:402-404.
5. Ayyar TVR. Notes on some fruit sucking moths of the Deccan. Indian J Ent. 1944;5(I & II):29-33.
6. Margabandhu V. Insect pests of orange in the Northern Circars. Madras agric. J. 1933;21:60-68.
7. Cherian MC, Sundaram CV. Fruit-sucking moths on tomatoes and their control. Madras agric. J. 1936;24:360-363.
8. Sontakay KR. Short note on the life and seasonal history

of *Othreis materna* L. and *Othreis fullonica* L. Indian J Ent. 1944;5:247-248.
9. Gupta JC. Occurrence of fruit-piercing moths (*Achaea*). Pl. Prot. Bull. F.A.O. 1974;22:72-73.
10. Nair MRGK. Insect and mites of crops in India. ICAR, New Delhi; c1975. p. 408.
11. Sundara Babu P, David BV. A note on Unprecedental occurrence of fruit-piercing moths on grapevine. S. Indian Hort. 1973;21:134-136.
12. Swamiappan M. Fruit piercing moths as emerging pests of fruit crops in India. Paper presented in national seminar on emerging trends in pests and diseases and their management held on October, 11-13, 2001 at TNAU, Coimbatore. Abs; c2001. p. 9-10.
13. Bhumannavar BS, Viraktamath CA. Biology, adult feeding, oviposition preference and seasonal incidence of *Othreis materna* (L.) (Lepidoptera: Noctuidae). Entomon. 2001a;27(1):63-77.
14. Bhumannavar BS, Viraktamath CA. Larval host specificity, adult feeding oviposition preference of the fruit piercing moth, *Othreis homaena* Hubner (Lepidoptera: Noctuidae) on different Menispermaceae host plants. J Ent. Res. 2001b;25(3):165-181.
15. Bhumannavar BS, Viraktamath CA. Seasonal incidence and extent of parasitization of fruit piercing moths of the genus *Othreis* (Lepidoptera: Noctuidae). J Biol. Control. 2001c;15(1):31-38.
16. Gohil B, Thakkar K, Gondaliya G. Moths (Lepidoptera: Heterocera) of Bhavnagar city, Gujarat, India: A preliminary checklist. International Journal of Entomology Research. 2022;7(4):62-71.