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Seasonal incidence and effect of abiotic factors on population dynamics of anar butterfly (*Virachola isocrates*) on pomegranate

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ABSTRACT

Experiment was carried out on effect of abiotic factors on population dynamics of anar butterfly (*V. isocrates*) at Horticultural Instructional Farm, S. D. Agricultural University, Sardarkrushinagar during 2020-21. The results revealed that incidence of anar butterfly (*V. isocrates*) was commenced from 2nd week of July (28th SMW) to 1st week of August (32nd SMW). The higher activity of anar butterfly was observed during the 3rd week of September (38th SMW) at peak activity period of the pest in *Mrig* bahar. Thereafter the larva of anar butterfly was decreased at 5.63 to 1.83 per cent. In the 3rd week of July (29th SMW) fruit damage per cent was 2.10 and reached up to 36.39 in the 3rd week of September (38th SMW). The corrected fruit damage per cent was found to be negatively non-significant during experiment, whereas bright sunshine (r = 0.181) and morning relative humidity (r = 0.047) was a positive non-significant. Two weather parameters wind speed (r = -0.719**) and maximum temperature (r = -0.566*) had highly significant negative and significant negative association with fruit damage caused by *V. isocrates*. Minimum temperature, evening relative humidity and rainy days showed negative non-significant correlation with fruit damage (r= -0.327, r= -0.041 and r= -0.121) respectively.

Key words: *Pomegranate, Seasonal incidence, Abiotic factors, Anar butterfly*

Introduction

Pomegranate (*Punica granatum* L.) is emerging as one of the commercially important fruit crop of tropical and subtropical regions of the world. The name pomegranate is derived from two Latin words Ponum (apple) and granates (seeded). In India, pomegranate is popularly known as Anar or dalima or dodima. It is thought to be indigenous to Iran, where it was first cultivated during 2000 B.C.

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(Evreinofa, 1949). In India it is regarded as a "vital cash crop" grown on 2,34,000 ha with a production of 28,45,000 MT with an average productivity of 12.15 MT.(Anon., 2018). In Gujarat, total cultivated area was about 30.51 thousand hectares and production of about 461.75 thousand tone with productivity of about 15.13 tone/ha (Anon.,2018). It is cultivated in Kachchh, Bhavnagar, Ahmedabad, Patan, Banaskantha and Sabarkantha districts of the state. Anar butterfly, *V.isocrates* is serious pest of pomegranate having a wid host ranges including, apple, ber, citrus, guava, pear, aonla etc. (Butani, 1976). This pest was reported to cause 40-90 per cent damage to pomegranate fruits (Atwal. 1986). Pomegranate butterfly, *V. isocrates* is one the most obnoxious pest on pomegranate crop incurring about 65 to 70 per cent of yield loss worldwide (Kumar *et al*., 2017). Avoidable losses in pomegranate caused by *V. isocrates* was about 13.23 per cent in the Rajasthan (Kumawat and Kanwat 1995. Moreover,weather parameters also play a pivotal role in the biology of any insect pests. Temperature, humidity, sun shine hours and wind velocity are the most crucial weather parameters influencing the rate of growth and development of insect pests.

Materials and Method

A field experiment was conducted at Horticultural Instructional Farm,S. D. Agricultural University, Sardarkrushinagar during 2020-21 to study the population dynamics of anar butterfly. Ten plants of pomegranate were randomly selected from the field having uniform age, size and canopy. From each plant, five branches were randomly selected and tagged off the same. Observations on incidence of fruit borer were recorded at weekly intervals during fruiting seasons of pomegranate and the pest intensity was judged on the basis of a number of damaged fruits and healthy fruits from tagged branched on each plant during fruiting season. Later, the per cent fruit damage was worked out as follows.

$$\text{Fruit damage (\%)} = \frac{\text{No. of damaged fruits}}{\text{Total number of fruits observed}} \times 100$$

Total, as well as damaged fruits, were counted at weekly intervals starting from *Mrig* bahar season (July to October). For recording larval population 10 infested fruits were collected from pomegranate fields and recorded presence of larvae by cutting the fruits during the study period.

Results and Discussion

The results (Table 1) indicated that infestation on fruits of pomegranate during 27th SMW to 44th SMW 2020 are presented in Table 1and graphically depicted in Fig. 1Pomegranate fruit borer composed of only one species, *V. isocrates* laid whitish, sculptured eggs singly on calyx of flowers, young fruit, or developing fruit. The young ones after hatching bored into fruit and fed on arils of tender fruit. The larvae completed development inside the fruit. The grown-up larvae is brownish, white, with prominent tubercular and whitish spots pupated inside or outside the fruit. The larvae are capable of damaging more than one fruit their by can cause significant yield loss .The data showed that per cent fruit infestation was ranged from 2.10 (29th SMW) to 36.39 (38th SMW) on pomegranate. The highest per cent fruit infestation was noticed at 38th SMW (36.39%) and then incidence was slowly declined. The activity period of the larval population fluctuated between 0.50 and 5.63 per 10 fruits. The activity of *V. isocrates* was observed below one larva per 10 fruits during the 2nd week of July (28th SMW) to 1st week of August (32nd SMW).

Table 1. Population dynamics of anar butterfly (*V. isocrates*) in pomegranate (2020-2021)

Month	Week	SMW	No. of Larvae/ 10 fruits	Fruit damage (%)
July	I	27	0.00	0.00
	II	28	0.00	0.00
	III	29	0.50	2.10
	IV	30	0.68	3.55
	V	31	0.71	5.96
August	I	32	0.93	13.03
	II	33	1.10	22.41
	III	34	1.87	27.68
	IV	35	2.24	29.72
September	I	36	2.93	31.00
	II	37	4.52	34.55
	III	38	**5.63**	**36.39**
	IV	39	5.11	35.50
	V	40	3.48	32.14
October	I	41	3.06	30.33
	II	42	2.25	27.46
	III	43	1.79	26.81
	IV	44	1.83	24.69

After these peaks, the larva of anar butterfly is decried at 5.63 to 1.83. The higher activity of pest was also reflected in fruit damage. The highest incidence of fruit borer on pomegranate was observed from September to October (Kabre *et al*., 1991). Whereas, Dongarjal (2017) reported the highest per cent infestation of pomegranate fruit borer during 37th SMW (13.66%) during 2014 and 40th SMW (15.66%) during 2015.

Table 2. Correlation between the damage by anar butterfly (*V. isocrates)* and abiotic factor

Weather parameters	Correlation coefficient (r)	
	No. of Larvae/ 10 fruits	Fruit damage (%)
Evapotranspiration (EP)	0.248	-0.105
Bright SunShine (BSS)	0.293	0.185
Rainfall (RF)	-0.258	-0.119
Wind speed (WS)	-0.562*	-0.719**
Maximum Temperature (Max. T)	-0.314	-0.566*
Minimum Temperature (Min. T)	-0.132	-0.327
Morning Relative humidity (RH Mo.)	-0.043	0.047
Evening Relative humidity (RH Ev.)	-0.011	-0.041
Rainy days (RD)	-0.233	-0.121

**Significant at the 0.01 level of significance ('r' = 0.735)*Significant at the 0.05 level of significance ('r' = 0.602)

Fig. 1. Infestation of Anar butterfly (*Virachola isocrates*)

The weekly incidence of fruit borer (*V. isocrates*) was correlated with various weather parameters *viz*., Evapotranspiration (EP) mm, Bright Sun Shine (BSS) hr/day, Rainfall (RF) mm, Wind speed (WS) km/hr, Maximum Temperature (Max. T) ^{0}C, Minimum Temperature (Min. T) ^{0}C, Morning Relative humidity (RH Mo.) %, Evening Relative humidity (RH Ev.) %, and Rainy days (RD) mm. are presented in Table 1.2

The present findings are more or less similar with the earlier workers. Dongarjal (2017) reported coefficient correlation to rainfall (r = -0.273*), the corrected per cent fruit infestation was found to be negatively significant during 2014, whereas, morning R.H. (r = -0.283) and wind velocity (r = -0.317*) was negatively significant and evaporation (r = 0.292*) was positively significant during 2015.

Conclusion

The activity of *V. isocrates* was observed below one larva per 10 fruits during the 2nd week of July (28th SMW) to 1st week of August (32nd SMW). The higher activity of anar butterfly was observed during the 3rd week of September (38th SMW) at peak activity period of the pest in *Mrig* bahar. Thereafter the larva of anar butterfly was decreased at 5.63 to 1.83 per cent. In the 3rd week of July (29th SMW) fruit damage per cent was 2.10 and reached up to 36.39 in the 3rd week of September (38th SMW) and after this peaks period, fruit damage dwindled from October onwards.The simple correlation studies during the fruiting period revealed that, the incidence of fruit borer no. of larvae/10 fruits the bright sunshine (r = 0.293) and evapotranspiration (r = 0.248) had a positive but non-significant relationship, and wind speed (r = -0.562*) had a highly significant but negative relationship with *V. isocrates* activity, maximum (r = -0.314) and minimum temperature (r = -0.132) had a non-significant negative relationship with *V. isocrates* activity, remaining all *viz*., morning relative humidity (r = -0.043), evening relative humidity (r = -0.011) and rainy days (r = -0.233) also showed the negative non-significant relationship.The corrected fruit damage per cent was found to be negatively non-significant during experiment, whereas bright sunshine (r = 0.181) and morning relative humidity (r = 0.047) was a positive non-significant. Two weather parameters wind speed (r = -0.719**) and maximum temperature (r = -0.566*) had highly significant negative and significant negative associa-

tion with fruit damage caused by *V. isocrates*. Minimum temperature, evening relative humidity and rainy days showed negative non-significant correlation with fruit damage (r= -0.327, r= -0.041 and r= -0.121) respectively.

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