

# **Microbiological Research Studies on Anar Butterflies (*Virachola isocrates* F.) population with a biotic factors in guava fruit (*Pisidium guajava*)**

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**ABSTRACT:** Among the various pests that attack guava, anar butterfly (*Virochola isocrates*) has found a major status limiting the cultivation of this crop in and around riverbed area of Ganga at Kanpur, Uttar Pradesh. Experiments were carried out in guava orchards in river bed area of Ganga from Kannauj to Kanpur. During survey it was found that about 80 species of insect-pests infested on guava crop. Anar butterfly (*Virachola isocrates*) was found as a major pests. Five varieties of guava viz – Allahabad Safeda, Lucknow-49, Apple Colour, Red flesh and Local seedlings were taken for the study the population fluctuation by regression analysis. It was found that population was positively associated with maximum temperature, and relative humidity. Partial regression coefficient of correlation on different independent variables showed negative correlation and was found significant at 5 per cent level of significance. Multiple correlation coefficient was found  $R=0.477$ . This indicated that the dependent variables, average incidence was highly and jointly correlated with maximum temperature, minimum temperature and relative humidity in all the five varieties of guava.

**KEYWORDS :** Population, Temperature, RH, Regression Analysis.

## **I. INTRODUCTION**

The Guava (*Pisidium guajava* L. myrtaceae) is native to tropical and sub tropical region. Cultivation of high yielding varieties of guava with intensive care and management in the recent past under irrigated condition led to certain serious pest problems. Among them, infestation of fruit borer results in reduction of guava yield and heavy loss for growers.

The farmers suffer loss in terms of quantity and quality of fruits (Teaotia *et al.*, 1962). Adult moth lay eggs on the ripening fruits larvae develop inside the fruit and bore out of the fruits and pupation takes place in soil. Fourth and Fifth instar larvae caused the maximum damage to fruits. In north India, after the harvesting of mango, the pest shift over the guava with the peak population in July, August, thereafter, population declines and larvae hibernate in winter. Ovipositional damage in the form of minute groove may be seen from outside. Fruit soften at the side of attack. The effected fruit rot and drop down prematurely. Ovipositional pore lead to secondary infection by different pathogens (Prakash, 2012 and Bhut and Borod, 2013).

Climate change could profoundly affect the population of insect pests. Several approaches have been used to predict how the maximum temperature, minimum temperature and relative humidity change the abundances, distributions, or status of insect pests. In this article it is demonstrated how the use of simple statistical method, such as regression analysis equation, including a mechanistic representation of the influence of exogenous forces may improve our predictive capacity of the dynamic behaviour of insect populations.

In present decade it has been observed that nearly 50% of guava crop is destroyed due to insect-pests and diseases infestation. Recent report indicate that over 150 arthropods sp. attack fruit trees and cause serious damage in term of both quantity and quality and thus result in huge economic loss (Aluja, 1986, Anon, 2003).

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## II. MATERIAL AND METHODS

Experimental data on population fluctuations of anar butterfly (*Virachola isocrates* F.) were used to evaluate the population dynamics with the help of multiple regression analysis and regression equation (Bates and Watts, 1988). Experiment was laid out in guava orchards of river bed area of Ganga with R.B.D. in three replications. Five varieties of guava were selected for the study of population fluctuation with a biotic factors all variance i.e. Regression analysis were used with maximum temperature, minimum temperature and relative humidity.

In order to study the effect of maximum temperature ( $X_1$ ), minimum temperature ( $X_2$ ) and relative humidity ( $X_3$ ) on the percentage damage of fruits ( $Y_1$ ) and population of insects ( $Y_2$ ). Multiple regression analysis was worked out the partial regression coefficients (i) of Y on  $X_1$  ( $b_1$ ), (ii) of Y on  $X_2$  ( $b_2$ ) and (iii) of Y on  $X_3$  ( $b_3$ ) along with the multiple correlation coefficients were estimated by the standard methodology given by statisticians. The multiple regression equation fitted to the data was:

$$Y = a + b_1 X_1 + b_2 X_2 + b_3 X_3$$

Multiple correlation coefficient (R) :

$$R = \sqrt{\frac{\text{ss (Regression)}}{\text{Total SS}}}$$

## III. RESULT AND DISCUSSION

Data of the Table 1 to 5 indicated that average population was positively associated with Maximum Temperature, Minimum Temperature and Relative Humidity. Partial Regression coefficient of correlation on different independent variables, it was Maximum Temperature which revealed negative correlation (-0.841) and it was also found it significant at 5 per cent level of significance. In the Minimum Temperature it revealed positive correlation but it was found non significant. Further multiple correlation coefficient was found  $R=0.477$  and it was clearly found significant at 5 per cent level of significance. This indicated that the dependent variables, average incidence were highly and jointly correlated with Maximum Temperature, Minimum Temperature and Relative Humidity. Similar results were found by Arya *et al.* (2004). It is interesting to note that influence of humidity on the population of moth.

Population of *Virachola isocrates* in L-49 revealed positive but non significant correlation with Maximum Temperature (0.229), Minimum Temperature (0.285) and Relative Humidity (-0.008). Partial Regression coefficient showed non-significant correlation ship with these factors during period of infestation, multiple correlation coefficient was found positive  $R=0.295$  and non significant. The R function is completely displaced vertically of each level of temperature, which implied that both temperature (max) and R is change. It is known from previous research that temperature is inversely correlated with mortality and development time (Olfert and Weiss, 2006 and Sharma *et al.*, 2013).

In apple colour it is observed that the average incidence was positively correlated with Maximum Temperature (0.050), Minimum Temperature (0.229) and Relative Humidity (0.132). Partial Regression coefficient was found negative (-

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1.169) and significant at 0.1 per cent level of significance. However, it was apparent that Minimum Temperature gave negative correlation (-0.240). Multiple correlation coefficient (R=0.376) was found to be significant. Moreover, this approach fits perfectly with the results of Musolin (2007) and Singh *et al.*, 2010.

In Red Flesh variety Maximum and Minimum, both Temperatures revealed negative correlation -0.224 and -0.066, respectively. Relative Humidity exhibited positive correlation. In case of partial regression coefficient Maximum Temperature (-1.865) and Relative Humidity (-0.500) revealed negative association. This was found significant at 5 per cent level of significance. Results showed close relation with the results of Cermeli and Geround (1997). Multiple correlation in regression analysis 0.918 and partial regression coefficient showed negative (-1.276) correlation in local seedlings.

Current status of insect responses to evaluated temperature in largely based on field and laboratory studies carried out over a limited range of temperatures (Cammell and Knight, 1992), but usually this approximation is just phenomenological and the underlying mechanisms are ignored. The use of multiple working hypothesis and strength of evidence (Burnham and Anderson, 2004 and Rahul *et al.* 2015). Scientists now face the challenges of explaining and predicting the consequences of global climate change (Stenseph *et al.*, 2004; Word and Mater, 2007 and Estay *et al.*, 2009). Thus use of different Scenarios may allows us to examine the sensitivity of the prediction and to improve the communication of our researches to the general public and decisions makers. Similar results have been found by Jalaluddin *et al.* (2004), Reddy and Vasugi (2002) and Zhong and Zu (1992).

**Table 1 : Correlation of population of Anar Butterfly (*Virachola isocrates* F.) with temperature and relative humidity.**

1. Dependent Variables - Variety Allahabad Safeda
2. Independent Variables -

Independent Variables	Correlation Coef. with Y	Partial Regression coef. byx	S.E. of byx	t - Value
Max. Temp. X <sub>1</sub>	0.185	-0.841*	0.626	-1.343
Min. Temp. X <sub>2</sub>	0.398	1.013	0.472	2.147
RH X <sub>3</sub>	0.207	-0.100	0.210	-0.474
	DF = 39			DF = 36

R = 0.477\*, R<sup>2</sup> = 0.227529 or 22.75% F (3,36) = 3.544  
Multiple regression equation – Y = 39.487 – 0.841X<sub>1</sub> + 1.013X<sub>2</sub> – 0.100

**Table 2 : Correlation of population of Anar Butterfly (*Virachola isocrates* F.) with temperature and relative humidity.**

1. Dependent Variables - Variety Lucknow - 49
2. Independent Variables -

Independent Variables	Correlation Coef. with Y	Partial Regression coef. byx	S.E. of byx	t - Value
Max. Temp. X <sub>1</sub>	0.229	-0.258	0.603	-0.428
Min. Temp. X <sub>2</sub>	0.285	0.459	0.454	1.011
RH X <sub>3</sub>	-0.008	-0.094	0.203	-0.464
	DF = 39			DF = 36

R = 0.295, R<sup>2</sup> = 0.087025 or 8.70% F (3,36) = 1.145  
Multiple regression equation – Y = 28.314 – 0.258X<sub>1</sub> + 0.459X<sub>2</sub> – 0.094

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**Table 3 : Correlation of population of Anar Butterfly (*Virachola isocrates* F.) with temperature and relative humidity.**

1. Dependent Variables - Variety Apple Colour
2. Independent Variables -

Independent Variables	Correlation Coef. with Y	Partial Regression coef. byx	S.E. of byx	t - Value
Max. Temp. $X_1$	0.050	-1.169***	0.655	-1.786
Min. Temp. $X_2$	0.229	1.065***	0.493	2.159
RH $X_3$	0.132	-0.240	0.220	-1.093
	DF = 39			DF = 36

$R = 0.376^*$ ,  $R^2 = 0.141376$  or 14.14%  $F(3,36) = 1.977$

Multiple regression equation –  $Y = 59.531 - 1.169X_1 + 1.065X_2 - 0.240$

**Table 4 : Correlation of population of Anar Butterfly (*Virachola isocrates* F.) with temperature and relative humidity.**

1. Dependent Variables - Variety Red Flesh
2. Independent Variables -

Independent Variables	Correlation Coef. with Y	Partial Regression coef. byx	S.E. of byx	t - Value
Max. Temp. $X_1$	-0.224	-1.865*	0.544	-3.429
Min. Temp. $X_2$	-0.066	1.257*	0.410	3.068
RH $X_3$	0.030	-0.500*	0.183	-2.738
	DF = 39			DF = 36

$R = 0.500^*$ ,  $R^2 = .2500$  or 25.00%  $F(3,36) = 4.010$

Multiple regression equation –  $Y = 91.394 - 1.865X_1 + 1.257X_2 - 0.500$

**Table 5 : Correlation of population of Anar Butterfly (*Virachola isocrates* F.) with temperature and relative humidity.**

1. Dependent Variables - Variety Local Seedling
2. Independent Variables -

Independent Variables	Correlation Coef. with Y	Partial Regression coef. byx	S.E. of byx	t - Value
Max. Temp. $X_1$	0.068	-1.276*	0.514	-2.483
Min. Temp. $X_2$	0.143	1.038*	0.387	2.681
RH $X_3$	-0.127	-0.446	0.173	-2.584
	DF = 39			DF = 36

$R = 0.425$ ,  $R^2 = 0.180625$  or 18.06%  $F(3,36) = 2.638$

Multiple regression equation –  $Y = 73.312 - 1.276X_1 + 1.038X_2 - 0.446$

### REFERENCES

1. Aluja, M. and P. Liedo (1936). Future perspective on integrated management of fruit flies in Mexico. *Nato ASI. series, Springer, New York.* pp. : 12-18.
2. Anonymous (2003). Oriental fruit fly. Pest Deection/Emergency Projects Branch [http://www.cdfa.ca.gov/phpps/pdep/oriental ff profile.htm](http://www.cdfa.ca.gov/phpps/pdep/oriental_ff_profile.htm) (23rd January, 2004).
3. Arya, S., A. Prasad and S. Yadav (2004). Studies on the bionomics and infestation of insect pests of Roses. *Ist Indian Hort. Cong. held at I.A.R.I., New Delhi (Abst.)* pp. : 26.
4. Bates, D. and D. Watts (1988). *Non linear regression analysis and its applications.* New York, Wiley New York.
5. Bhut, J.B. and Borod, P.K. (2013). Effrect of weather parameters on incidence of anar butterfly , *Virachola isocrates* Fabricius. *Bioinfolet.* 10 (4c) : 1597-1599.
6. Burnham, K. and D. Anderson (2004). Multi model inference understanding AIC and BIC in model section. *Social. Methods. Res.*, 33, 261.

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(An ISO 3297: 2007 Certified Organization)

Website: [www.ijirset.com](http://www.ijirset.com)

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7. Cammell, M. and J. Knight (1992). Effect of climatic change on population dynamics of crop pests. *Adv. Ecol. Res.*, 22 : 117-162.
8. Cermeli, M. and F. Povey Geraud (1997). *Capulina* sp. near *Jaboticabae* von Ihering (Homoptera: coccoidea, Eriococcidae) new pest of guava in venezela. *Agron. Trop. maracay*. 47 (1) : 115-123.
9. Estay, S.A.; M. Lima and F.A. Labra (2009). Predicting insect pest status under climate change scenarios : combining experimental data and population dynamics modelling. *J. Applied Ent.*, 133 (7) : 491-499.
10. Jalaluddin, S.M., H. Usha Nandhini Devi and K. Natarajan (2004). Host resistance in guava fruit fly *Bactrocera Correcta Bezzi*. *Management. Entomon.* 29 (1) : 67-68.
11. Musolin, D. (2007). Insect in a warmer world: Ecological, Physiological and life history responses of true bugs to climate change. *Glob. Chang. Bio.*, 13 : 1565-1585.
12. Olfert, O. and R. Weiss (2006). Impact of climate change on population distributions and relative abundance of *O. melanopus* Canada. *Agric. Ecosyss. Environ.* 113 : 295-301.
13. Rahul, S.S.; V. Baswaraj and S.r. Shinde (2015). Seasonal incidence and correlation of insect-pests on mustard with weather parameters. *J. Eco. Environ. and Conservation.* 21 Suppl. issue (Aug.) pp: 183-183.
14. Reddy, P.V.R. and C. Vasugi (2002). Evaluation of guava accessions for resistance to the fruit fly, *Bactrocera dorsalis* (Hendel) in relation to certain fruit morphological characters. *Pest Management in Hort. Ecosystems.* 8 (1) : 27-32.
15. Sharma, D.; A. Maqbool; H. Ahmed and V.S. Jamwal (2013). Meteorological factors influencing insect pests of tomato. *Ann. Pl. Protec. Sci.*, 21 (1) : 68-71.
16. Singh, D.; S.M.A. Rigvi and H.S. Kushwaha (2010). Seasonal history of *Helicoverpa armigera* on cultivars under agroclimatic conditions. *Ann. Pl. Protection Sci.*, 18 : 327-332.
17. Stenseth, N.; A. Mysterud; G. Ottersen and Lima, M. (2002). Ecological effects of climate Fluidizations Science, 297, 1292-1296.
18. Teatota, S.S.; L.C. Pandey; B.N. Agnihotri and K.K. Kapur (1962). Study of some guava varieties (*Psidium guajava* L.) of Uttar Pradesh. *Indian Agriculturist.* 6 47-53.
19. Ward, N. and G. Masters (2007). Linking climate change and species invasion : an illustration using insect herbivores. *Glob. Change Biol.*, 13 : 1605-1615.
20. Zhong, B.X. and J.L. Xu (1992). A practical manual for Biometrics. Shanghai Sci. and Tech. Publishing House, shanghai. P.R. China. (Abst.) pp : 415.