The Journal of Plant Protection Sciences, **2**(2) : 49-52, 2010

Epidemiological studies on some diseases of guava (*Psidium guajava L.*)

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A B S T R A C T

The role of weather factors, such as temperature, total rainfall, number of rainy days and relative humidity on the development of diseases like canker (P*estalotia psidii)*, anthracnose and die back (*Colletotrichum gloeosporioides)*, stem canker and dry fruit rot (*Botryodiplodia theobromae)* and Phytophtora fruit rot (*Phytophthora nicotianae v*ar P*arasitica) of guava* were analysed for predictive purpose from regression equations. The simple correlation coefficient matrix showed significantly positive correlation of canker severity with maximum relative humidity at 1% level whereas, anthracnose correlated well with minimum relative humidity, temperature and number of rainy days at 5% level.The negative correlation was obtained for stem canker and dry rot with all parameters at 1% significant level. In case of Phytophthora fruit rot, positive correlation was also recorded with all parameters, except maximum relative humidity.

Keywords: Disease prediction model, weather parameters, *Pestalotia psidii, Colletotrichum gloeosporioides, Botryodiplodia theobromae, Phytophthora nicotianae v*ar *parasitica*

Introduction

Guava (*Psidium guajava* L.) is an important horticultural fruit crop grown in over 218 thousand ha in West Bengal. The climatic and soil conditions of West Bengal are usually suitable for its profitable cultivation. In recent years, guava cultivation is becoming more and more popular because of its phenomenal yield potential and early bearing habit, especially at a time when the other fruits are not available in the market. Though several foliar diseases have been known to occur in different guava growing areas of West Bengal (Mishra 2006) and some are more important viz. canker (*Pestalotia psidii* Pat), anthracnose and die back (*Colletotrichum gloeosporioides* Peng.), stem canker and dry rot (*Botryodiplodia theobromae* Pat.) and Phytophthora fruit rot (*Phytophthora nicotianae* var. *parasitica* Dast.). The time of appearance of the disease and severity vary depending on the growing season of guava and is influenced by weather conditions. The knowledge of weather parameters in relation to disease development is very essential for its cost effective management. Therefore, present investigations were carried out to study the periodical progression of the disease, its correlation with weather parameters for developing a suitable prediction model .

Materials and Methods

The inter-relationship of various environmental factors (temperature, humidity, rainfall etc.) which are responsible for disease development and the severity of the diseases in guava growing areas of West Bengal were studied by using the method described by (Mathur *et al.*1992). The appearance of disease in the guava orchards were closely examined at weekly intervals starting from 1st week of June to 1st week of November and December 1st week to May 1st week considering two fruit seasons annually. Fruit, leaf, and twig infection were recorded in randomly selected 3 branches each in 5 plants of guava for calculating disease intensity. The path genic infection on leaves and

twigs and general effect on trees were also considered for assessing total intensity of the disease using a disease rating scale (0-4) and the intensity was calculated using the formula used earlier by Singh and Singh (1982). The data was reorded for two consecutive years and statistically analyzed.

Daily data on minimum & maximum temperature, relative humidity, rainfall and precipitation were collected from meteorological observatory station situated nearby the orchards. Regression analysis was done by correlating the disease intensity with weather factors.

Results and Discussion

It is evident from the data (Table 1) that there was a significant (<.01%) positive correlations of disease severity with the maximum relative humidity only and negative correlation with maximum and minimum temperature at <0.05 and 0.01% levels. Non significant negative correlation was recorded with minimum relative humidity, total rainfall and number of rainy days, respectively for canker (*P. psidii*). For anthracnose (*C. gloeosporioides*) non significant positive correlation was obtained with maximum relative humidity, temperature and total rainfall and significant positive with minimum relative humidity, temperature and number of rainy days, respectively at <0.05% significant level. On the other hand, stem canker, dry rot (*B. theobromae*), all the weather parameters like minimum relative humidity, maximum & minimum temperature, total rainfall and number of rainy days showed negative correlation at <0.01% significant level. In phytophthora fruit rot (*P. nicotianae* var. *parasitica*) significant (<0.01%) positive correlation was found with minimum relative humidity, temperature, total rainfall and number of rainy days and non significant with maximum relative humidity and temperature. When the combined effects of all these parameters were analysed for determination of multiple correlation (Table 2) and correlation matrix (Table 3) almost similar results were obtained in all cases.

These results are comparable with that of Mathur *et al.* (1992) and Pandey *et al.* (1997). Almost all the respective pathogen were usually seen to be present through out the year either in the host or plant debris at different magnitude although the severity of disease is usually noted at any time in a year in the presence of favourable condition (Peres *et al.* 2002; Patel & Joshi 2005). A combined effect of both relative humidity and temperature has been noted by several workers (Kumar & Kumar 2004; Thind & Kaur 2005).

The pathogens like *Colletotrichum* and *Phytophthora* prefer wet conditions for the production of spores and infection (Ploetz *et al.* 2003). Therefore, for these two organisms, the environmental factors showed a positive correlation with disease severity. Variation of results in the present studies from earlier reports may be due the non-effectiveness of some epiphytotic factors on disease development. In the present investigation, the disease index was calculated under natural condition in orchards where several diseases of a particular crop is likely to appear simultaneously. For improved precision under such a situation usually ten to twelve-years epidemiological data should be recorded (Thind & Kaur 2005). Therefore, from the over all perusal of the results, it was found that all the four pathogens prefer different types of weather conditions for disease development state multi location tests for improvements on these findings.

Literature Cited

Kumar CPC Kumar CSK. 2004 Epidemiological studies on Phytophthora fruit rot disease of betelvine. *Indian Journal of Plant Protection* **32:** 100-01.

Mathur S Bhatnagar MK Mathur K. 1992 Occurrence and epidemiology of fruit rot of guava caused by *Phytophthora nicotianae* var. *parasitica. Indian Phytopathology* **45:**217-20.

Mishra NK. 2006 Studies on some foliar diseases of Guava (*Psidium guajava* L.) and their possible control measures. *Ph. D. Thesis*, BCKV, West Bengal, India, 136pp.

Pandey RR Arora DK Dube RC. 1997 Effect of environmental conditions and inoculum density on infection on guava fruits by *Colletotrichum gloeosporioides. Mycopathology* **3:** 165-72.

Patel RV Joshi KR. 2005 Host range of *Colletotrichum gloeosporioides* causing leaf spot of turmeric. *Journal of Mycology and Plant Pathology* **35:** 116-17.

Peres NAR Kuramae EE Dias MSC Souza NL-De Souza NL. 2002 Identification and characterization of *Colletotrichum* spp. affecting fruit after harvest in Brazil. *Journal of Phytopathology* **150**: 128-34.

Ploetz RC Zentmyer GA Nishijma WT Rohrbach KG Ohr HD. 2003 Common pathogens of tropical fruits. *Diseases of Tropical fruits crops.* CAB publication New Delhi.

Singh TS Singh GP. 1982 Field evaluation of systemic and non-systemic fungicides for the control of powdery mildew of pea. *Pesticides* **16**: 19-20.

Thind SK Kaur N. 2005 Status of grape anthracnose in Punjab. *Journal Mycology and Plant Pathology* **35**: 21-26.

Table 1.
Correlation matrix of intensity guava diseases with weather factors during 2003-2005

ŷ		X_1	X_2	X_3	X_4	X_5	X_6
Canker	a	0.556*	-0.101	-0.308**	-0.329**	-0.292**	- 0.220
	b	0.356*	-0.295**	-0.333**	-0.441*	-0.207	- 0.292**
	c	0.450*	-0.195	-0.317**	-0.382*	-0.241	- 0.240
Anthracnose	a	0.211	0.208	0.287**	0.337**	0.178	0.210
	b	0.288**	0.359*	0.141	0.297**	0.290**	0.407*
	c	0.248	0.280**	0.221	0.317**	0.234	0.311**
Stem canker and dry rot	a	0.388*	0.699*	-0.569*	-0.843*	-0.455*	- 0.617*
	b	0.250	-0.706*	-0.543*	-0.806*	-0.485*	- 0.639*
	c	0.269	-0.702*	-0.555*	-0.825*	-0.470*	- 0.625*
Phytophthora fruit rot	a	0.354*	0.797*	0.160	0.555*	0.469*	0.692*
	b	0.050	0.892*	0.187	0.600*	0.594*	0.796*
	c	0.198	0.841*	0.171	0.577*	0.536*	0.749*
Max. RH X_1	a	-	0.320**	-0.612*	-0.370*	0.158	0.101
	b	-	0.052	-0.500*	-0.389*	0.042	- 0.078
	c	-	0.192	0.560*	0.379*	0.098	0.005
Min. RH X_2	a	-	-	0.062	0.531*	0.552*	0.699*
	b	-	-	0.147	0.613*	0.685*	0.862*
	c	-	-	0.100	0.571*	0.616*	0.776*
Max. Temp. X_3	a	-	-	-	0.828*	0.096	0.271
	b	-	-	-	0.854*	0.150	0.269
	c	-	-	-	0.838*	0.120	0.266
Min. Temp. X_4	a	-	-	-	-	0.358*	0.562*
	b	-	-	-	-	0.438*	0.635*
	c	-	-	-	-	0.397*	0.596*
Total Rainfall X_5	a	-	-	-	-	-	0.483*
	b	-	-	-	-	-	0.641*
	c	-	-	-	-	-	0.568*
No. of Rainy Days X_6	a	-	-	-	-	-	-
	b	-	-	-	-	-	-
	c	-	-	-	-	-	-

a = 2003-2004 b = 2004-2005 c = Pooled data ** = Significant at 5%* = Significant at1%

Table2.

Simple correlation coefficient (r) of severity of guava diseases with independent weather variables

Variable	Canker			Anthracnose			Stem canker & dry rot			Phytophthora fruit rot		
	2003-04	2004-05	Pooled	2003-04	2004-05	Pooled	2003-04	2004-05	Pooled	2003-04	2004-05	Pooled
Max. RH X_1	0.556*	0.356*	0.450*	0.329**	0.008	0.248	0.288**	0.250	0.269	0.354*	0.050	0.198
Min RH X_2	-0.101	0.295**	-0.195	0.235	0.308**	0.280**	-0.699*	-0.706*	-0.702*	0.797*	0.892*	0.841*
Max. Temp X_3	-0.308**	-0.333**	-0.317**	0.184	0.214	0.221	-0.569*	-0.543*	-0.555*	-0.160	0.187	0.171
Min Temp X_4	-0.329**	-0.441*	-0.382*	0.255	0.338**	0.317**	-0.843*	-0.806*	-0.825*	0.555*	0.600*	0.577*
Total Rainfall X_5	0.292**	-0.207	-0.241	0.178	0.290**	0.234	-0.455*	-0.485*	-0.470*	0.469*	0.594*	0.536*
No. of Rainy Days X_6	-0.210	-0.292**	-0.240	0.210	0.407*	0.311**	-.617*	-0.639*	-0.625*	0.629*	0.796*	0.749*

* = Significant at 1%** = Significant at 5%

Table 3.

Multiple regression equation between severity of guava diseases and meteorological factors

Disease	Dependent variable (y)		Intercept (a)	Max. RH (x_1)	Min. RH (x_2)	Max. Temp (x_3)	Min. Temp (x_4)	Total Rain fall (x_5)	No. of Rainy days (x_6)	R values (%)	R^2 values (%)	Ad. R^2 Values (%)	S.E. of estimate
Canker	a	Y_1	169.245035	1.9533	-0.0065657	0.052435	0.0024378	-0.035530	-0.050298	0.711	0.506	0.433	6.530
	b	Y_2	-54.114503	0.068029	0.011706	1.5331	-1.7355	-0.0044703	0.01642	0.518	0.268	0.161	7.997
	c	Y_3	-89.828726	1.1916	-0.33328996	0.060462	-0.059703	-0.019504	-0.00013719	0.558	0.311	0.265	7.473
Anthracnose	a	Y_1	-337.978919	3.0705	-.025361	1.5751	1.2371	0.0094000	-.0.03065	0.580	0.337	0.239	14.552
	b	Y_2	-166.756831	2.2215	-0.060590	-1.6055	2.5505	0.007585	2.9314	0.581	0.338	0.241	14.013
	c	Y_3	-245.139560	2.3767	-0.025048	0.070492	1.1724	0.0093504	1.2932	0.539	0.291	0.243	14.187
Stem canker and dry rot													
	a	Y_1	-70.967319	1.5111	-0.057081	0.026358	-1.5296	-0.010505	-0.011873	0.922	0.851	0.829	6.923
	b	Y_2	20.504863	0.02594	0.027113	1.7350	-3.4136	-0.0032902	0.088619	0.857	0.735	0.696	9.231
	c	Y_3	0.406230	0.076790	-0.047720	0.036730	-2.02226	0.0052594	0.04363	0.882	0.777	0.762	8113
Phytophthora fruit rot	a	Y_1	-213.767182	1.9830	0.023884	-1.0481	2.4667	-0.0045387	1.7475	0.874	0.764	0.730	9.845
	b	Y_2	-64.627000	0.038604	0.083461	-1.3855	1.6417	-0.0085110	0.087131	0.899	0.8018	0.780	9.416
	c	Y_3	-110.538076	0.098987	0.045400	-1.4599	2.1371	-0.0035054	1.8491	0.875	0.766	0.750	9.719

a = 2003-2004 b = 2004-2005 c = Pooled data