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Short Comminucation

Tomato early blight progress and it's severity in relation to weather parameters in coastal Andhra Pradesh

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Tomato is the most popular vegetable grown under wide range of agro climatic conditions. High relative humidity and warm temperature, which favour the luxuriant plant growth was congenial for the development of various fungal, bacterial and viral diseases (Balanchard, 1992). Among the fungal diseases, early blight caused by *Alternaria* spp. is the most threatening biological constraint in tomato cultivation with yield losses ranging from 50 to 86 per cent (Mathur and Shekhawat, 1986). Role of weather parameters such as temperature and relative humidity in disease development has been reported by Dragomir (1995), Gupta and Paul (2001) and Pandey (2011). However, precise information is not available on the epidemiological aspects of this disease under coastal conditions of Andhra Pradesh where the crop is cultivated during *kharif* under irrigated conditions. Hence, the present investigation was carried out to correlate the weather parameters with the disease development.

Field experiments were conducted during *kharif* 2010-11 and 2012-13 in the experimental farm of the Horticultural Research Station, Dr. Y.S.R Horticultural University, Venkataramannagudem, Andhra Pradesh. The cultivar Arka Vikas was sown on 27.9.2010 and 12.9.2012 adopting recommended package of practices in plot size of 162 m^2.

Disease severity ratings (Mayee and Datar, 1986) were recorded on randomly selected and tagged 25 plants at different locations in the field at four days interval from the first disease appearance *i.e.,* 4.12.2010 (2010-11) and 19.11.12 (2012-13). The percent disease index (PDI) were calculated as given below

$$PDI = \frac{\text{Sum of individual ratings}}{\text{Number of leaves scored x Maximum rating in the scale}} \times 100$$

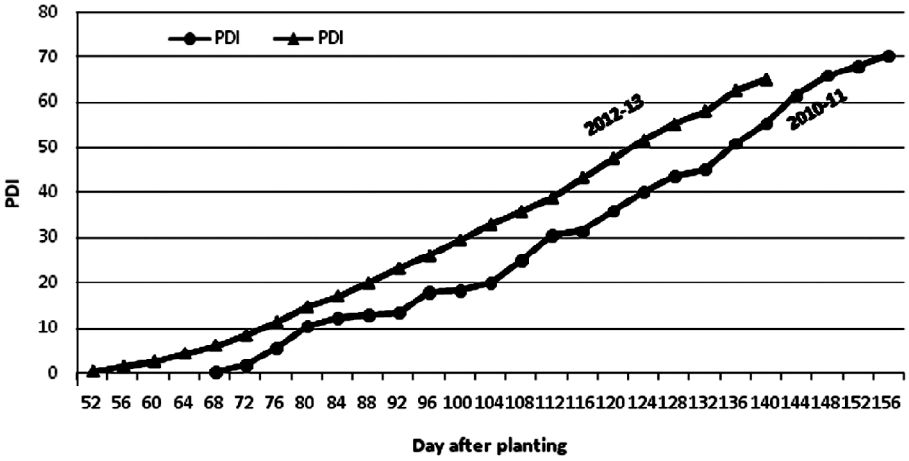

Fig. 1: Progress of tomato early blight disease severity (PDI) during 2010-11 and 2012-13.

The data on the weather parameters *viz*. maximum temperature (T_{max}), minimum temperature (T_{min}), rainfall (Rf), relative humidity at 08.00 hrs (RH I) and relative humidity at 14.00 Hrs (RH II) were recorded daily during the

Table 1: Correlation between weather parameters and early blight PDI

Weather parameters	Correlation coefficient (r)
T_{max}	0.35*
T_{min}	-0.23
RH I	0.39**
RH II	-0.08
Rf	-0.13

*Significant at 5% ** Significant at 1%

entire period of experimentation. The mean value of four days (interval of observation of PDI) for each of the weather parameters except rainfall was calculated corresponding to the period of observation of PDI and correlation coefficients were worked out between weather parameters and PDI. The step wise regression analysis was done to develop prediction equation.

Progress of early blight of tomato

The series of PDI mean values assessed at four days interval starting from the first appearance of disease during 2010-11 and 2012-13 (Fig. 1) shows that the disease initiated at 68 days after transplanting (DAT) in 2010-11 and 52 DAT in 2012-13. During both seasons, only progressive phase of the epidemic was observed in spite of shedding of infected leaves as the infection continued to increase because of production of new foliage for infection and availability of inoculum.

Regression analysis of PDI with DAT for pooled data (2010-11 and 2012-13) revealed that the age of the plant was an important factor explaining disease development up to 94 per cent.

$Y = - 46.93 + 0.743$ (DAT)

$N = 23$ $R^2 = 0.94^{**}$

Relationship between weather and early blight severity

The correlation coefficient between weather parameters and PDI (Table 1) revealed that the T_{max} ranging between 25.5 ^{0}C and 32.7 ^{0}C and RH I ranging between 68 and 94 per cent were found to have significant positive correlation with disease severity.

Stepwise multiple regression for pooled data yielded two distinct equations for prediction of PDI that were significant ($P \leq 0.05$) with R^2 values ranging from 0.48 to 0.46.

$Y = -239.67 + 5.88$ (Tmax *) $- 3.28$ (Tmin *) $+ 1.92$ (RH I*)

$N = 46$ $R^2 = 0.46$ F value = 12.04 Standard error = 16.30

* significant at 5%

This equation with three weather variables viz. maximum temperature, minimum temperature and relative humidity at 08.00 h was considered as the best fit as there was no appreciable drop in R^2 values.

Ngoc *et al*. (2013) reported an increased susceptibility to early blight caused by *A. solani* with age of the plant. Degree of susceptibility to *A. solani* infection was found to increase with age of tomato plants under artificial conditions (Pandey *et al.,* 2003). Early blight was found to be favoured by a wide range of temperature and relative humidity. Maximum temperature 14 and 38 ^{0}C and minimum between 6 and 21^{0}C in combination with maximum relative humidity between 75 and 93 per cent and minimum relative humidity of 20 to 68% explained 85 to 100 per cent of early blight development in Gangetic plains (Pandey, 2011). Dragomir (1995) found that 23-25^{0}C temperature and 90 per cent relative humidity with leaf wetness period for more than two hours was ideal for early blight development in tomato. The forecasting system FAST (**F**orecasting ***A**lternaria **s**olani* in **T**omato) mainly emphasizes weather variables and does not incorporate age of the plant (Madden *et al*., 1978). The weather variables *viz*. maximum temperature, minimum temperature and morning relative humidity that were found to significantly influence early blight progress in this study were determinants in FAST.

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