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CLIMATIC FACTORS FAVOURABLE FOR INFESTATION OF TIKKA DISEASE ON GROUNDNUT AT AKOLA

1. Tikka disease of groundnut, (Arachishypogao Linn.) appears as leaf spots caused by two species of Circospora. It is one of the major constraints in achieving the potential yield. It generally starts affecting the crop in its early growth stage and becomes severe especially after flowering under the influence of congenial prevailing weather conditions. The proper precautionary measures at appropriate time can save the loss in yield even up to 50 percent (Rangaswami 1988). With this in view, an attempt is made to explore the feasibility of issuing forewarning based on the weather situation persisting in a particular area by finding the possible relation between the magnitude of the disease attack and various weather parameters a few days before the disease appearance and during attack period.

2. The entomological data recorded fortnightly in the farm of Punjabrao Krishi Vidyapeeth, Akola (20° 42'N, 77° 02'E) and meteorological data of Agro-meteorological Observatory, Akola are used in this study. The data of kharif groundnut varieties SB-XI, AK 12-24 for six years (1979-84) were available. These varieties have high yield potential with excellent quality character, such as, high percentage of Shelling (70%), sound matured kernels and oil (49-50%) (Reddy, 1988). Akola is situated in western part of Vidarbha region where annual rainfall lies between 700-950 mm. Tikka disease appears as dark spots which enlarge about 3 to 8 mm in diameter. Severely infected leaves may drop off prematurely. The yearwise disease data recorded in a particular week were tabulated. The average weekly disease intensity was calculated combining 6 years' data whichever fell in that particular week and weekly disease intensity alongwith mean meteorological parameters, *viz.*, T_{max}, T_{min}, SSH, RH-1, RFL are plotted in Fig. 1.

The data of pest infestation percentage was recorded once in a fortnight. The means of seven days before the date of appearance of the pest in every year for different meteorological parameters were also worked out. The simple correlation coefficients (CC) using six data points between disease percentage on the date of appearance and mean meteorological parameters of seven days before the appearance were calculated and presented in Table 1. Only the parameters having significant correlation at five percent level were selected for further discussion.

The average intensity of attack during the full growing season in a particular year is calculated by fortnightly recorded data. The other part of the analysis was to find out the effect of different mean weather parameters for 7, 8,..... and 15 days period before the date of appearance of disease. For this purpose these mean weather parameters were taken independent variables and the average disease infestation in the full growing period of the year as dependent parameter. Simple correlations based on six data points were first calculated between yearly

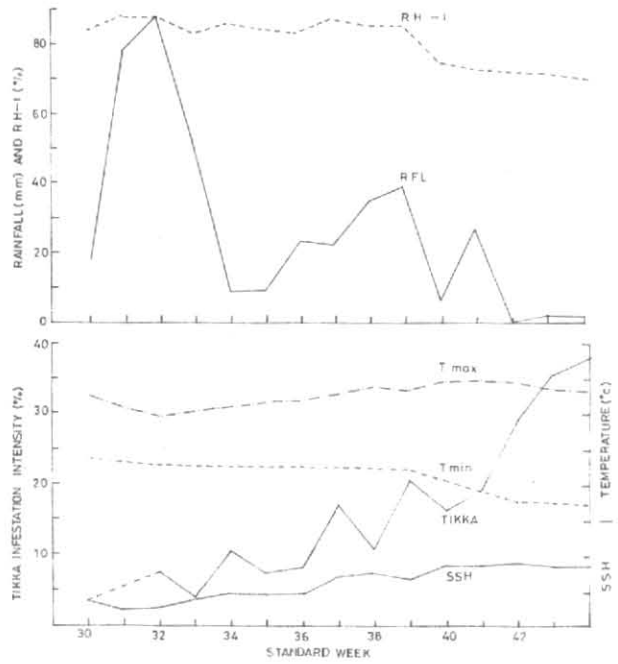

Fig. 1. Weekly average variation of Tikka disease infestation and meteorological parameters at Akola

disease intensity and different parameters separately for successive overlapping periods of seven to fifteen days before the date of appearance of disease. The correlation coefficients(r) for each element were analysed for their statistical and physical significance and presented in Table 2. Critical accumulated period when weather may exert significant effects on infestation were located and discussed.

3. Fig. 1 shows the seasonal variation of the attack of 'Tikka' at Akola. It depicts that the groundnut is affected by Tikka disease from July onwards at Akola which is in Vidarbha region of Maharashtra. It supports the report given by Venkataraman and Kazi (1979). Sudden rise in attack is generally noticed in October. The weather parameters showing significant correlation along with their mean values are depicted in Table 1. It is seen that rainfall (RF), relative humidity (RH), sunshine hours (SSH) during one week before disease appearance have highest correlations. More rainfall and higher humidities during the current week may cause the disease appearance in coming days. SSH has negative correlation which means lower sunshine hours during the week is also conducive. Another sensitive weather element is maximum temperature. It shows correlation coefficient (CC) of −0.812. It means lower temperatures are very conducive. In humid atmosphere with lower

TABLE 1

Correlation coefficients between mean meteorological factors one week before the disease appearance and disease intensity

Parameters	Mean	CC	Level of significance (%)
T_{max}	23.8°C	− 0.812	5
T_{min}	22.7°C	− 0.304	20
RH-I	86 %	0.750	10
RH-II	67 %	0.922	1
SSH	3.6 hrs	− 0.905	1
RF	54.9 mm	0.964	1

temperature, the groundnut crop is likely to be affected by this disease.

The development of any disease may not be due to one day effect of any parameter. It should be due to accumulated effect of several days. To know the number of days necessary for a particular parameter to affect the development of disease, the accumulated effect of 7 to 15 days period called duration depth, in case of every weather element was studied by increasing the day in steps of one starting from 7 upto 15 days. The simple correlation coefficients between average seasonal infestation and the T_{max}, T_{min}, RH-I, SSH, T_{mean}, T_{range} and rainfall in all duration depth and their mean values were calculated and given in Table 2. The duration of highest significant correlation coefficients(r) were found as 10 days for T_{max}, starting from 6 August, 9 days for T_{min} starting from 5 September, 7 days for RH-I starting 8 July, 9 days for SSH starting from 16 July, 15 days for rainfall starting from 2 July, 8 days for T_{range}, starting from 19 July and 10 days for T_{mean}, starting from 6 August.

The mean temperature (T_{mean}), range of temperature ($T_{max}-T_{min}$), SSH & RF showed the clear effect on the development of the disease. Falling of mean temperature, during first fortnight of August, range of temperature and SSH due to cloudy weather in second fortnight of July help in development of the disease while increase in rainfall in 1st fortnight of July causing higher RH-I helps in increasing the infestation. Lower T_{max} in first fortnight of August but higher T_{min} in first fortnight of September are conducive for disease occurrences.

TABLE 2

Correlations between meteorological parameters accumulated for different duration depth (days) and disease intensity

	T_{max}	T_{min}	RH-I	SSH	RF	T_{range}	T_{mean}
Duration depth (days)	10	9	7	9	15	8	10
CC	− 0.994	0.990	0.871	− 0.995	0.990	− 0.936	− 0.991
Mean values	29.8°C	22.4°C	84%	4.6 hrs	85.7 mm	8.4°C	25.3°C
Starting dates	6 Aug	5 Sept	8 Jul	16 Jul	2 Jul	19 Jul	6 Aug

With the knowledge of the conducive weather conditions, it is possible to issue advisories to the farmers for taking necessary control measures. In seed borne inoculum important for disease initiation which can develop at proper crop stage in congenial weather, can be controlled by the application of suitable chemicals to the soil just before or after planting. Application of soil fumigants before planting can reduce plant loss from the disease. Spraying and dusting of pesticides can be made more economic and effective in calm wind and a little rain before spraying for which weather forecast is needed.

4. The following conclusions may be drawn from this study :

(*i*) Lowering the range of day-night temperature variation, lesser number of sunshine hours and increase in rainfall during 1st fortnight of July are conducive for development of Tikka disease.

(*ii*) Falling of mean temperature during 1st fortnight of August also helps in the enhancement of this disease.

(*iii*) Tikka disease generally occurs more in October.

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