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RESEARCH ARTICLE

Seasonal incidence of mungbean leaf curl disease caused by peanut bud necrosis virus in Allahabad (U.P.)

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ABSTRACT

Experiments were conducted during *Kharif*-2006, summer -2007 and *Kharif*-2007 at Central Agricultural Farm, AAI-DU, Allahabad and observations were recorded on leaf curl disease incidence, *Thrips palmi* Karny population at fortnightly interval and were correlated with weather parameters during crop period in standard weeks of respective years. During *Kharif*-2006, the disease incidence had a significant positive correlation with thrips population, ("r"=0.967), maximum temperature ("r"=0.964), maximum relative humidity (r=0.927), whereas minimum temperature showed a negative significant correlation ("r"= - 0.907). During summer-2007, disease incidence had a significant positive correlation with thrips population ("r"= 0.948) and maximum temperature (0.970), whereas minimum humidity had negative significant correlation ("r"-0.894). Disease incidence showed a significant positive correlation with thrips population, ("r"= 0.974), maximum temperature ("r"=0.900) and maximum humidity (r=0.939), negative significant correlation was observed between minimum temperature(r=-0.970) and disease incidence during *Kharif*-2007. Investigation has revealed that mungbean pulse crop grown during *Kharif* in Allahabad district was prone to leaf curl during 2nd fortnight of July. Prophylactic spraying of systemic insecticides to control *Thrips palmi* at 30-40 days after sowing can reduce the leaf curl disease and similar practice can reduce the leaf curl in summer crop.

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INTRODUCTION

In India, acerage, production and coverage under pulses have increased which emphasizes the significance of pulses in Indian agriculture. Among the pulse growing states of India, Uttar Pradesh occupies the prominent place in pulse production with area of 2.72 million hectares, which makes 10.06 per cent of all India pulse's area with a production of 2 million tones which is 13.72 per cent to all India production. (Agricultural Statistics at Glance, 2011). Among the pulses cultivated in Uttar Pradesh *viz.,* pigeonpea, mungbean, lentil, cowpea, etc., mungbean is an important pulse crop in state and is prone to several biotic stresses. Mungbean leaf curl is one of the important diseases of mungbean causing considerable loss in the past up to 40 per cent in 33 districts of Uttar Pradesh as per the survey conducted by Nene and Singh (1972). The disease already assumed alarming level in southern states like Andhra Pradesh (Prasada Rao, 2003) and was reported to be transmitted by Thripspalmi Karny in Andhra Pradesh (Sreekanth, 2002). As the disease is prevalent in Uttar Pradesh and causing considerable loss to mungbean, investigation was done to study the seasonal incidence of leaf curl so as to devise strategy for economical control measures.

MATERIALS AND METHODS

Disease incidence :

Seasonal incidence study was conducted at Central Agricultural Farm, Allahabad Agricultural University (AAI-DU) during *Kharif*-2006, 2007 and summer 2007 on local variety . Observations on mungbean leaf curl incidence was recorded at 14 days intervals from 1st week after germination up to a week prior to harvest by using 1 sq.m. quadrate at five random locations in the field. The per cent infection was calculated by formula :

$$\text{Per cent infection} = \frac{\text{No. of infected plants}}{\text{Total no. of plants}} \text{x100}$$

Mungbean plants showing typical symptoms of leaf curl were collected in polythene bags and were processed quickly for diagnosis in laboratory by Direct Antigen Coating Enzyme –Linked Immunosorbent Assay (DAC-ELISA, Hobbs *et al*., 1987; conducted at National Bureau of Plant Genetic Resources, Regional Station, Hyderabad)

Collection and identification of *Thrips palmi* Karny :

Mungbean terminal leaves were collected from AAI-DU field during morning hours of the day and they were placed in plastic jar and covered with a glass funnel attached to homeopathic vials. Adult thrips crawled along the walls of the funnel were collected in glass vial and the glass vials were changed at 2 hour interval. Collected thrips were immobilized in a vial by placing them in a refrigerator for 15 minutes and were dislodged on to ice tray (Lewis, 1973). After immobilization by cold treatment, thrips were identified and sorted into different species (within 15 minutes) using stereoscopic binocular microscope, based on the key characters (Palmer *et al*., 1989 and Reddy *et al*., 1991).

Correlation studies :

Per cent incidence of disease was correlated with *Thrips palmi* Karny population and standard week weather data collected from meteorological observatory A.A.I.-DU by simple correlation analysis (Gomez and Gomez,1984) .

RESULTS AND DISCUSSION

During *Kahrif*-2006, disease first appeared during 28th standard week(11.12%) when the preceeding observation of maximum temperature was 25.10^{0}C, minimum temperature and maximum humidity were 32.1^{0}C and 78 per cent, respectively, Disease gradually progressed from 28th standard week to 34th standard week (34.87%), disease incidence had a high significant positive correlation with thrips population ("r"=*0.967), maximum temperature ("r"=**0.964), whereas maximum humidity (r=-*0.927) and minimum temperature showed a negative significant correlation ("r"=*-0.907) (Table 1, Fig.1and 2).

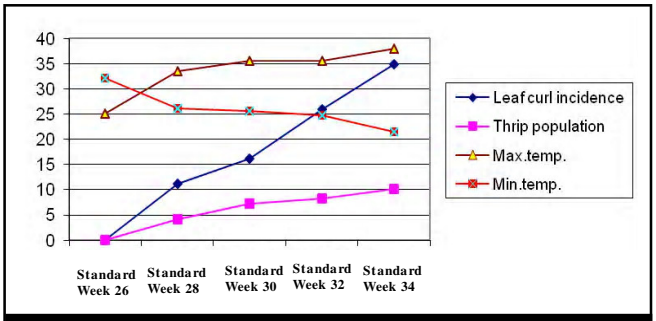

Fig. 1 : Leaf curl, *Thrips palmi* population maximum and minimum temperature in respective standard week during *Kharif*- 2006

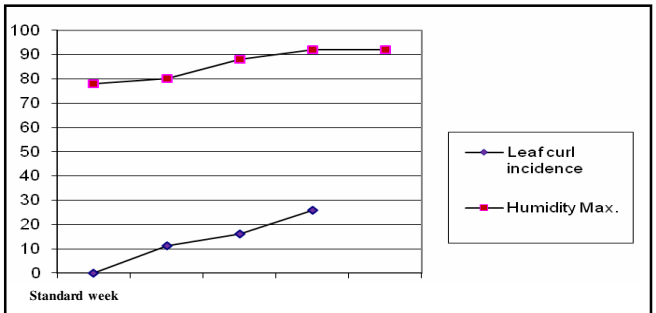

Fig. 2 : Leaf curl, humidity maximum in respective standard week during *Kharif*- 2006

During summer-2007, the disease first appeared on 13th standard week of 2007 and had a significant positive correlation with thrips population ("r"= 0.948), maximum temperature had positive significant correlation (0.970) whereas

Table 1: Seasonal incidence of leaf curl of mungbean during *Kharif* -2006 (Date of sowing: 21-06-06)

Standard weeks	Disease incidence	No. of thrips/terminal	Temperature max. (°c)	Temperature min. (°c)	Humidity max. (%)	Humidity min. (%)	Wind velocity (km/hr.)	Sun shine (hr.)
26	0	0	25.10	32.1	78	60	4.2	6.8
28	11.12	4.22	33.50	26.2	80	59	4.7	7.0
30	16.10	7.19	35.60	25.6	88	52	1.08	5.6
32	25.98	8.30	35.60	24.8	92	68	2.4	7.5
34	34.87	10.18	38.00	21.5	92	45	0.83	9.3
	"r"	*0.967	*0.964	-0.907	*-0.927	0.823	-0.371	-0.757

*r value at 5% = 0.879**r value at 1% = 0.959

minimum humidity had negative significant correlation ("r"-0.894) and rest of the climatic factors had non-significant correlation with disease incidence(Table 2) (Fig.3).

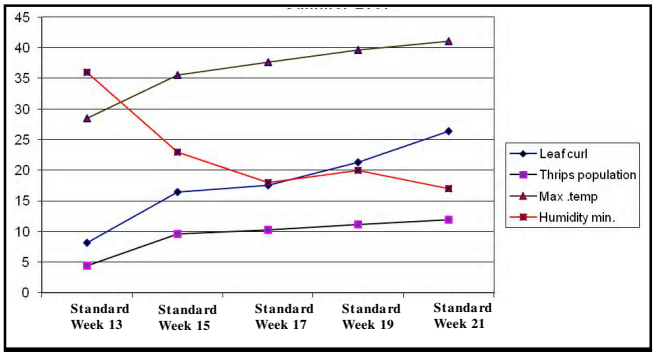

Fig. 3 : Leaf curl, *Thrips palmi* population maximum temperature and minimum humidity in respective standard weeks of summer-2007

During *Kahrif*-2007, the disease first appeared during 28th standard week with preceeding maximum temperature observation was 32.6°C, minimum temperature was 26.21°C and maximum humidity was 79 per cent and the disease gradually increased from 28th standard week (10.28%) to 34th standard week(36.71%). Disease incidence had a significant positive correlation with thrips population, ("r"= 0.974), maximum temperature("r"=0.900) and maximum humidity showed positive significant correlation with disease incidence ("r"=0.939), negative significant correlation was observed between minimum temperature("r"= -0.970) (Table 3, Fig.4 and 5). Other factors had

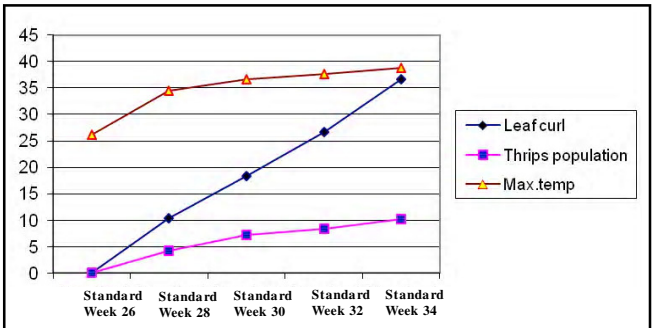

Fig. 4 : Leaf curl, *Thrips palmi* population and maximum temperature in respective standard weeks during *Kharif*-2007

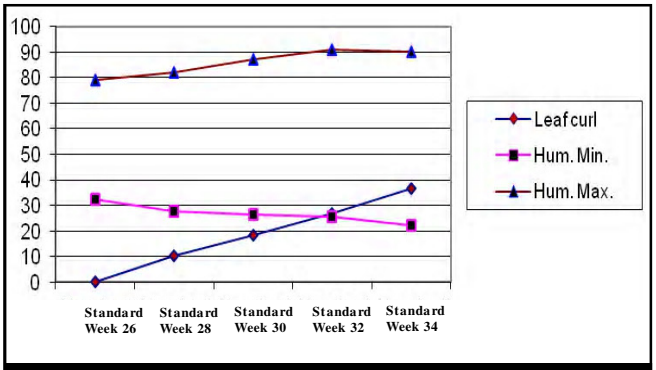

Fig. 5 : Leaf curl, Min. Hum. Max. Hum. in respective standard week during *Kharif*-2007

Table 2 : Seasonal incidence of leaf curl during of mungbean during summer- 2007 (Date of sowing :21-03-07)

Standard weeks	Disease incidence	No. of thrips/terminal	Temperature Max. (°c)	Temperature Min. (°c)	Humidity max.(%)	Humidity min.(%)	Wind velocity (km/hr)	Sun shine (hr)
13	8.20	4.41	28.5	12	74	36	3.7	9.5
15	16.40	9.62	35.5	17.8	76	23	4.66	9.3
17	17.51	10.21	37.6	17.4	70	18	4.74	9.4
19	21.34	11.11	39.6	34.2	60	20	1.5	9.3
21	26.32	11.96	41	24.6	56	17	2.83	8.1
	"r"	*0.948	**0.970	0.741	-0.847	*-0.894	-0.37	-0.459

*r value at 5% = 0.879 **r value at 1% = 0.959

Table 3 : Seasonal incidence of leaf curl during *Kharif* 2007 (Date of sowing : 22-06-07)

Standard weeks	Disease incidence	No. of thrips / terminal	Temperature max. (°c)	Temperature min. (°c)	Humidity max. (%)	Humidity min. (%)	Wind velocity (km/hr)	Sun shine (hr)
26	0	0	26.21	32.6	79	61	4.1	6.1
28	10.28	4.22	34.52	27.8	82	60	4.8	7.1
30	18.30	7.19	36.63	26.6	87	59	1.1	5.9
32	26.68	8.30	37.65	25.7	91	67	1.9	7.2
34	36.71	10.18	38.86	22.4	90	46	0.9	9.6
	"r"	*0.974	*0.900	*-0.970	*0.939	-0.495	-0.811	-0.031

*r value at 5% = 0.879 **r value at 1% = 0.959

non-significant correlation with disease incidence.

Reddy *et al*. (1983) reported that the hot and dry weather favoured the disease build up and thrip prevalence and weather factors *viz.,* temperature, humidity, rainfall, sunshine and wind speed largely influenced the activity of given sp. of thrips. The present research findings showed that during 2006 *Kharif* thrip population, maximum temperature had a positive significant correlation with disease incidence and is in conformity with Reddy *et al*. (1983) whereas wind velocity, rainfall and sunshine had non-significant correlation, minimum temperature and maximum humidity had negative significant correlation with disease incidence.

Season also plays vital role in disease development. Disease incidence and thrip abundance was more in *Kharif* than in summer and is in conformity with Reddy *et al*.(1983) Sreenivasulu (1994) and Krishnaveni (1998).On contrary**,** Kenchaiah and Porte (1989) reported the incidence of thrips on groundnut which remained same during *Kharif* and *Rabi* season of 1984-1989 that may be attributed to environment factors influencing vector abundance which in turn influences the spread of disease.

The present finding indicates that *Kharif* sown crop during June can be protected from leaf curl damage by taking up prophylactic systemic insecticidal spray in 2nd fortnight of July. Summer sown crop has less leaf curl incidence, however, practice of chemical spray at 30 days after sowing controls leaf curl and simultaneously checks the thrips and sucking pest damage to mungbean.

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