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NATURAL OCCURRENCE OF CUCUMBER MOSAIC VIRUS IN CHILLI (*CAPSICUM ANNUUM* L.) IN SOUTHERN TELANGANA ZONE OF ANDHRA PRADESH

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ABSTRACT
Survey conducted during *kharif* 2005 in Southern Telangana Zone of Andhra Pradesh for the occurrence of cucumber mosaic virus (CMV) in chilli revealed that average incidence was 23.27 per cent. The disease incidence was 28.28 per cent in Medak, 26.60 per cent in Nalgonda, 24.99 % in Ranga Reddy and 21.32 percent in Mahaboobnagar. Survey for different aphid species in the zone indicated that *Aphis gossypii* (58.04 %), *Myzuspersicae* (27.63 %), *Aphis craccivora* (8.18 %) and *Rhopalosiphummaidis* (6.12 %) were predominant.

KEY WORDS: survey, CMV, chilli, Aphids, Identification.

INTRODUCTION

Chilli (*Capsicum annuum* L.) is one of the most important commercial crops belonging to the family solanaceae. In India, the crop occupies an area of 9.91 million ha with an annual production of 1.02 million tones of dry chilli. Among the major chilli growing states of India, Andhra Pradesh has been leading both in area and production contributing to an extent of 25 percent of the total area with a total production of 40-50 percent followed by Karnataka, Orissa and Maharastra[1]. In Andhra Pradesh, it is cultivated in 0.24 m ha with an annual production of 0.75 m tonnes of dry chilli[2]. In India, mosaic viruses that have been reported to occur in the crop are tobacco mosaic virus (TMV), cucumber mosaic virus (CMV), tobacco etch virus (TEV), tomato spotted wilt virus (TSWV), potato virus – Y (PRY), tobacco ring spot virus (TRSV), pepper vein banding virus (PVBV) and pepper vein mottle virus (PVMV)[3]. In Andhra Pradesh, natural occurrence of CMV was reported by[4], [5] to an extent of 24-28 %. Cultivation of chilli in Southern Telangana zone of Andhra Pradesh was effected by CMV, PBNV, PVY, PVMV and TMV in different districts of Northern Telangana zone [6], [7].

MATERIALS & METHODS

Disease survey was carried out in major chilli growing areas of Southern Telangana Zone of Andhra Pradesh.
Survey for mosaic disease, Survey for mosaic disease on chilli was undertaken during *Kharif* 2005 in Medak, Mahaboobnagar, Nalgonda and Ranga Reddy districts of the zone (STZ) During survey, chilli fields in a village were observed for the occurrence of mosaic disease and various kinds of symptoms expressed due to cucumber mosaic virus in different locations. In each field, five rows of 10 m length were selected randomly and total number of plants showing mosaic symptoms was recorded and per cent disease incidence was calculated by using the formula:

$$\text{Percent disease incidence} = \frac{\text{No. of plants showing mosaic symptoms}}{\text{Total No. of plants}} \times 100$$

The observation on incidence of mosaic was recorded mandal wise and district averages were obtained for *kharif* 2005 season.
In each field, 5 leaves showing typical mosaic symptoms were collected in polyethylene bags, sealed with proper labelling and placed in a vasculum containing ice. The samples thus collected were brought to the laboratory for further studies.

Survey for Aphid vectors

Survey for aphid population was made during *kharif* 2005 season in the same fields selected for recording incidence of mosaic. Monitoring of the aphids was done from vegetative to fruit formation stages in different cultivars grown in the districts of Southern Telangana Zone.

Collection and Identification of Aphids

In order to quantify the population of aphids, six leaves (two each from top, middle and bottom positions) were taken from three randomly selected plants in each field [8]. The leaves with aphids were detached carefully and placed in a glass container consisting 50 percent ethyl alcohol. Later, the insects were transferred to homeopathy glass vials containing 50% ethyl alcohol and properly labelled indicating the place of collection for further identification and recording the population, both location and species wise. For identification of aphids, the keys given by [9] was used.

Identification of the virus causing mosaic

Seed material

Susceptible chilli cv. Sindhur (CA 960) was used throughout the investigation. Seeds of cv. Sindhur were obtained from the Regional Agricultural Research Station, Lam Farm, Guntur, Andhra Pradesh.

Isolation and maintenance of the virus

The causal virus of chilli mosaic was isolated through inoculation of sap obtained from the infected leaves and were further maintained on chilli cv. Sindhur under insect proof conditions. In order to maintain purity of the mosaic virus, single local lesion was taken from the respective local lesion host and further maintained on cv. Sindhur. Sufficient care was taken to avoid contamination and the virus was further maintained in glasshouse on the same cultivar as mentioned.

TABLE 1: List of plant species inoculated and symptoms developed

Family/Host species	Symptoms
Chenopodiaceae	
Chenopodium amaranticolar Coste and Reyn	Chlorotic local lesions
C. quinoa wild	Chlorotic local lesions
Cucurbitaceae	
Cucumis sativus L. cv Japanees long green	Chlorotic spots and mosaic
C. melo L. cv. Durgampur	Mosaic
Luffaa cutangula L. cv Pusanasdar	Mosaic
*L. cylindrica*L.cv. Pusachikini	Yellow mosaic
Leguminosae	
*Phaseolus vulgaris*L. cv Pinto	Necrotic local lesions
Phaseolus vulgaris L. cv C152	Necrotic ring spots
Solanaceae	
Daturametel L.	Vein clearing and mosaic
*D. stramonium*L.	Mosaic and chlorotic spots
Nicotiana tabacum L. xanthinc	Mosaic mottling
N. glutinosa L.	Mosaic mottling and Rat tailing
N. tabacum Harrison's special	Mosaic
Capsicum annuum L. cv Sindhur	Shoe string leaves, mosaic mottling and vein clearing

Test plants:

The test plants (chilli cv. Sindhur) were raised in earthen pots of 30 x 10 cm size under insect proof conditions. In each pot, 5 plants were grown by direct seeding. The soil compost mixture (3:1 sandy loam and FYM) was used for filling the pots. Seedlings of 30 days age were used for mechanical inoculation.

Indicator hosts

In order to establish the virus causing mosaic in chilli, thirteen species of indicator hosts from four families were employed. Seeds of indicator hosts were collected from healthy plants and were maintained in insect proof cage. Ten plants (5 plants/pot) of each species were sap inoculated. The plants were kept under observation for a period of 60 days as the case may be after inoculation for development of symptoms. Symptoms developed on individual plant species were recorded separately. Chilli seedlings cv. Sindhur were back inoculated to test whether there was any symptomless carrier among these plant species.

With the aim to establish CMV on systemic hosts, preliminary identification of the virus causing mosaic in chilli was done by following the virus assay hosts. Fifteen days old plants were used for inoculation. Observations on type of symptoms (local or systemic) produced by the virus was recorded (Table 1). The plants were sprayed periodically with insecticides as a precautionary measure to avoid insect infestation.

RESULTS & DISCUSSION

The incidence of mosaic varied from 3.10 to 55.10 percent with an overall average of 23.27 percent in the season in all the districts surveyed. Highest incidence (28.28 %) of mosaic was recorded in Medak, while, it was lowest in Mahaboobnagar district (21.32 %) (Table 2). During survey, all the cultivars grown in the zone were naturally infected with mosaic disease under field conditions. Whenever the incidence of mosaic increased slightly, that might be due to vector population, age of the crop, season and susceptibility of the crop [6].

TABLE 2: Incidence of chilli mosaic in different districts and mandals of Southern Telangana Zone of Andhra Pradesh during *Kharif* 2005.

District	Mandal	No. of samples collected	Sap transmissibility of samples	Per cent Mosaic Incidence		Per cent CMV incidence
				Range	Average	
Medak	Sadasivpet	25	20 (80)*	3.50-54.50	29.21	7 (28.00)
	Jogipet	25	19 (76)	8.50-54.50	28.35	6 (24.00)
	Zaheerabad	25	21 (84)	5.50-45.50	27.13	8 (32.00)
	Total	75	60 (80)	3.50–54.50	28.28	21 (35.00)
Nalgonda	Mothe	25	21 (84)	3.10-48.80	25.75	4 (16.00)
	Mattampalli	25	23 (92)	6.50-38.50	27.32	7 (28.00)

	Mellacheruvu	25	22 (88)	4.50-50.50	26.75	5 (20.00)
	Total	75	66 (88)	3.10 – 50.50	26.60	16 (24.24)
Ranga Reddy	Shamshabad	25	19 (76)	3.50-50.50	24.43	3 (12.00)
	Shankarapalli	25	17 (68)	4.50-39.50	25.75	4 (16.00)
	Chevella	25	16 (64)	8.85-55.10	24.82	5 (20.00)
	Total	75	52 (69)	3.50 – 55.10	24.99	12 (23.07)
Mahaboobnagar	Balanagar	25	19 (76)	5.50-48.85	21.32	3 (12.00)
	Kondurg	25	22 (88)	3.81-49.15	24.75	4 (16.00)
	Shadnagar	25	18 (72)	6.55-49.11	23.75	3 (12.00)
Total		75	59 (78)	3.80 – 49.10	21.32	10 (16.94)
Grand Total		300	237 (79)	3.10-55.10	23.27	59 (24.89)

**Figures in the parenthesis are percentage*

Based on morphological characters, four species of aphids *viz*., *Aphis gossypii*, *Myzuspersicae*, *Aphis craccivora* and *Rhopalo siphummaidis* were observed during the survey in the Zone. Among the aphid species, occurrence of *A. gossypii* was maximum (58.04 %) followed by *M. persicae* (27.63 %), *A. craccivora* (8.18%) and *R. maidis* (6.12 %) respectively. As it was a well established fact that aphid transmission is a primary factor that promotes the spread of the disease from source of survival and hence the disease incidence was in accordance with the aphid prevalence in the season as reported by [10](Table 3).

TABLE 3: Occurrence and distribution of Aphids 3 P^{-1} in different districts of Southern Telangana Zone of Andhra Pradesh during *Kharif* 2005

District	Percent occurrence of aphid species				Mean No. of Aphids ($3P^{-1}$)
	Aphis gossypii	*Myzuspersicae*	*Aphis craccivora*	*Rhopalosiphummaidis*	
Medak	59.43	27.03	6.50	6.84	62.50
Nalgonda	59.26	28.18	8.80	5.37	58.66
Ranga Reddy	55.39	28.90	9.30	6.10	46.34
Mahaboobnagar	58.09	27.85	8.10	6.16	49.88
Mean	58.04	27.63	8.18	6.12	54.35

The diagnostic symptoms observed under natural conditions varied with the cultivar. Under field conditions, the symptoms were characterized by severe mottling, vein cleaning, vein banding, leaf curling, plant stunting, few flowers and fruits. Plant age at infection, virus strain, vectors involved and environmental conditions that prevailed in the season might be the reasons for variation in symptoms.

Severity and frequency of foliar symptoms in CMV infected pepper plants were greater if infected when plants are young and early in the season than in plants infected late[11]. Since viruses remain intercellular and have no elaborate structures to cause mechanical injuries to host cells but bring about sub cellular changes which result in varied type of symptoms as observed during the present investigation [12]. There is apparent correlation between the young plant age and prevailing low temperature with higher virus titre and more severe symptoms in the early infected plants on one hand, and older plant age and higher prevailing temperature with lower virus titre and milder symptoms in the late infected chilli plants with CMV indicating the role of various abiotic and biotic factors in the development of symptoms under field conditions on the other hand [11].

REFERENCES

[1]. Anonymous, Indian Agriculture (2003) (Ed Vikas Singhal) Indian Economic data research centre, New Delhi, pp. 565-570.

[2]. Anonymous (2003) Centre for Monitoring Indian Economy (CMIE).

[3]. Prasada Rao, R.D.V.J. and Yaraguntaiah, R.C. (1979) A key of diagnosis of some chilli mosaic viruses. Mysore Journal of Agricultural Science 12: 442-445.

[4]. Anjaneyulu, A. and Apparao, A. (1967) Natural occurrence of cucumber mosaic virus on chilli in India. Indian Phytopathology 20 : 380-381.

[5]. Vijayabhanu, I. (1991) Characterization and identification of chilli (*Capsicum annuum* L.) mosaic viruses in Guntur. M.Sc. (Ag.) Thesis submitted to ANGR Agricultural. University, Rajendranagar, Hyderabad.

[6]. Jagadeeshwar (2004) Identification and management of naturally occurring viruses on chilli (*Capsicum annuum* L.) in Northern Telangana Zone of Andhra Pradesh.Ph.D Thesis submitted to the Acharya N.G. Ranga Agricultural University, Rajendranagar, Hyderabad.

[7]. Jagadeeshwar, R., Ravindrababu, R., Prasada Rao, R. D.V.J., Raja Ram Reddy, D. and Vijayalakshmi, K. (2005a) Identification of naturally occurring chilli mosaic virus in Northern Telangana zone of Andhra Pradesh. Indian Journal of Plant Protection 33: 235-240.

[8]. Musuna, A.C.Z. (1986) A method for monitoring whitefly, *Bemisia tabaci* (Genn.) in cotton in Zimbabwe. Agricultural Ecosystems and Environment 17: 29-35.

[9]. Martin, J.H. (1983) The identification of common aphid pests of tropical agriculture. Tropical Pest Management, 29: 395-411.

[10]. Narayan Rishi and Poonam Dhawan (1990) Characterization and identification of virus causing mosaic diseases of Capsicum in nature. Indian Phytopathology, 42(2): 221-226.

[11]. Agrios, G.N., Walker, M.E. and Ferro, D.N. (1985) Effect of cucumber mosaic virus inoculation at successive weekly intervals on growth and yield of pepper (*Capsicum annuum* L). Plant Disease 69: 52-55.

[12]. Mishra, A.K. and Singh, T.K.S. (1973) Pathology anatomy of virus infected chilli plants. Indian Phytopathology, 26: 111-114.