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Studies on host range of peanut stem necrosis virus infecting groundnut in Tamil Nadu

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Abstract

A new threat to peanut was first observed in Ananthapur district of Andhra Pradesh during 2000 in the form of a virus that causes Stem Necrosis disease. Characteristic symptoms were necrosis of the stem and terminal leaflets followed by death of the plant. The extract of virus samples collected from infected groundnut plants were sap inoculated on indicator plant, cowpea (Co-7) for multiplication and maintained at glass house condition. To know the host range of PSND, twenty weed and crop plants were sap inoculated with the virus. Among these *Vigna mungo*, *Vigna radiata*, *Gossypium sp*, *Macrotyloma uniflorum*, *Cucumis sativus*, *Capsicum annum*, *Solanum melangina*, *Amaranthus viridis*, *Trianthema portulacastrum* and *Euphorbia hirta* produced mostly necrotic local lesion. whereas *Sesamum indicum*, *Lablab purpureus*, *Crysanthymum indicum*, *Tagetes erecta* were not infected by the virus and exhibited no symptoms.

Keywords: Tobacco streak virus, groundnut, peanut stem necrosis disease, host range studies

Introduction

Peanut (*Arachis hypogaea* L.) is one of the important commercial crops of the world, and is a major source of protein and oil. Groundnut production in India was about 7180.5 thousand tonnes during 2015-16. as compared to 7401.7 thousand tonnes in 2014-15. The groundnut production in Tamil Nadu was reported as 894.9 thousand tonnes in 2015-16. It decreased by 31.5 thousand tonnes as compared to the groundnut production of 926.4 thousand tonnes in the year 2014-15. Reduction in yield is due to various diseases including those caused by viruses is a major production constraint in Peanut cultivation. Peanut stem necrosis disease (PSND), a new threat to peanut was first observed in the district of Anantapur during 2000. (Prasada Rao *et al.* 2003) [6]. Necrosis of the stem and terminal leaflets followed by complete death of the plant is the characteristic symptom of the disease. Invariably, PSND affected peanut plants died due to severe necrosis. (PBNV) affected plants seldom die due to the spread of terminal bud necrosis to other parts of the plant. Necrotic lesions observed on pods in the case of PSND were never recorded for plants affected by PBNV

Materials and Methods**Source of the virus**

The plant leaves showing typical symptoms were collected from Thoothukudi and Tirunelveli district (Fig-2). The collected plant samples were inoculated on cowpea variety Co-7 plants, which was used as indicator plant (Kannan, 2012) [4] for the entire study and plants were maintained under glass house condition for further studies.

Isolation of plant virus and multiplication

The virus sap was extracted from naturally infected leaves of groundnut samples collected from infected plants. The virus sap was inoculated on 6-7 day old cowpea plants using 0.1M of phosphate buffer (PH 7.0), containing 0.1% of mercaptoethanol. The symptoms were appeared after 3-4 days of inoculation. Then single lesion was transferred to new cowpea plants and maintained under glass house condition (Reddy *et al.* 2002) [7]

Symptomology

The primary necrotic lesions were observed on young leaves 3 to 4 days of inoculation. Then its spreads to upper part of the plant and kills the terminal buds systemically.

Host range studies

As the symptom is observed in oil seeds, pulses and weed crops, the present study was conducted to know the host range of the virus (Fig-1) Virus sap collected from cowpea local lesions were inoculated on different plants (Table 1) using 0.1 M sodium phosphate buffer, (pH-7) containing 0.1% mercaptoethonal, In order to facilitate the virus entry in leaves, celite or carborundum powder was rubbed on the leaves to make minute injuries on plant leaf surfaces, then the plants were kept under insect-proof screen house for observation. When the lesion was back inoculated on cowpea that produced same kind of symptom. (Ladhalakshmi *et al.* 2005) ^[5]

Results and Discussion

The plants such as (Table1) *Vigna mungo*, *Vigna radiata*, *Gossypium sp*, *Macrotyloma uniflorum*, *Cucumis sativus*, *Capsicum annum*, *Solanum melangina*, *Amaranthus viridis*, *Trianthema portulacastrum* and *Euphorbia hirta* produced mostly necrotic local lesions. Veinal necrosis was noticed both

in *Vigna mungo* and *Amaranthus viridis*. leaf distortion symptom was observed in *Vigna unguiculata* and *Helianthus annuus* whereas *Sesamum indicum*, *Lablab purpureus*, *Crysanthymum indicum*, *Tagetes erecta* were not infected by the virus and exhibited no symptoms. When the lesion was back inoculated on cowpea that produced same kind of symptoms it is concluded that above host plants were served as host crops for the peanut stem necrosis virus in the field.

Abtahi and Khodaimotagh (2009) ^[2] reported that Tobacco Streak Virus infecting crop, did not infect Cucurbitaceae family but in this study the peanut stem necrosis virus was found to infect *Cucumis sativus* and produced chlorotic spots. Cupertino *et al.* 1984 reported that TSV inoculated cowpea plants did not produce lesions but in this present study TSV inoculated cowpea plants produced necrotic local lesions. It is in contrast with the findings of Prasado Rao *et al.* (2003) ^[7] who reported that TSV did not produce any lesions on *Trianthema portulacastrum*.

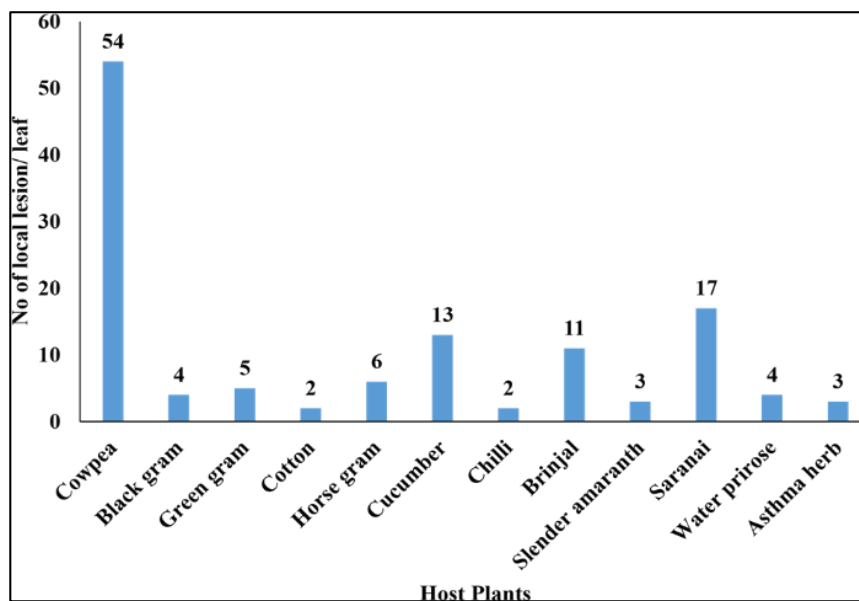


Fig 1: Response of different crop species to peanut stem necrosis virus



Fig 2: Symptom of groundnut plants



Vigna Ungiculate



Capsicum annum



Amaranthus viridis



Amaranthus viridis



Cucumis sativus



Vigna radiata



Trianthema Portulacastrum



Ludwigia peploides



Gossypium Sp



Vigna mungo



Solanum melangina

Table 1: Response of different crop species to peanut stem necrosis virus

S.no	Name of the host	Scientific name	No of lesions/plant	Days taken to express symptoms	Description of symptoms	
					Local	Systemic
1	Cowpea	<i>Vigna unguiculata</i>	55-56	3-4	NLL	LD
2	Blackgram	<i>Vigna mungo</i>	3-4	3-4	None	VN
3	Sesame	<i>Sesamum indicum</i>	-	-	None	-
4	Green gram	<i>Vigna radiata</i>	4-5	4-5	CLL	
5	Lab Lab	<i>Lablab purpureus</i>	-	-	None	-
6	Cotton	<i>Gossypium sp</i>	1-2	8-10	CLL	-
7	Horse gram	<i>Macrotyloma uniflorum</i>	3-9	2-3	NLL	-
8	Cucumber	<i>Cucumis sativus</i>	12-13	3-4	CLL	-
9	Chilli	<i>Capsicum annum</i>	1-2	3-4	NLL	SN
10	Sunflower	<i>Helianthus annuus</i>	-	4-5	None	M, LD
11	Brinjal	<i>Solanum melangina</i>	10-11	3-4	NLL	-
12	Crysanthemum	<i>Crysanthemum indicum</i>	-	-	None	None
13	Marigold	<i>Tagetes erecta</i>	-	-	None	-
14	Slender amaranth	<i>Amaranthus viridis</i>	2-3	-	None	VN
15	Kuppaimeni	<i>Acalypha indica</i>	-	-	None	-
16	Saranai	<i>Trianthema portulacastrum</i>	15-17	4-5	NLL	-
17	Water prirose	<i>Ludwigia peploides</i>	3-4	2-3	RLL	-
18	Asthma herb	<i>Euphorbia hirta</i>	2-3	4-5	NLL	

CLL - Chlorotic local lesions; M -Mosaic; NLL - Necrotic local lesions; RLL - Red bordered local lesions; SI - Symptomless infection; SN- Systemic necrosis; VN-Veinal necrosis. LD- Leaf distortion.

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