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Incidence of different groundnut (*Arachis hypogaea*) viruses in the plains of West Bengal

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Groundnut (*Arachis hypogaea* L.) is one of the most important crops in India and cultivation of groundnut in the plains of West Bengal is gradually increasing. In the state, groundnut is cultivated in *kharif, rabi* and *summer* seasons and many farmers has accepted it as an alternative crop in rainfed situation with poor soil fertility. One of the major constrains of groundnut crop it its susceptibility to number of diseases caused by fungi, bacteria and viruses. Research information on the major fungal diseases like 'Tikka' and their management practices is available to minimize the loss in production but till now no information by scientific documentation of any of the viral diseases are available from the state West Bengal. In this study, an attempt has been made to record the incidence of virus disease that were commonly affected in *kharif* and *rabi* season crop in different groundnut germplasms. The virus diseases identified based on their characteristic symptoms were, stripe virus, bud necrosis virus, chlorosis virus, stunt virus and mottle virus. Incidence of stripe and stunt virus were almost same in *kharif* and *rabi* season while with bud necrosis virus higher incidence was recorded in *kharif* season than *rabi* season. The disease incidence in field was more with the age of the crop, possibly due to high rate of spread by vectors or mechanical contamination between healthy and infected plants.

Key words : Groundnut, viruses, West Bengal

INTRODUCTION

Groundnut (*Arachis hypogaea* L.) cultivation in West Bengal in gradually increasing and the crop could be cultivated both as *pre-kharif* (December to March), *kharif* (May-June to September-October) and *rabi* (September to December) seasons. At present total area of groundnut in West Bengal is 34 thousand hectares with a total production of 45.70 thousand tonnes and still there is enough scope to further increase of area and productivity. The increase in area and year round cultivation of groundnue has simultaneously increased the chances of out break of various disease problems of which virus diseases are one of them. In India nine virus diseases have been recorded under natural condition and they are groundnut bud necrosis, groundnut stripe, groundnut mottle, groundnut mosic, groundnut clump, groundnut rosette, groundnut chlorosis, cowpea mild mottle, and groundnut stunt. (Yadav, 1987 ; Subrahmanyam *et al.*, 1992). Although various types of groundnut diseases caused by fungi and bacteria are of regular occurrence in West Bengal, but at present no information is available on the incidence of any virus diseases of groundnut. In this study an attempt has been made to record the incidence of virus diseases that were commonly affected *kharif* and *rabi* season crop in different groundnut germplasms identified based on the characteristic symptoms. Most prevalent groundnut virus diseases in West Bengal were stripe, bud necrosis, chlorosis, stunt and mottle.

MATERIALS AND METHODS

To record the incidence of groundnut virus diseases experimental field were selected at the Regional

Research Station (RRS), Gayespur, Bidhan Chandra Krishi Viswavidyalaya during *rabi* and *kharif* seasons of 2002-2003, and also in some farmer's field of Gontra village of Nadia District. The experiment was made in Randomised Complete Block Design with four replications. Required quantity of inorganic NPK fertilizer (20:40:40) were applied and sowing of seeds was done after making a furrow using a spine. Distance between row to row and plant to plant were 15 and 25 cm. respectively. To record the seasonal incidence of groundnut virus diseases variety JL-24 was used considering its popularity in this locality. Besides many more germplasms grown in the RRS were also taken into consideration to record the disease incidence. Incidence of groundnut virus diseases was recorded based on the visual symptoms as described in book "Field diagnosis of groundnut diseases" (Subrahmanayam *et al.* (1992), at different time interval. Observation to record the diseases incidence was started at 75,90,105 and 120 days after sowing. Number of individual infected plant were taken into consideration to estimate disease incidence and presented as percentage of incidence by using the following formula.

$$\text{Percentage of disease incidence} = \frac{\text{No. of infected plants}}{\text{Total no. of plants}} \times 100$$

RESULTS AND DISCUSSION

The most common groundnut viruses found in the field were Groundnut Strip Virus (GStV), Groundnut Bud Necrosis Virus (GBNV/TSWV), Groundnut Chlorosis Virus, Groundnut Stunt Virus (GSV). The results on the incidence of different groundnut viruses which commonly occur in West Bengal during two seasons are presented in Table 1. It appears from the results that incidence of different virus diseases differed with each other in respect to age of the plants. The average percentage of GStV infected plants during *kharif* seasons at 75, 90, 105 and 120 days after sowing were (DAS) 8.25, 15.54, 18.74 and 23.62 respectively while during *rabi* season the mean disease incidence on the respective days (DAS) were 8.50, 12.16, 16.04 and 23.37 percent. During *kharif* season a significant diffrence of disease incidence was observed between 75 and 90 DAS while in *rabi* season it was at 105 and 120 DAS.

The results showed that average rate of increase of disease was slightly more during *kharif* season than *rabi*. The GStV is transmitted by mechanically, seed and by aphid (Demki *et al.*, 1984 ; Camat, 1985; Fukumoto *et al.*, 1986 ; Demski and Lovell, 1985) and the present field trial have suggested that spread of disease under field condition occurred mainly due to the presence of insect vector particularly aphid.

Table 1 : Characteristics symptoms of groundnut virus diseases

Name of virus	Symptom	Mode of transmission
Groundnut stripe	Discontinuous chlorotic strips along the lateral veins of young quadrifoliate leaves.	Mechanical, seed, vector aphids (Demski *et al.*, 1984 ; Camat 1985; Demski and Reddy, 1988.
Groundnut bud necrosis	Chlorotic and necrotic spots on the leaves followed by bud necrosis.	Mechanical and by vector thrips. (Amin *et al.*, 1981 ; Reddy, 1991).
Groundnut chlorosis	Symptoms of chlorosis virus is similar to early symptoms of bud necrosis. The plant become dwarf with yellow leaves often red colour leaf margin.	Mechanical, seed and by Aphids. (Sharma, 1979).
Groundnut mottle	Irregular light green island on the leaves which show mild mottle symptom visible in transmitted light.	Mechanical, seed and by aphids (Kuhn, 1964; Harold and Munz, 1969 ; Kuhn and Demski, 1984)
Groundnut stunt	Reduction of plant size with chlorotic symptoms.	Mechanical, seed and by aphids (Kuhn and Demski, 1984; Reddy, 1988)

The results of GBNV incidence was more in *kharif* season that *rabi* season. In respect to plant age percentage of GBNV infection were 8.50, 13.00, 19.37 and 26.75 at 75, 90, 105 DAS, respectively during *kharif* season while in *rabi* season percentage of infected plants in rspect to DAS as mentioned earlier were 1.50, 4.50, 5.75 and 7.25. Incidence of GBNV was more in *kharif* than the

rabi crops but no significant difference was observed with the age of the plant except between the age of 75 and 120 DAS for both the seasons. GBNV is transmitted by mechanical and by thrips (Chuhan, 1972 and Ghanekar *et al.*, 1979). It appears from the results that the low incidence of disease during *rabi* season was probably due to low population of thrips. GBNV was previously considered as TSWV (Tomato Spotted Wilt Virus) having wide host range that includes large number of cultivated crops as well as weeds (Reddy, 1988). This study confirmed the persence of GBNV from West Bengal.

Incidence of Groundnut Chlorosis Virus (GCV) in *kharif* seasons was high in comparison to *rabi* season. The percentage of infected plants recorded in respect to 75, 90, 105 an 120 DAS were 8.37, 10.00, 23.04 and 30.70 during *kharif* season and in *rabi* season the respective percentage were 1.25, 2.00, 3.25 and 4.00 (Table 2a, b).

Two other diseases namely Groundnut Mottle and Stunt Virus were observed only in *kharif* season. Average number of infected plants of diferent days after sowing namely 75, 90, 105 and 120 were 5.87, 10.75, 13.78 and 18.24 and 4.79, 11.50, 15.00 and 16.50 respectively. The results obtained was statistically analysed and found a variation on the number of infected plants but they are not significantly different at all the stage of plant growth. Based on the symptomatology under field condition in West Bengal it is concluded that five groundnut viruses are present in all the seasons and they need confirmation by transmission study in detail for taking situable control measure.

Table 2a : Incidence of different virus diseases of groundnut under field condition at different days after sowing during *kharif* season of 2002.

Age of plant (days after sowing)	Percentage of disease Incidence of different virus disease				
	Stripe	Bud necrosis	Chlorosis	Stunt	Mottle
75	8.25	8.50	8.37	4.79	5.87
90	15.54	13.00	10.00	11.50	10.75
105	18.74	19.37	23.04	15.00	13.78
120	23.62	26.75	30.70	16.50	18.24
SEm(±)	2.74	3.69	1.88	1.38	3.87
CD(P=0.05)	5.94	8.02	4.10	3.03	8.40

Table 2b : Incidence of different virus diseases of groundnut under field condition at different days after sowing during *rabi* season of 2003.

Age of plant (days after sowing)	Percentage of disease			Incidence of different virus disease	
	Stripe	Bud necrosis	Chlorosis	Stunt	Mottle
75	8.50	1.50	1.25		
90	12.16	4.50	2.00		
105	16.04	5.75	3.25	Not	Not
120	23.37	7.25	4.00	found	found
SEm(±)	2.79	2.09	0.48		
CD(P=0.05)	6.05	4.55	1.15		

Table 3 : Field screening of groundnut germplasms against Strip Virus and Bud Necrosis Virus during *rabi* season under field condition at 60 and 80 days after sowing.

Germaplasm	Percentage of infection at two different stage of plant growth			
	Bud necrosis virus		Stripe virus	
	60	80	60	80
ICGV-95299	—	—	10.00	13.33
ICGV-95249	—	3.33	13.33	16.66
ICGV-95296	—	6.66	10.00	33.33
BARC 4-3	—	10.00	16.66	30.00
DH-8	—	3.33	10.00	20.00
DH-45	—	3.33	10.00	13.33
Gangapwari	—	3.33	10.00	16.66
Somnath	—	—	6.66	16.66
Smruti	—	—	13.33	16.66
OG-931	—	—	16.66	26.66
OG-938	—	10.00	16.66	20.00
OG-933	—	3.33	10.00	26.66
TG-3	—	—	10.00	30.00
AK 12-24	—	—	6.66	23.00
JL-24	—	—	10.00	26.66
SG-84	—	—	6.66	33.33
Kisan	—	3.33	10.00	30.00
Jawan	—	6.66	10.00	36.66
ICGS-37	—	3.33	6.66	20.00
VG-77	—	—	6.66	13.33
TAG-24	—	—	10.00	40.00
J-11	—	—	10.00	50.00
TMV-2	—	3.33	13.33	50.00
SB-11	—	3.33	10.00	40.00
KADIRI-2	—	—	6.66	20.00

Twenty five groundnut germplasms were screened at *rabi* season to record the groundnut viruses undr natural condition at 60 days and 80 days of plant age (Table 3). In the screening test the most prominent diseases like Bud Necrosis (BNV) and Strip virus (GStV) were taken into consideration. At 60 days of plant age none out of 25 germplasm

showed the infection of BNV but subsequently it appeared at the age of 80 days and the infection percentage varied from 3.33 to 10.00 percent. The germplasms BARC 4-3 and OG-938 showed highest infection of 10% while ICGV-95 296 and Jawan had 6.66 percent infection and few other germplasms like DH-8, DH-45, Gamgapwari, Kisan, ICGS-37, TMV-2, SB-11 had 3.33 percent infection.

Regarding GStV all of the tested germplasms recorded the incidence of disease and the percentage of infection increased over the time at 60 days of plant age maximm incidence upto 16.66 percent were observed in three germplasms and they were BARC 4-3, OG-931, OG-938. The remaining germplasms infection percentages were in the range from 6.66 to 13.33 but most of the germplasms had infection maximum upto 10 percent. At 80 days old plant highest infection of Stripe Virus was observed upto 50 percent in J-11, TMV-2 germplasms while a minimum infection upto 13.33 percent was recorded in ICGV-95299, DAH-45 and VG-77 germplasms. From the results its clear that out of the Viruses GStV is widely distributed in the plains of West Bengal.

REFERENCES

Amin, P. W. ; Reddy D. V. R. ; Ghanekar, A. M. and Reddy, M. S. (1981). Transmission of Tomato spotted wilt Virus, the casual agent of bud nercosis disease of groundnut by *Scirtothrips dorsalis and Franklinella schultzer. Plant Disease* **65** : 667-679.

Camat, M. (1985). Mode of transmission of the groundnut stripe virus : a new virus disease in the Philippines. *M. Sc, Theses, University of Philippines at Los Banos, College, Laguna, Philippines.*

Chouhan, J. S. (1972). Important diseases of groundnut in the Punjab. *Final Progress Report.* ICAR scheme, 1957-1967, pp. 117.

Demski, J. W. and Reddy, D. V. R. (1988). Groundnut stripe virus disease in the USA., *Proceeding of the first Meeting of Co-ordinated Research on Groundnut Strip Virus Disease of Groundnut,* 1987, pp. 10-11.

Demski, J. W. and Lovell, G. R. (1985). Groundnut stripe virus and the distribution of groundnut seed. *Plant Disease* **69** : 734-738.

Demski, J. W. ; Reddy, D. V. R. ; Sowell G. Jr. and Bays, D. (1984). Groundnut stripe virus — a new seed born-virus potyvirus from China infecting groundnut (*Arachis hypogaea* L.) *Ann. Appl. Biol.,* **105** : 495-501.

Fukumoto, F. ; Thongmeearkonm, P. ; Iwaki, M. ; Choopanya, D. ; Sarindu, N. ; Deema, N. ; Tsuchizaki, T. (1986). Groundnut chlorotic ring mottle virus occurring on groundnut inThailand. *Technical Bulletin, Trop Agri Res. Cen. Japan* **21** : 150-157.

Ghanekar, A. M. ; Reddy, D. V. R. ; Iizuka, N. ; Amin, P. W. and Gibbons, R. W. (1979). Bud necrosis of groundnut (*Arachishypogaea* L.) in India caused by tomato spotted with virus. *Ann. Appl. Biol.* **93** : 173-179.

Harold, F. and Munz, K. (1969). Groundnut mottle virus. *Phytopathology,* **59** : 663-666.

Kuhn, C. W. (1964). Mechanical transmission of virus causing leaf mottling of groundnuts. *Plant Disease Reporter,* **48** : 729-732.

Kuhn, C. W. and Demski, J. W. (1984). Groundnut mottle virus. In : *compendium of groundnut disease.* The American Phytopathological Society, St. Paul Mennesota, USA. pp. 45-46.

Reddy, D. V. R. (1991). Groundnut viruses and virus diseases : distribution, identification and control. *Rev Pl. Pathol.* **70** : 665-678.

Reddy, P. S. (1988). Groundnut virus diseases. Groundnut, *Publication on and information division ICAR, New Delhi,* 508-524.

Sharma, D. C. (1979). Studies on Virus diseases of groundnut (*Arachis hypagaea* L.) *Phytopathology* **55** : 127-136.

Subrahmanayam, P. ; Wongkkaw, S. ; Reddy, D. V. R. ; Demski, D. ; Donald, Mc. ; Sharma, S. B. and Smith, D. H. (1992). Field diagnosis of groundnut diseases. ICRTSAT, *Information Bulletin no.* 36.

Yadav, T. P. (1987). Groundnut Research in India. *Coordination of Grain Legumes Research in Asia,* pp. 49-51.

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