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Inoculum potential of *Cercospora arachidicola* and *Phaeoisariopsis personata* with infection by groundnut (*Arachis hypogaea* L.) viruses

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Number and size of lesions of *Cercospora arachidicola* produced on groundnut mottle virus (GMV) and groundnut stripe virus (GStV) infected seedlings were compared to those produced on GMV or GStV free leaves in three groundnut varieties (JL 24, AK 12 24 and local). Both number and size of lesions were more on GMV or GStV-free leaves. Sporulation as well as size and septation of tikka leaf spot pathogens were more abundant in lesions on GMV or GStV-free leaves which suggested reduction of inoculum potential as well as nutrients for growth and sporulation of leaf spot pathogens.

Key words : Peanut mottle virus, peanut stripe virus, interaction, *Arachis hypogaea*, tikka leaf spot

INTRODUCTION

Leaf spot of groundnut commonly known as 'Tikka' disease in India and groundnut mottle virus (GMV) and groundnut stripe virus (GStV) occurs worldwide resulting in severe economic losses (Rangaswami and Mahadevan, 2001; Demski and Lovell, 1985; Sanborn and Melouk, 1983). Multiple infections by two or more pathogens in field is a common phenomenon.

Virus infection may render a plant more susceptible to a fungal pathogen (Beaute, 1970 ; Stevens and Gudauskas, 1982 ; Stevens and Gudauskas, 1983 ; Tu and Ford, 1971), less susceptible to a fungal pathogen (Diaz-Polanco *et al.,* 1969 ; Hopen and DeZeeuw, 1962 and McIntyre and Dodds, 1979) or have no effect (Russell, 1966). A progressive decrease in susceptibility to stem rust of wheat (as evident by pustule size and spore yield) occurs with increasing concentration of virus (brome mosaic virus) in infected tissue (Erasmus and Von Wechmar, M.B., 1983). In contrast, *Helminthosporium maydis* Race O produces greater number of lesions and larger lesions on corn seedlings infected with maize dwarf mosaic virus (MDMV) than on virus free seedlings (Stevens and Gudauskas, 1982). Also, sporulation of *H. maydis* Race O starts sooner and is more abundant in lesions on MDMV-infected corn leaves (Stevens and Gudauskas, 1983). However, inoculation of PVY-infected tomato leaves with *Phytophthora infestans* leads to no reduction in disease severity indicating that the interaction is host specific (Kalra *et al.,* 1989).

Number of conidia produced per leaflet has been proposed as an important selection criterion (Gobina *et al.,* 1983) for evaluating germplasms for resistance to early leaf spot. Tikka leaf spot and groundnut viruses have often been found together under field conditions. Therefore, the present study has been undertaken to determine the effect of groudnut mottle virus (GMV) and groundnut stripe virus (GStV) on expression of disease based on number and size of lesions, conidial density and size and septation of conidia and conidiophore on some commonly grown groundnut varieties.

MATERIALS AND METHODS

Two weeks old seedlings of groundnut cv. JL 24, AK 12 24 and a local variety were mechanically inoculated with an isolate of GMV and GStV separately and placed in shade with insect proof condition for symptom development.

Four weeks later, four pots each with 3 GMV and GStV-infected plants and four pots with virus-free plants (JL 24, AK 12 24 and local) were inoculated by spraying them with spore suspension of

Cercospora arachidicola and *Phaeoisariopsis personata* (10^5 conidia/ml) in separate test plants. Plants were maintained under high humidity in a growth chamber maintained at 28°±1C during the day and 22°±1C at night with 14 hrs photoperiod.

Two months after inoculation, number and size of lesions, conidial density and size and septation of conidia and conidiophore of *C. arachidicola* and *P. personata* were determined. For counting sporulation, conidia were washed from surface of each leaflet with 2 ml of distilled water and numbers of conidia in suspensions were determined with haemacytometer. Length and breadth and numbers of septa of conidia and conidiophore were determined with a compound microscope fitted with an ocular micrometer.

RESULT AND DISCUSSION

Number and size of lesions produced by *C. arachidicola* was remarkably lower on both GMV and GStV-infected than on virus-free plants (JL 24, AK 12 24 and local) in all four experiments (Table 1). Sporulation of *C. arachidicola* was also remarkably lower on virus-infected than on virus-free plants (JL 24, AK 12 24) in all the five tests performed (Table 2).

Table 1 : Numbers and size of lesions on groundnut leaves inoculated with *Cercospora arachidicola* conidia infected by mottle (GMV) and stripe (GStV) virus

Variety	Inoculum source	Lesions	
		No./nine leaflets	Size (mm) of lesion
JL 24	GMV-infected leaves	23.2	4.2
	GStV-infected leaves	22.8	3.6
	Virus-free leaves	41.8	4.9
AK12 24	GMV-infected leaves	8	1.6
	GStV-infected leaves	8.6	1.8
	Virus-free leaves	13.4	3.2
Local	GMV-infected leaves	5.2	2.5
	GStV-infected leaves	4.6	3.0
	Virus-free leaves	7	4

Lesion number - Average of 20 experiments
Size of lesion - Average of 20 - 30 lesions

Conidia as well as conidiophore from lesions on GMV or GStV-infected leaves were shorter than those from lesions on virus-free leaves (Table 3). Numbers of septa were also reduced considerably. Generally the numbers of septa in both conidia and conidiophore increased with an increase in conidial and conidiophore length.

Table 2 : Sporulation of *C. arachidicola* in lesions on sections from GMV and GStV-infected and GMV and GStV-free groundnut leaves

Variety	Treatment	Sporulation rate (10^5/ml)/leaflet*
JL 24	GMV-infected	1.54
	GStV-infected	1.88
	Virus-free	3.10
AK 12 24	GMV-infected	0.68
	GStV-infected	0.66
	Virus-free	2.08

* Mean of 10 replications.

Table 3 : Size of conidia and conidiophore and range of septation on groundnut plant infected individually by *C.arachidicola* (C) and *P. personata* (P) and jointly by C + GStV and C + GMV or by P + GStV and P + GMV in variety JL-24 (60 days after inoculation)

Infection type	Average size(μ)*				Range of septation	
	Conidia		Conidiophore			
	Length	Breadth	Length	Breadth	Conidia	Conidiophore
C	69.64 (39-104)	5.39 (2.6-6.5)	49.33 (45-52)	5.5 (3-7)	1-11	3-11
C+GStV	59.80 (39-78)	3.22 (2.6-4.3)	44.53 (39-52)	6.5 (3-7)	1-3	1-4
C+GMV	49.23 (26-78)	3.71 (2.6-6.5)	42.25 (39-52)	4.6 (2.5-5)	1-4	1-3
P	38.22 (26-52)	6.5 (2.6-7.8)	52.43 (26-91)	6.16 (4-8)	1-6	1-4
P+GStV	35.36 (14.3-45.5)	4.16 (2.6-6.5)	35.55 (19.5-65)	4.55 (2.6-6.5)	1-3	1-3
P+GMV	28.78 (13-52)	3.34 (2.6-5.2)	40.82 (19.5-91)	5.39 (2.6-6.5)	1-4	1-2

* Mean of ten separate count
Figure in the parenthesis indicate range of length and breadth

Although an antagonistic interaction may occur between a virus and a fungus (Erasmus and Von Wechman, 1983), the influence on evaluating disease reaction has not been documented. An important parameter in evaluating peanut germplasm reaction to *C. arachidicola* or *P. personata* is the number of conidia produced per leaflet (Gobina *et al.*, 1983). Reaction of tikka leaf spot pathogens may be altered due to virus (GMV and GStV) infection and therefore, it is important to consider the presence of the virus where GMV and GStV is endemic when germplasm are being evaluated for leaf spot resistance.

The data presented in this paper clearly indicate that infection by GMV or GStV altered its reaction to both *C. arachidicola* and *P. personata* on susceptible host. High incidence of GMV or GStV-infected groundnut in field tests could be hazardous in selecting promising lines with resistance to leaf spot

pathogens. Therefore, it is necessary to obtain information on the effects of GMV and GStV on the outcome of resistant evaluations.

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