



Response of Groundnut (*Arachis hypogaea* L.) Varieties to Leaf Spot Diseases

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Abstract

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop of India. The early and late leaf spots are common and destructive diseases of groundnut which cause severe yield losses up to 59% and reduce the quality of the pod and fodder. Therefore, the present investigation was undertaken to know the response of groundnut varieties for their resistance levels against early and late leaf spot disease under pot condition during *kharif* 2020 and 2021 at ICAR – Directorate of Groundnut Research, Junagadh, Gujarat. Among the thirty varieties of groundnut, one variety (GPBD-5) showed resistant reaction and twenty two varieties showed moderate resistance against ELS disease. While against LLS, none of these varieties were found resistant.

Key words : *Cercospora*, groundnut, leaf spot, resistant, screening, susceptible.

Introduction

Groundnut (*Arachis hypogaea* L.) is an important oilseed crop of India, cultivated during *kharif* and *rabi*-summer. Presently, in India groundnut is grown in about 5-6 million hectares area and total production around 10 million tonnes during 2020-21 (Anon., 2021). Gujarat, Andhra Pradesh, Tamil Nadu, Karnataka, Rajasthan and Maharashtra are major groundnut growing states contributing about 80 percent area and production in India. Diseases and pests are the important elements affecting the groundnut productivity.

Among various diseases affecting groundnut, Early and late leaf spots [*Cercospora arachidicola* S. Hori and *Phaeoisariopsis personata* (Berk. & M.A. Curtis) Arx], rust (*Puccinia arachidis* Speg.), *Alternaria* leaf blight, *Alternaria tenuissima* (Kunze:Fr.) Wiltshire are major air-borne pathogens of groundnut and *Sclerotium* stem rot (*Sclerotium rolfsii* Sacc.), collar rot (*Aspergillus niger* Tiegh.), dry root rot or charcoal rot [*Macrophomina phaseolina* (Tassi) Goidanich], aflaroot (*A. flavus* Link:Fr.) are major soil-borne pathogens of groundnut (Kumar and Thirumalaisamy 2016).

Early leaf spot and late leaf spot disease commonly occurs in all the major groundnut growing states and yield losses range from 15 to 59%. Besides the losses in pod and kernel yield, the fodder quality is also adversely affected (Kumar and Thirumalaisamy 2016). Early leaf spot disease generally occurs 30 days after sowing. Initially minute circular to sub-circular chlorotic spots (1 to over 10 mm in diameter) develop on upper surface of leaf. Later these spots turn to brown in colour, surrounded by yellow halo. Severely infected leaves may drop off prematurely and lesion can extend to the stem and

branches. While in case of late leaf spot, disease generally occurs on 60 days old crop to till harvesting. Dark brown to black, circular to sub-circular lesions (1-6 mm diameter) appear on lower surface of the leaves where most sporulation occurs. Infected leaves may drop off prematurely.

Growing of resistant varieties is the most ideal and economical way of managing the disease which can be determined by different screening techniques. Therefore, the identification of the resistance source is a basic need in breeding for disease resistance. Hence, the present investigation was proposed to find out the resistant sources against leaf spot diseases of groundnut.

Materials and Methods

A total of thirty varieties of groundnut were screened under pot conditions during *kharif* 2020 and 2021 at ICAR – Directorate of Groundnut Research, Junagadh, Gujarat.

Sandy loam soil mixed with Farm Yard Manure (FYM) in 3:1 proportion was steam-sterilized at 1.2 kg/cm² pressure consequently for two hours two days and filled in the surface-sterilized earthen pots for the experimentation. The earthen pots of 30 cm diameter were washed thoroughly with tap water and disinfected with 4 per cent formaldehyde (Formalin 40%) solution for two minutes before use. Five seeds of respective varieties of groundnut were sown in the pot.

The severity of leaf spot was recorded on three compound leaves of the main stem chosen from bottom, middle and top position of five plants of each variety with the interval of 10 days after the initiation of disease by using the scale 1-9 (Subramanyam et al. 1995) (Table 1). Disease scoring was based on 1-9 scale visual score

Table-1 : Modified 9-point scale used for field-screening groundnut genotypes for resistance to late leaf spot.

Disease Score	Description	Disease severity (%)*
1	No disease	0
2	Lesions present largely on lower leaves; no defoliation	1-5
3	Lesions present largely on lower leaves, very few on middle leaves; defoliation of some leaflets evident on lower leaves	6-10
4	Lesions on lower and middle leaves but severe on lower leaves; defoliation of some leaflets evident on lower leaves	11-20
5	Lesions present on all lower and middle leaves; over 50% defoliation of lower leaves	21-30
6	Severe lesions on lower and middle leaves; lesions present but less severe on top leaves; extensive defoliation of lower leaves; defoliation of some leaflets evident on middle leaves	31-40
7	Lesions on all leaves but less severe on top leaves; defoliation of all lower and some middle leaves	41-60
8	Defoliation of all lower and middle leaves; severe lesions on top leaves; some defoliation of top leaves evident	61-80
9	Almost all leaves defoliated, leaving bare stems; some leaflets may remain, but show severe leaf spots	81-100

* Percentage leaf area damaged by the disease.

Table-2 : Reaction of different groundnut varieties to early leaf spot under pot condition.

Final Disease Reaction	No. of varieties	Varieties
R Scale(1-3)	1	GPBD-5
MR Scale (4, 5)	22	TAG-26, FDRS-4, ALR-2, GAUG-10, ALR-1, RHRG-6083, HNG-10, TAG-24, ICGV-00350, JL-776, GPBD-4, GJG-32, ICGV-86590, KDG-123, KDG-128, GG-20, HNG-69, GJG-17, FRDS-79, ALR-3, R-2001-2, VRI-6
S Scale (6, 7)	7	TG-37 A, FRDS-10, SG-99, JL-24, GIRNAR-2, GIRNAR-3, TMV-2
HS Scale (8, 9)	0	-

Table-3 : Reaction of different groundnut varieties to late leaf spot under pot condition.

Final Disease Reaction	No. of varieties	Varieties
R Scale(1-3)	0	-
MR Scale(4, 5)	0	-
S Scale(6, 7)	16	TG-37 A, FRDS-10, FRDS-4, ALR-1, RHRG-6083, HNG-10, GPBD-5, JL-776, GPBD-4, ICGV-86590, KDG-123, KDG-128, GIRNAR-2, FRDS-79, R-2001-2, VRI-6
HS Scale(8, 9)	14	TAG-26, ALR-2, GAUG-10, SG-99, TAG-24, ICGV-00350, JL-24, GJG-32, GG-20, HNG-69, GJG-17, ALR-3, GIRNAR-3, TMV-2

indicated as 1-3= resistance, 4-5= moderate resistance, 6-7= susceptible and 8-9= highly susceptible.

Results and Discussion

The varieties were grouped under different degrees of resistance based on per cent disease incidence. The result presented in Table 2 and 3 showed that there were considerable differences among the varieties for the level of resistance against early leaf spot disease during two years of experimentation.

Early leaf spot : Based on two years of data, the final disease reaction has been worked out. The final reaction indicated that only one variety GPBD-5 showed a resistant reaction while seven varieties viz., TG-37 A, FRDS-10, SG-99, JL-24, GIRNAR-2, GIRNAR-3 and TMV-2 showed a susceptible reaction. Remaining twenty-two varieties viz., TAG-26, FDRS-4, ALR-2, GAUG-10, ALR-1,

RHRG-6083, HNG-10, TAG-24, ICGV-00350, JL-776, GPBD-4, GJG-32, ICGV-86590, KDG-123, KDG-128, GG-20, HNG-69, GJG-17, FRDS-79, ALR-3, R-2001-2 and VRI-6 were moderately resistant to the disease compared to the susceptible check TMV-2 (Table 2).

Late leaf spot : Out of 30 varieties screened, none of the varieties were found resistant or moderately resistant against the disease. Sixteen varieties viz., TG-37 A, FRDS-10, FRDS-4, ALR-1, RHRG-6083, HNG-10, GPBD-5, JL-776, GPBD-4, ICGV-86590, KDG-123, KDG-128, GIRNAR-2, FRDS-79, R-2001-2 and VRI-6 were found susceptible whereas remaining varieties viz., TAG-26, ALR-2, GAUG-10, SG-99, TAG-24, ICGV-00350, JL-24, GJG-32, GG-20, HNG-69, TMV-2, GJG-17, ALR-3, GIRNAR-3 were highly susceptible to late leaf spot disease compared to the susceptible check TMV-2 (Table-3).

A similar type of results were reported by earlier workers viz., Pensuk *et al.* (2003), Hossain *et al.* (2007), Alidu *et al.* (2019), Pooniya *et al.* (2020) and Zanjare *et al.* (2020) against early and late leaf spot of groundnut. With these studies it can be concluded that, among the thirty groundnut varieties screened, only GPBD 5 variety was found resistant against early leaf spot disease. This detail can be useful to improve foliar fungal disease management in groundnut resistance breeding by using the identified variety as a donor.

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