

Original Research Article

<https://doi.org/10.20546/ijcmas.2018.710.411>

Morphological and Biochemical Variability in Greengram Genotypes with Reaction to Cercospora Leaf Spot Disease

B. Praveen*, M. Adinarayana, J. Krishna Prasadji and K. Jayalalitha

Department of Plant Pathology, Agricultural College, Bapatla-522101, ANGRAU,
Andhra Pradesh, India

*Corresponding author

ABSTRACT

Keywords

Greengram or Mungbean [*Vigna radiata* (L.) Wilczek], Biochemical variability

Article Info

Accepted:

24 September 2018

Available Online:

10 October 2018

The present in vitro experiment was conducted at Agricultural College, Bapatla, Guntur, Andhra Pradesh to evaluate the stomatal frequency, level of total sugars, total proteins and total phenols in resistant and susceptible greengram genotypes against *Cercospora* leaf spot disease. Number of stomata per mm² was found higher in susceptible genotypes (199.36 mm²) and lower in resistant genotypes (74.10 mm²) total phenols were found higher in resistant genotypes (0.99 mg/100mg) and lower in susceptible genotypes (0.54 mg/100mg) total proteins were found higher in resistant genotypes (1.99 mg/100mg) and lower in susceptible genotypes (1.54 mg/100mg). But, total sugars were found to be higher in susceptible genotypes (7.72 mg/100mg) and lower in resistant genotypes (5.49 mg/100mg)

Introduction

Greengram or Mungbean [*Vigna radiata* (L.) Wilczek], is an important leguminous crop of South and Southeast Asia. It is sown as a monocrop in different cropping systems due to its early maturity and association with nitrogen fixing bacteria (Chankaew *et al.*, 2011). Mungbean is a popular pulse crop because of its nutritive value which contains 21.1% protein and 67.5% carbohydrate (Adams, 1975). Greengram crop covers a total world area of 5 m ha with a total production of 3 mt (John, 1991). In India the total production of greengram is 14 lakh tonnes from an area of 34.4 lakh ha with a productivity of 406 kg ha⁻¹. In Andhra Pradesh

(A. P) it is grown in an area of 2.78 lakh ha producing 1.94 lakh t with a productivity of 696 kg/ha (Directorate of Economics & Statistics, Government of A. P, 2013).

The crop is of special significance in A. P as it fits well in rice–pulse cropping system as a relay crop particularly in Krishna–Godavari and North Coastal zones. It is also cultivated preceding crop to rice in Nagarjuna sagar project (NSP) right canal dryland areas and tank fed areas in Guntur and Prakasham districts.

Greengram suffers from many diseases caused by fungi, bacteria, viruses, nematodes and also abiotic stresses. Among the fungal diseases,

Cercospora leaf spot is of common occurrence throughout Asia. In India, leaf spot caused by *Cercospora canescens* Ellis & Martin was first reported from Delhi by (Munjali *et al.*, 1960) and is prevalent in all parts of the humid tropical areas of India (Pandey *et al.*, 2009). *Cercospora* leaf spot caused yield loss ranging from 50-70% has been observed in greengram (Lal *et al.*, 2001 and Chand *et al.*, 2012). In present experiment some genotypes were identified as resistant based on their biochemical defence which may be used as resistant varieties

Materials and Methods

After screening of greengram genotypes in the field level against *Cercospora* leaf spot disease some of the selected genotypes were sown in pots under natural conditions for estimating their stomatal frequency, total phenols, total sugars and total proteins. Greengram leaf samples of 45 days old healthy plants were collected for estimation of total sugars, total proteins and total phenols

Estimation of Stomatal frequency

The stomatal frequency was determined as per the procedure given by Varadarajan and Wilson (1973). Greengram leaf samples of 45 days old healthy plants were collected. Fully opened trifoliate leaves were selected and smeared with synthetic gum.

It was allowed to dry and the flakes were peeled off. The flakes were mounted on microscope glass slide. The microscopic field was fixed using ocular micrometer and number of stomata per mm² was counted using 40X objective lens.

Estimation of total phenols

The total phenols were determined by AOAC colorimetric method (Anonymous, 1965).

Protein estimation

Protein estimation was carried out according to the procedure described by the Lowry *et al.*, (1951).

Estimation of total sugars

Total sugars were estimated following anthrone method (Mahadevan and Sridhar, 1982).

Calculation

The total phenol, proteins and sugar contents were calculated with help of the standard curve and expressed as mg of phenol/ 100 mg tissue on fresh weight basis.

Results and Discussion

Stomatal frequency (number of stomata per mm²)

Stomatal frequency of 14 genotypes differed significantly and it was ranged from 74.10 to 199.36 mm². Among *Cercospora* resistant genotypes stomatal frequency was low in AKM 9910 (74.10) and high in COGG 912 mm² (86.56). In moderately resistant genotypes it was ranged from 97.18 (AKM 8802) to 104.30 mm² (GAYT 596) (Fig. 1).

In moderately susceptible genotypes it was ranged from 137.37 (COGG 973) to 149.90 mm² (KMP 42). Higher number of stomata were observed in susceptible genotypes and it was ranged from 182.83 (AKM 4) to 199.36 mm² (Kopergaon)

Phenols (mg/100mg)

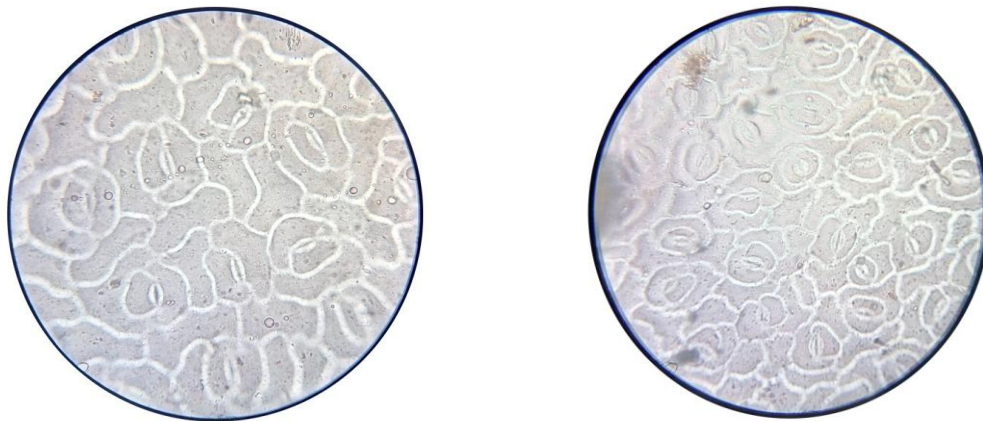
Phenols in greengram genotypes differed significantly and varied from 0.54 (Kopergaon) to 0.99 mg/100mg (GAYT 586 and AKM 9910).

Table.1 Morphological and biochemical variability in greengram genotypes with varying reaction to cercospora leaf spot infection

S. No	Genotype	Disease Reaction	Stomatal Frequency (mm ²)*	Phenols (mg/100mg)*	Total sugars (mg/100mg)*	Total Proteins (mg/100mg)*
1	GAYT 586	R	77.16	0.99	5.95	1.99
2	SATYA	R	82.25	0.97	5.60	1.98
3	AKM 9910	R	74.10	0.99	5.49	1.94
4	COGG 912	R	86.56	0.95	5.65	1.95
5	AKM 8802	MR	97.18	0.93	6.85	1.85
6	OUM11-5	MR	101.12	0.89	6.83	1.88
7	KMP 4	MR	112.94	0.91	6.38	1.90
8	GAYT 596	MR	104.30	0.89	6.45	1.86
9	MH 729A	MS	143.60	0.79	7.36	1.59
10	COGG 973	MS	137.37	0.78	7.23	1.55
11	KMP 42	MS	149.90	0.70	7.19	1.57
12	KMP 37	S	197.53	0.55	7.56	1.52
13	AKM 4	S	182.83	0.64	7.41	1.54
14	KOPERGAON	S	199.36	0.54	7.72	1.48
SEm±			4.04	0.02	0.11	0.06
CD (P ≤ 0.05)			12.25	0.07	0.36	0.18
CV (%)			12.12	11.86	6.68	12.94

*Mean of two replications

Fig.1 Stomatal frequency in resistant and susceptible genotypes



In *Cercospora* resistant genotypes it ranged from 0.95 (COGG 912) to 0.99 (GAYT 586 and AKM 9910) mg/100mg and in

moderately resistant genotypes it was ranged from 0.89 (GAYT 596) to 0.93 mg/100mg (AKM 8802). In moderately susceptible

genotypes it was ranged from 0.70 (KMP 42) to 0.79 mg/100mg (MH 729A). Low phenols were recorded in susceptible genotypes and it was ranged from 0.54 (Kopergaon) to 0.64 mg/100mg (AKM 4)

Total sugars (mg/100mg)

The total sugars in greengram genotypes differed significantly and varied from 5.49 (AKM 9910) to 7.72 mg/100mg (AKM 4). In *Cercospora* resistant genotypes it was ranged from 5.49 (AKM 9910) to 5.95 mg/100mg (GAYT 586). In moderately resistant genotypes it was ranged from 6.38 (KMP 4) to 6.85mg/100mg (AKM 8802).

In moderately susceptible genotypes it was ranged from 7.19 (KMP 42) to 7.36mg/100mg (MH729A) and high total sugars were recorded in susceptible genotypes which varied from 7.41 (AKM 4) to 7.72 mg/100mg (Kopergaon)

Total proteins (mg/100mg)

The total proteins in greengram genotypes differed significantly and varied from 1.54 (AKM 4) to 1.99 mg/100mg (GAYT 586). In *Cercospora* resistant genotypes it was ranged from 1.94 (AKM 9910) to 1.99 mg/100mg (GAYT 586).

In moderately resistant genotypes it was ranged from 1.85 (AKM 8802) to 1.90 mg/100mg (KMP 4). In moderately susceptible genotypes it was ranged from 1.55 (COGG 973) to 1.59 mg/100mg (MH729A) and low sugars were recorded in susceptible genotypes which varied from 1.48 (Kopergaon) to 1.54 mg/100mg (AKM 4)

References

Adams, C.F. 1975. Nutritive value of American food in common units.

Agriculture Hand Book. United States Department of Agriculture, USA. P. 456.

Association of Analytical Chemists (AOAC). 1965. *Official Methods of Analysis*. 10th ed. 139-140.

Chand, R., Singh, V., Pal, C., Kumar, P and Kumar, M. 2012. First report of a new pathogenic variant of *Cercospora canescens* on mungbean (*Vigna radiata*) from India. *New Disease Reports*. 26: 6.

Chankaew, S., Somta, P., Sorajjapinun, W and Srinives, P. 2011. Quantitative trait loci mapping of *Cercospora* leaf spot resistance in mungbean, *Vigna radiate* (L.) Wilczek. *Molecular Breeding*. 28: 255-264.

Directorate of Economics & Statistics Govt. of Andhra Pradesh. 2013. *Agriculture Statistics at a Glance* A. P. 38: 50.

John, M.P. 1991. *The Mungbean*, Oxford and IBH Publishing Co. Pvt. Ltd., p. 375.

Lal, G., Kim, D., Shanmugasundaram, S and Kalb, T. 2001. Mungbean production. AVRDC. World Vegetable Center. Tainan, Shanhua: *AVRDC-The World Vegetable Center*. 6.

Lowry, O.H., Rosebrough, N.J., Fan, A.L and Randall, R.J. 1951. Protein measurement with the folin-phenol reagent. *Journal of Biological Chemistry*. 193: 265-275.

Mahadevan, A and Sridhar, R. 1982. *Methods in Physiological Plant Pathology* 2nd Edition. Sivakami Publications. 157-159.

Munjal, R.L., Lall, G and Chona, B.L. 1960. Some *Cercospora* species from India-IV. *Indian Phytopathology*. 13: 144-149.

Pandey, S., Sharma, M., Kumari, S., Gaur, P.M., Chen, W., Kaur, L., Macleod, W., Basandrai, A.K., Basandrai, D., Bakar, A., Sandhu, J.S., Tripathi, H.S and Gowda, C.L.L. 2009. Integrated foliar diseases management of legumes.

Indian Society of Pulses Research and Development. Indian Institute of Pulses Research, Kanpur, India. 143-161.

Varadarajan, F and Wilson, K.J. 1973. A technique to spore germination studies on plant leaves. *Current Science*. 42: 70.

How to cite this article:

Praveen, B., M. Adinarayana, J. Krishna Prasadji and Jayalalitha, K. 2018. Morphological and Biochemical Variability in Greengram Genotypes with Reaction to Cercospora Leaf Spot Disease. *Int.J.Curr.Microbiol.App.Sci*. 7(10): 3549-3553.
doi: <https://doi.org/10.20546/ijcmas.2018.710.411>