

Original Research Article

<https://doi.org/10.20546/ijcmas.2020.909.262>

## Evaluation for Resistance of Cluster Bean Varieties against *Alternaria* Leaf Blight *in vivo*

Suresh Kumar\*, A.K. Meena, Mohit Kumar and Kavita Rani

Department of Plant Pathology, College of Agriculture, Swami Keshwanand Rajasthan  
Agricultural University, Bikaner (Rajasthan) 334 006, India

\*Corresponding author

### ABSTRACT

#### Keywords

Cluster bean,  
Varieties, *Alternaria*  
blight, *Alternaria*  
*cyamopsidis*

#### Article Info

Accepted:  
17 August 2020  
Available Online:  
10 September 2020

The sixteen varieties of cluster bean were screened against *Alternaria* blight of cluster bean caused by *Alternaria cucumeriana* var. *cyamopsidis* under field conditions at College Research Farm, College of Agriculture, Swami Keshwanand Rajasthan Agricultural University, Bikaner. Sixteen varieties screened against *Alternaria* blight under artificial inoculation conditions during Kharif 2016. Out of sixteen varieties of cluster bean, none was found highly resistant against *Alternaria* blight. Only one variety of RGC-986 was found resistant, whereas, five varieties viz., RGC-1003, HG-75, HGS-365, HGS-563, and GG-2 were found moderately resistant to *Alternaria* blight.

### Introduction

The cluster bean [*Cyamopsis tetragonoloba* (L.) Taub], bushy annual herb have a deep-rooted system, is a resilient and drought-resilient leguminous crop grown on sandy soils of arid and semi-arid regions Cluster bean is being grown in India since ancient time, Although believed to be of African origin (Vavilov, 1951). It was domesticated centuries ago in the north-western region of the Indo Pakistan sub-continent (Hymowitz, 1972). Cluster bean is a photosensitive crop and grown well in specific climatic conditions, which ensure a soil temperature

around 21–25 °C for proper germination (Hymowitz and Matlock, 1963). It can be grown on a variety of soil types from loamy to sandy. Cluster bean is grown in India, Pakistan, Indonesia, America, Italy, Mexico, Brazil, and South Africa. India is the leading country in the world concerning area and production of *guar*, where it occupies 55.8 lakh hectares with an annual production of 27.51 million tonnes of seed (Anonymous, 2015 –16). India produced 82 percent of total *guar* production in the world followed by Pakistan 15.6 percent and 2.4 percent USA, Brazil, and others. In India, this crop is mostly grown in the state of Rajasthan, Haryana,

Punjab, Uttar Pradesh, and Madhya Pradesh. Rajasthan occupies 47.8 lakh hectares area with a production of 22.23 million tonnes with a productivity of 465 kg ha<sup>-1</sup> (Anonymous, 2015–16). It has potential productivity of about 1500 kg ha<sup>-1</sup>. In Rajasthan, it is mainly grown in Barmer, Churu, Sriganganagar, Nagaur, Jalore, Sikar, Jaisalmer, Bikaner, Jaipur, Jhunjhunu, Hanumangarh, and Alwar districts.

The production and productivity of cluster bean in terms of grain and fodder is limited mostly due to the destructive fungal disease caused by *Alternaria cucumerina* var. *cyamopsidis*, it is a major foliar disease of cluster bean in northern India (Rangaswami and Rao, 1957). This disease alone has been reported to be responsible for a reduction in yield by 55.76 to 58.70 percent under artificial epiphytotic conditions (Gupta, 1994). The disease appears year after year in mild to severe form since the pathogen is seed-borne (Sowell, 1965). *Alternaria* blight is a major disease in North India. In the early stages of infection, the water-soaked spots appear on leaf blade which later turns grayish to dark brown with concentric zonations, demarcated with light brown lines inside the spot on the under surface. The time of appearance as well as the intensity of *Alternaria* blight varies from variety to variety, area to area, and one crop season to other. The information on various biochemical parameters imparting resistance to *Alternaria* blight will be helpful for the identification of resistant varieties based on biochemical attributes and these can be used as marker for screening of germplasm and other breeding material at the early stage for resistance to this disease. The knowledge of

sources of resistance and inheritance of resistance is must carry out a systemic breeding programme for incorporating effective resistance gene (s) in promising genotypes. During favorable weather conditions for disease development, a very meager work has been carried out on weather parameters, which are responsible for disease development. There is a positive correlation between weather parameters favorable for the progressive development of disease in the crop. Although the effective control of the disease can be only possible through management aspects, in which the basic disease control parameters are fungicidal and botanical preparation.

### Materials and Methods

This experiment, sixteen varieties, of cluster bean namely RGC-986, RGC-1003, HG-75, HGS-365, HGS-563, GG-2, RGC-1031, RGC-1002, RGC-1002, RGC-471, RGC-936, RGC-1017, RGC-1033, RGC-1038, RGC-1055, HGS-870, HG-2-20, RGC-936 collected from different sources were sown in *Kharif* 2016 (20<sup>th</sup> July). Artificial inoculation was made after 45 days of sowing. Each test cultivar was sown in two rows of 3 m length with a row to row spacing 30 cm and randomly sown one row of a known susceptible check (RGC-936). The recommended package of practices was followed to raise the normal crop. The observations on initiation and development of disease were recorded at 50 percent pod formation stage using 0-5 scale.

The disease index on foliage was calculated using the formula of McKinney (1923).

$$\text{Percent Disease Intensity} = \frac{\text{Sum of all numerical ratings}}{\text{Total number of leaves observed} \times \text{Maximum disease grade}} \times 100$$

## Results and Discussion

The varieties under the study were scored for their reaction to the disease on 0-5 scale and categorized as highly resistant (HR), resistant (R), moderately resistant (MR), moderately susceptible (MS), susceptible (S) and highly susceptible (HS). The maximum disease intensity was observed in RGC-936 (79.06%) followed by RGC-471 (69.30%) and RGC-1017 (66.20%). Similarly, the minimum disease intensity was recorded in RGC-986 (4.85%) and GG-2 (8.41%).

Out of sixteen varieties, none was found free from *Alternaria* blight disease. However, one variety RGC-986 was found resistant (R). The five varieties viz., RGC-1003, HG-75, HGS-365, HGS-563, GG-2 were assessed as moderately resistant (MR). The one variety RGC-1031 was categorized as moderately susceptible (MS) and another one variety RGC-1002 was categorized as susceptible (S). Rest of eight varieties viz., RGC-471, RGC-936, RGC-1017, RGC-1033, RGC-1038, RGC-1055, HGS-870, and HG-2-20 were grouped under highly susceptible (HS) category against *Alternaria* blight of cluster bean.

Similarly, trends were also found by Saharan

and Saharan (2003). They observed that out of 186 varieties/genotypes tested under artificial inoculation conditions during *Kharif* 1997, none was found free from *Alternaria* blight. However, only five varieties viz., CAZG-9007, GAUG-9008, GAUG-9406, GAUG-9407, and RGC-1014 were found resistant to *Alternaria* blight of cluster bean. Among the rest of the genotypes, 73, 86, and 19 were accessed as moderately resistant (MR), under moderately susceptible (MS) and susceptible (S), respectively. The same categorized pattern was also used during *Kharif* 1998 in 83 cluster bean genotypes under artificial inoculation conditions. The results of the present studies are also in agreement with the findings of Shivanna and Shetty (1991) and Meena *et al.*, (2010). Therefore, these lines can be used in future studies against *Alternaria* blight of cluster bean.

It is concluded that out of sixteen varieties of cluster bean screened during *Kharif* 2016, none was found highly resistant against *Alternaria* blight. Only one variety RGC-986 was found resistant, whereas, five varieties viz., RGC-1003, HG-75, HGS-365, HGS-563, and GG-2 were found moderately resistant to *Alternaria* blight.

**Table.1** Rating scale for *Alternaria* leaf blight of cluster bean

| Rating Scale | Disease Reaction                   | Per cent Disease Intensity | Description                   |
|--------------|------------------------------------|----------------------------|-------------------------------|
| 0            | Near immune/ Resistant reaction(I) | 0                          | No symptoms                   |
| 1            | Resistant (R)                      | 1-10                       | 1 - 10 % leaf area infected   |
| 2            | Moderately Resistant (MR)          | 11-25                      | 11 – 25 % leaf area infected  |
| 3            | Moderately Susceptible (MS)        | 26-50                      | 26 - 50 % leaf area infected  |
| 4            | Susceptible (S)                    | 51-75                      | 51 – 75 % leaf area infected  |
| 5            | Highly Susceptible (HS)            | 76-100                     | 76 % above leaf area Infected |

**Table.2** Reaction of cluster bean varieties to *Alternaria cucumerina* var. *cyamopsidis* under artificial *in vivo*

| Variety  | Disease Intensity (%) | Disease reaction |
|----------|-----------------------|------------------|
| RGC-1003 | 8.85                  | MR               |
| RGC-1033 | 63.97                 | HS               |
| RGC-1002 | 41.73                 | S                |
| RGC-1017 | 66.20                 | HS               |
| RGC-1055 | 62.18                 | HS               |
| RGC-1031 | 24.42                 | MS               |
| HG-75    | 9.74                  | MR               |
| GG-2     | 8.41                  | MR               |
| HG-365   | 9.30                  | MR               |
| HG-870   | 60.41                 | HS               |
| RGC-1038 | 56.41                 | HS               |
| HG-563   | 9.30                  | MR               |
| HG-2-20  | 63.93                 | HS               |
| RGC-986  | 4.85                  | R                |
| RGC-471  | 69.30                 | HS               |
| RGC-936  | 79.06                 | HS               |

**Table.3** Categorization of cluster bean varieties against *Alternaria* blight

| Varieties  | Host reaction               |
|--|-----------------------------|
| RGC-986 (1)  | Resistant (R)               |
| RGC-1003, HG-75, HGS-365, HGS-563, GG-2 (5)                                    | Moderately Resistant (MR)   |
| RGC-1031 (1)   | Moderately Susceptible (MS) |
| RGC-1002 (1)   | Susceptible (S)             |
| RGC-471, RGC-936, RGC-1017, RGC-1033, RGC-1038, RGC-1055, HGS-870, HG-2-20 (8) | Highly Susceptible (HS)     |

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**How to cite this article:**

Suresh Kumar, A.K. Meena, Mohit Kumar and Kavita Rani. 2020. Evaluation for Resistance of Cluster Bean Varieties against *Alternaria* Leaf Blight *in vivo*. *Int.J.Curr.Microbiol.App.Sci.* 9(09): 2107-2111. doi: <https://doi.org/10.20546/ijcmas.2020.909.262>