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## Screening of germplasms/varieties against anthracnose disease of green gram in field condition

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### Abstract

Green gram also known as moong bean or mung bean (*Vigna radiata* L.) is autogamous diploid grain legume crop belonging to *Leguminosae* family. Anthracnose of green gram disease is caused by *Colletotrichum lindemuthianum* (Sacc. & Magn.) Brisi and Cavara is a severe disease in almost all green gram growing areas of country. Aims of this study is for the necessity for emphasizes the screening of various germplasms/varieties against anthracnose caused by *Colletotrichum lindemuthianum* under natural field conditions and to identify the resistant genotypes or germplasms against the anthracnose disease which having importance in future breeding programme for developing resistant variety. Field experiment was conducted during *kharif* 2024 to identify the resistant genotypes or germplasms against the anthracnose disease. Twenty one green gram germplasms/varieties procured from Pulse Research Station, S. D. Agricultural University, Sardarkrushinagar were assessed against anthracnose disease under field/natural conditions. Each test entry were sown with two rows of 4 m length and the susceptible check (GM 4) was sown after every five test entries. For recording the intensity of anthracnose at weekly interval, ten plants from each entry were randomly selected and labelled from the disease appearance up to physiological maturity of crop. Observations of percent disease intensity in each entry was recorded on ten randomly selected plants by using standard scale i.e. 0 to 9 given by AICRP. One germplasm viz., SKNM 2306 was recorded minimum percent disease intensity (06.66%) which regarded as resistant. Whereas, three germplasms/varieties viz., SKNM 2304 (12.22%), SKNM 2305 (15.55%) and SKNM 2308 (14.44%) were found moderately resistant. Seven germplasms/varieties viz., SKNM 2301 (38.88%), SKNM 2302 (33.33%), SKNM 2307 (34.44%), SKNM 2309 (28.88%), SKNM 2316 (34.44%), GM 3 (21.11%) and GM 5 (36.66%) were found to be moderately susceptible while nine germplasms/varieties viz., SKNM 2303 (47.77%), SKNM 2310 (55.55%), SKNM 2311 (50.00%), SKNM 2312 (47.77%), SKNM 2314 (53.33%), SKNM 2315 (43.33%), GM 6 (54.44%), GM 7 (48.88%) and GM 9 (43.33%) were found to be susceptible and one germplasm viz., SKNM 2313 was observed maximum percent disease intensity (64.44%) which regarded as highly susceptible to anthracnose disease.

**Keywords:** Green gram, anthracnose, screening, *Colletotrichum lindemuthianum*

### Introduction

Green gram also known as moong bean or mung bean (*Vigna radiata* L.) is one of the important pulse crop of India which ranked third most popular pulse crop after chickpea and pigeonpea. It is autogamous diploid ( $2n = 22$ ) grain legume crop belonging to *Leguminosae* family. This crop is most commonly known as mung, mungbean, green gram in India whereas, mungo in Philippines. It is an erect, sub-erect, deep rooted, much branched, somewhat hairy, herb with the height from 30 to 160 cm. It is an ancient and well-known leguminous crop of Asia and India. It is relatively multipurpose crop grown for seeds, forage and green manure. Generally, pulse crop stand rich source of protein (20 to 25%) with 30-150 kg/ha capability to fix atmospheric nitrogen and employment to small and marginal farmers with regular source of income therefore hold a premier position in the world agriculture (Ali & Gupta, 2012) [1]. This crop is mostly cultivated all over the South and South East Asia including India, Pakistan, Sri Lanka, Myanmar, Thailand, Philippines, Laos, Cambodia, Vietnam, Indonesia, Malaysia, South China and Taiwan. In the USA, it was grown as early as 1835 as the Chickasaw pea. It is also grown to a lesser extent in many parts of Africa, USA and introduced in many parts of Australia. However, it did not become a major commercial crop in these countries.

India is the principal producer of green gram in the world with an annual production of 3.17 million tonnes from an area of 5.5 million hectares with productivity of 570 kg/ha. (Anonymous, 2022a) [2]. The green gram alone accounts for 10 percent of production and 16 percent of the area for all pulses. Rajasthan, Gujarat, Haryana, Punjab, Maharashtra, Madhya Pradesh, Uttar Pradesh, Bihar, Karnataka, Andhra Pradesh, and Tamil Nadu are the major green gram growing states of India. Green gram total area in Gujarat is 1690.29 ha, productivity 1368.88 MT and yield is 809.85 kg/ha (Anonymous, 2022b) [3]. Green gram contains carbohydrate (55-65%) and also rich in vitamins, protein and minerals. About 20-50 percent protein of dry weight composed, among which 60 percent globulin and 25 percent albumin which are the primary storage proteins (Kudre *et al.*, 2013) [5]. The crop suffers from many fungal, bacterial and viral diseases like anthracnose, bacterial leaf blight, yellow mosaic, cercospora leaf spot, powdery mildew, and rust disease. Among all fungal diseases, anthracnose caused by *Colletotrichum* spp. is a vulnerable disease in almost all green gram growing areas of the countries. In past few years, green gram crop suffered with anthracnose caused by *Colletotrichum lindemuthianum* (Sacc. & Magn.) Briosi and Cavara has become one of the solemn disease of green gram. The green gram anthracnose disease was first reported in India from Jorhat of Assam state during 1951 (Majid, 1953) [7]. Anthracnose of green gram was noticed 40.18 percent seed yield loss and 46.90 percent stalk yield loss (Kulkarni, 2009) [6]. This study highlights the necessity for emphasizes the screening of various germplasms/varieties against this pathogen and identify the resistant genotypes or germplasms against the anthracnose disease which having importance in future breeding programme for developing resistant variety.

## Materials and Methods

In the study, twenty one green gram germplasms/varieties were obtained from Pulse Research Station, SDAU, Sardarkrushinagar, Dist: Banaskantha, North Gujarat, India. Twenty-one green gram germplasms/varieties viz., SKNM 2301, SKNM 2302, SKNM 2303, SKNM 2304, SKNM 2305, SKNM 2306, SKNM 2307, SKNM 2308, SKNM 2309, SKNM 2310, SKNM 2311, SKNM 2312, SKNM 2313, SKNM 2314, SKNM 2315, SKNM 2316, GM 3, GM5, GM 6, GM 7 and GM 9 along with (susceptible check GM 4) were screened against anthracnose disease under natural/field conditions. Field experiment was conducted during *khari* 2024 in Agronomy farm, Chimanbhai Patel College of Agriculture, S. D. Agricultural University, Sardarkrushinagar, Gujarat, India. Two rows of each test entry were sown with 4 m length and the susceptible check (GM 4) was sown after every five test entries. Spacing of the crop plant is 45 cm x 10 cm. All agronomical recommendation was followed for good growth of the crop plant. For recording the intensity of anthracnose at weekly interval, ten plants from each entry were randomly selected and labelled from the disease appearance up to physiological maturity of crop. Observations of percent disease intensity in each entry was recorded on ten randomly selected plants by using standard scale i.e. 0 to 9 as given by AICRP under Table 1 (Anonymous, 2024) [4]. The disease intensity was recorded by observing on every basal, middle and upper portion of three trifoliate leaves from the randomly selected plants.

**Table 1:** Disease rating scale for green gram anthracnose

| Scale | Description                                  |
|-------|--|
| 0     | No visible symptoms.                         |
| 1     | 0.1-10.0 % leaf area covered with symptoms.  |
| 3     | 10.1-20.0 % leaf area covered with symptoms. |
| 5     | 20.1-30.0 % leaf area covered with symptoms. |
| 7     | 30.1-50.0 % leaf area covered with symptoms. |
| 9     | > 50 % leaf area covered with symptoms.      |

Following formula was used for the calculation of the percent disease intensity (Wheeler, 1969) [10].

$$\text{PDI} = \frac{\text{Sum of individual numerical disease ratings}}{\text{Total no. of leaves examined} \times \text{Maximum disease scale}} \times 100$$

The final observations on disease intensity were considered to categorize the germplasms/varieties into different reactions as in Table 2 (Anonymous, 2024) [4].

**Table 2:** Percent disease intensity and categorize the germplasms/varieties into different reactions against anthracnose disease

| PDI       | Reaction                    |
|-----------|-----------------------------|
| 0.1-10.0  | Resistant (R)               |
| 10.1-20.0 | Moderately Resistant (MR)   |
| 20.1-30.0 | Moderately Susceptible (MS) |
| 30.1-50.0 | Susceptible (S)             |
| >50       | Highly Susceptible (HS)     |

## Results

Use of resistant varieties is the best, simplest and economically reliable method in plant disease management. So far used of disease resistant varieties does not disturb natural eco-system and that avoids hazards of environmental pollution as well as it stabilizes the yield. The identification of source of resistance is a basic requirement and genetic resistance is the most efficient, economical and environment friendly approach against anthracnose of green gram. So here Twenty-one green gram germplasms/varieties viz., SKNM 2301, SKNM 2302, SKNM 2303, SKNM 2304, SKNM 2305, SKNM 2306, SKNM 2307, SKNM 2308, SKNM 2309, SKNM 2310, SKNM 2311, SKNM 2312, SKNM 2313, SKNM 2314, SKNM 2315, SKNM 2316, GM 3, GM5, GM 6, GM 7 and GM 9 along with (susceptible check GM 4) were evaluated against anthracnose disease under natural condition/field conditions. Out of twenty one (21) germplasms/varieties screened under natural conditions, lowest percent of disease intensity was recorded in one germplasm viz., SKNM 2306 (06.66%) regarded as resistant. Whereas, three germplasms/varieties viz., SKNM 2304 (12.22%), SKNM 2305 (15.55%) and SKNM 2308 (14.44%) were found moderately resistant. Seven germplasms/varieties viz., SKNM 2301 (38.88%), SKNM 2302 (33.33%), SKNM 2307 (34.44%), SKNM 2309 (28.88%), SKNM 2316 (34.44%), GM 3 (21.11%) and GM 5 (36.66%) were found to be moderately susceptible while nine germplasms/varieties viz., SKNM 2303 (47.77%), SKNM 2310 (55.55%), SKNM 2311 (50.00%), SKNM 2312 (47.77%), SKNM 2314 (53.33%), SKNM 2315 (43.33%), GM 6 (54.44%), GM 7 (48.88%) and GM 9 (43.33%) were found to be susceptible and one germplasm viz., SKNM 2313 (64.44%) was found to be highly susceptible to anthracnose disease of green gram.



### Discussion

These results are in harmony with earlier workers reported most effective. Raja Sekhar & Chand (2001) <sup>[9]</sup> screened forty six green gram genotypes against anthracnose disease and they reported thirty-five genotypes possessed resistance.

Purushotham *et al.* (2024) <sup>[8]</sup> reported four germplasms of green gram as a resistant reaction to anthracnose whereas, two germplasms were moderately resistant and two were susceptible reaction and no one was classified as highly susceptible reaction to anthracnose disease.



**Plate 1:** Field reaction of different green gram germplasms/varieties against anthracnose



## Conclusion

Among the twenty-one germplasms/varieties of green gram were screened against anthracnose disease under natural field conditions revealed that one germplasm viz., SKNM 2306 showed resistant reaction, while three germplasms viz., SKNM 2304, SKNM 2305 and SKNM 2308 were moderately resistant, while seven germplasms/varieties viz., SKNM 2301, SKNM 2302, SKNM 2307, SKNM 2309, SKNM 2316, GM 3 and GM 5 were moderately susceptible, while nine germplasms/varieties viz., SKNM 2303, SKNM 2310, SKNM 2311, SKNM 2312, SKNM 2314, SKNM 2315, GM 6, GM 7 and GM 9 were found susceptible and one germplasm viz., SKNM 2313 was found highly susceptible to anthracnose disease. On the basis of experiment result, concluded that screening of various germplasms/varieties against anthracnose pathogen of green gram and identify the resistant genotypes or germplasms against the anthracnose disease which having importance in future used for breeding programme for developing resistant variety of green gram.

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