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# Field reaction of Cowpea Genotypes against *Rhizoctonia Solani* Kuhn Inciting Web Blight Disease

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**ABSTRACT**
*Twelve cowpea genotypes were evaluated for their reaction to web blight caused by Rhizoctonia solani Kuhn under natural field conditions at Agriculture Research Station (ARS) Beechwal, College of Agriculture, SKRAU Bikaner. The disease was higher during rainy season due to a high level of humidity. The disease severity scores, according to a 1–9 scale and categorized as immune, resistant (R), moderately resistant (MR), moderately susceptible (MS), susceptible (S) and highly susceptible (HS). Among 12 genotype screened, two genotype DC 7-15 and CPD 229 was free from web blight incidence. One genotype DCS 47-1 showed highly resistant reaction and two genotype TC 161 and VCP 12-007 showed resistant reaction. Two genotype CPD 240 and RC-101 were found moderately resistant. One genotype GC 1304 was highly susceptible to web blight. Four genotype GC 3, GC 1203, KBC 10 and VCP 09-019 showed susceptible reaction.*
***Key words:*** *Web Blight, cowpea genotypes, Rhizoctonia Solani*

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## INTRODUCTION

In Indian agriculture, pulses play an important role in maintaining soil fertility, and supplying protein to the large vegetarian population of the country as a leguminous crop. The cowpea [*Vigna unguiculata* (L.) Walp.] is an annual herbaceous legume from the genus Vigna and it is a native of Africa and widely growing in tropical and subtropical regions of Africa, Asia, and Central and South America. It is a most versatile pulse crop because of its smothering nature, drought tolerant characters, soil restoring properties and multi-purpose uses, it fixes about 70 – 240 kg per ha of nitrogen per year and supplying protein to the large vegetarian population of the country. Considering the nutritional, agronomical and industrial value of pulses and yield of legumes the present study is aimed to study the soil borne fungal pathogens of important legume crops of Rajasthan namely cowpea [*Vigna unguiculata* (L.) Walp.]. Commonly known as 'lobia or chawla' is the most important legume grown in Rajasthan and grown over 66.3 thousand ha of land with a production nearly 30.6 thousand tonnes and the productivity is 463 kg per ha [1]. Cowpea is attacked by atleast 35 diseases; the occurrence and severity of these individual diseases vary from place to place and the stage of plant growth. Diseases hampers crop establishment, impair forage quality and reduces green fodder and seed yield. Cowpeas are especially susceptible to seedling diseases caused by *R. solani* when planted in moist soils coupled with high temperature and humid conditions [14]. Collar rot and web blight caused by *Rhizoctonia solani* Kuhn are the soil borne disease of cowpea [*Vigna unguiculata* L. Walp], particularly under high temperature and humidity causing severe yield loss [7]. The pathogen being soil borne, the infection can take place through rain splashed mycelium in spattering rain thus increasing the disease during monsoon season [15]. *R. solani* has prolonged saprophytic survival ability and a wide host range, the management of the disease is very difficult. So, resistance is fundamental attributes of all living systems. Host plant resistance (HPR) is the most efficient and ecofriendly means of management. For exploitation of HPR, reliable field and environmental screening techniques are essential. Therefore, the present investigation was undertaken with an objective to identify the sources of resistance in different genotypes/varieties of cowpea against web blight.

**Geographical distribution**: Web blight is one of the major constraints in the production of many pulses in warm humid tropic zones of the world. Lakshmanan *et al.* [7] reported cowpea web blight and collar rot for the first time from India as *R. microsclerotia* (synonym, *R. solani*), and the perfect state, *Thanatephorus cucumeris*, is as the causal agent of collar rot and web blight of cowpea (*Vigna unguiculata*). The disease has been known to occur in India on other leguminous crops like black gram [10], Soybean [16], Groundnut [4], ricebean [5] and mungbean [11]. Sivakumar *et al.* [13] reported that collar rot and web blight of cowpea caused by *Rhizoctonia solani* Kuhn is the most serious soil borne disease in Kerala and favorable environmental conditions like high temperature and humidity cause severe yield loss.

Kuhn (1858) observed the pathogen on diseased potato tubers and named it as *Rhizoctonia solani* kuhn. Genus Rhizoctonia has gained the reputation of being a wide spread, destructive and versatile plant pathogen. It occurs in all part of world and is probably indigenous to uncultivated area. The anamarph; *Rhizoctonia solani* belongs to the phylum Ascomycota form class Deuteromycetes and order Agonomycetales [1]. The colonies of *R. solani* are yellowish white to light yellowish brown and letter becoming pale brown to dark brown in colour. The rapidly growing mycelium; hyaline when young but later turning brown. Sclerotia are white but later turning chestnut brown, globose to sub globose, oval or cushion shaped, often less than 1 mm in diameter to thin crusts several centimetres across. This ubiquitous fungus is highly virulent in cowpea causing stand loss and subsequent yield loss. Collar rot is most severe at seedling stage and web blight is severe at vegetative stage. As it has wide host range, it is difficult to develop disease resistance. The collar rot is characterized by oval or spindle shaped brown-black lesions having length ranging from 0.2-8 cm at soil level near collar region, girdling the basal portion of the stem. The leaves turn yellow followed by shedding of leaves and finally the entire plant wilts. In affected plants root development is poor. White mycelial growth often studded with small sclerotia was seen on basal part of the affected stem [12].

## MATERIAL AND METHODS

### Cowpea genotype and field establishment:

Twelve cowpea genotypes were obtained from the Agriculture Research Station (ARS) Beechwal, Bikaner. The experiment was carried out under field conditions at Agriculture Research Station (ARS) Beechwal, Bikaner College of Agriculture, SKRAU Bikaner. Land was prepared by ploughing and harrowing. Planting took place in the late July seasons of *Kharif* 2016. Experiment were arranged according to a randomized block design (RBD) with three replications. Plant spacing within rows was 30 cm and row to row distance 60 cm was maintained. Seeds were planted at two per hill and thinned to one plant per stand two weeks after planting (WAP). Weed control was done manually at 2 and 6 WAP.

### Pathogenicity Test:

The pathogenicity of the fungus tested in pot by soil infestation method. Mass culture of the fungus is prepared on sand maize media. In each 500 ml Erlenmeyer conical flask 200 ml of sand maize (2:1) media is poured and sterilized at 121° C for 30 minutes. Each flask is inoculated and incubated at 28 ±2°C for one-week shaking them once in every 24 hours. The contents of this flask are used for soil infestation by mixing with the autoclaved soil. Infested soil is filled in 20 cm diameter pots and ten apparently healthy seeds of RC-101 cultivar of cowpea are planted in each pots. For control sterilized non-inoculated sand maize media is mixed in sterilized soil. The web blight symptoms developed in seedlings were recorded periodically. After 30 days of sowing young plants showed visible small water soaked brown lesions which enlarge rapidly in size and girdled the entire base of young stem at the collar region. With the advancement of disease 75 per cent plant topples down and dried. Re-isolation of the pathogen was made from infested seedlings and Koch's postulates were proven.

### Disease severity:

Severity of web blight was recorded from the first day the disease was noticed. Plants were assessed using a visual score of 1–9 and categorized as free from disease, resistant (R), moderately resistant (MR), moderately susceptible (MS), susceptible (S) and highly susceptible (HS).

### Disease Assessment Key

The web blight disease severity is recorded using 1-9 rating scale basis [3]. The details of rating scale is as follows:

**Table 1. Scale for grading of web blight disease in cowpea**

| Grade | Discription | Disease reaction |
|---|---|---|
| 1 | 0% infected plant parts | Immune |
| 2 | 0.1-5% infected plant parts | Highly resistant (HR) |
| 3 | 6-10% infected plant parts | Resistant (R) |
| 4-5 | 11-20% infected plant parts | Moderately resistant (MR) |
| 6-7 | 21-50% infected plant parts | Susceptible (S) |
| 8-9 | 50% infected plant parts | Highly Susceptible (HS) |

Disease incidence was calculated on the basis of percent of infected stems for collar rot and percentage of disease index (PDI) of web blight was calculated as follows:

$$\text{Per cent disease incidence} = \frac{\text{Number of infected plants}}{\text{Total number of plants observed}} \text{X } 100$$

Similarly, to calculate the per cent disease intensity following arbitrary disease rating scale and formula was used:

$$\text{Per cent disease intensity} = \frac{\text{Sum of all ratings}}{\text{Maximum rating x Total number of plants observed}} \times 100$$

**RESULTS AND DISCUSSION**

The study showed that disease incidence recorded in individual cowpea genotype in response to *R. solani* was variable. Hence, the twelve cowpea genotype were categorized based on per cent disease incidence in six disease reaction groups. During field screening, out of twelve genotypes, two genotype *viz*., DC 7-15 and CPD 229 was free from web blight incidence. There was no incidence of web blight throughout growing period. One genotype DCS 47-1 (2.5%) showed less web blight incidence and showed highly disease resistant reaction and two genotype TC 161 (7.5%) and VCP 12-007 (10.0%) were found resistant. Genotype CPD 240 (12.5%) and RC-101 were found moderately resistant, while four genotype GC 3, GC 1203, VCP 09-019 and KBC 10 showed 22.50-31.25 per cent disease incidence and showed susceptible reaction. Web blight incidence was highest in GC 1304 (75.0%) and it showed highly susceptible reaction. Severity of web blight incidence was found out by length and breadth of lesions. Similar cowpea varietal screening against collar rot and web blight has also been reported in by Nassir and Oshunlaja [8], Sivakumar and Celine [12]. Varietal screening has also been reported against urdbean web blight by [9].

**Table 2: Evaluation of cowpea genotype/varieties against *R. solani* under field conditions**

| S.No. | Cowpea Genotype | Disease incidence (%) | Disease reaction |
|---|---|---|---|
| 1 | DC 7-15 | 0.00 | F |
| 2 | CPD 240 | 12.50 | MR |
| 3 | TC 161 | 7.50 | R |
| 4 | RC 101 | 15.00 | MR |
| 5 | VCP 12- 007 | 10.00 | R |
| 6 | GC 1304 | 75.00 | HS |
| 7 | CPD 229 | 0.00 | F |
| 8 | DCS 47 -1 | 2.50 | HR |
| 9 | GC 3 | 22.50 | S |
| 10 | GC 1203 | 27.50 | S |
| 11 | KBC 10 | 31.25 | S |
| 12 | VCP 09-019 | 30.00 | S |

immune, resistant (R), moderately resistant (MR), moderately susceptible (MS), susceptible (S) and highly susceptible (HS).

* F= Free, MR= moderately resistant, R= resistant, HS=highly susceptible HS., HR=highly resistant

**REFERENCES**

1. Alexopoulus, C.J., Mims, C.W. and Blackwell, M. (1996).Introductory Mycology, Wiley Eastern, New Delhi, p 869.
2. Anonymous, Agriculture Statistics: (2016).Directorate of Agriculture. Government of Rajasthan, Jaipur.
3. Anonymous, Annual report 2016-2017. (2015).ANIP on Arid Legumes, ICAR-IIPR, Kanpur.

4. Dwivedi, R.P. and Dubey, S.C. (1986). Web blight of groundnut caused by Thanatephorus cucumeris. Farm Sci. J. 1 (1-2): 33-37.
5. Jalali, B.L. (1989).Observation on Rhizoctonia leaf blight of ricebean from H.A.U., Hisar. Consolidated Report on Kharif Pulses 1988-1989, pp. 144-145.
6. Kuhn, J.G. (1858). Die Krankheiten der kulturegewachse, ihre ur sachen und ihre verhutung. Gustav Bosselmann, Berlin: 312.
7. Lakshmanan, P., Nair, M.C. and Menon, M.R. (1979).Collar rot and web blight of cowpea caused by Rhizoctonia solani in Kerala, India. Pl. Dis. Reptr, 63: 410-413 .
8. Nassir, A.L., and Oshunlaja, S.O., (2003). Field reaction of some cowpea varieties to Rhizoctonia solani induced foliar blight in the early and late seasons in Nigeria. African Plant Protection 9(2): 109–113.
9. Neelam, Kushwaha K.P.S. and Upadhyay V. (2014). Screening of urdbean germplasm for resistance against Rhizoctonia solani Kühn Causing web blight disease. Int. J. Agri. Environ. Biotech. 7(2): 293-298.
10. Sharma, J. and Tripathi, H.S. Host range of Rhizoctonia solani Kuhn, the causal agent of web blight of urdbean [vigna mungo (L.) Hepper]. J. Mycol. Pl. Pathol. 31 (1):81-82 (2001).
11. Singh, J., Mishra, K.K and Singh A.K. (2013). Current status of web blight of mungbean. Asian J. Soil Sci., 8(2): 495-504 .
12. Sivakumar, V. and Celine, V.A. (2014). Screening of vegetable cowpea (Vigna Unguiculata L. Walp) germplasms for collar rot and web blight. Bioinfolet 11 (2 A): 418 – 420.
13. Sivakumar, V., Celine, V.A., and Girija, V.K., (2014). Collar rot and web blight caused by Rhizoctonia solani Kuhn in vegetable cowpea (Vigna unguiculata (L) Walp.) and its organic management. Agrotechnol, 2:4.
14. Thies, J.A., Berland, P.A. and Fery, R.L. (2006). Hort. Science. 40: 876.
15. Upmanyu, S. and Gupta, S.K. (2005). Indian Phytopath. 58: 79-83.
16. Verma, H.S. and Thapliyal, P.N. (1976).Rhizoctonia aerial blight of soybean. Indian Phytopath. 29: 389-391.

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