



E-ISSN: 2278-4136

P-ISSN: 2349-8234

www.phytojournal.com

JPP 2020; 9(4): 1501-1504

Received: 07-04-2020

Accepted: 12-05-2020

B SahanaDepartment of Plant Pathology,
College of Horticulture,
Bengaluru, Karnataka, India**TB Manjunatha Reddy**Department of Plant Pathology,
College of Horticulture, Kolar,
Karnataka, India**B Anjaneya Reddy**Horticultural Research and
Extension Centre, Hogalagere,
Kolar, Karnataka, India**SK Mushrif**Department of Plant Pathology,
College of Horticulture, Kolar,
Karnataka, India**B Doddabasappa**Department of Entomology,
College of Horticulture, Kolar,
Karnataka, India**H Amarananjundeswara**Horticultural Research and
Extension Centre, Somanhalli
Kaval, Hassan, Karnataka,
India**Corresponding Author:****TB Manjunatha Reddy**Department of Plant Pathology,
College of Horticulture, Kolar,
Karnataka, India

Screening of capsicum varieties/hybrids against stem rot (*Sclerotium rolfsii* Sacc.) under poly house condition

B Sahana, TB Manjunatha Reddy, B Anjaneya Reddy, SK Mushrif, B Doddabasappa and H Amarananjundeswara

Abstract

An experiment was carried out to screen resistance of capsicum against *S. rolfsii*. Fourteen capsicum varieties/ hybrids were collected from different sources and were evaluated at College of Horticulture, Bengaluru, Karnataka during *kharif* 2018 to identify sources of genetic resistance against stem rot disease. The pathogen was isolated from diseased capsicum plants collected during survey at seedling and vegetative stage of the crop, purified and maintained on PDA for further screening process. Mass culture of the pathogen was prepared on sorghum grains media and inoculated at collar region of capsicum plant, at 30 days after transplanting in the earthen pots. Out of fourteen capsicum varieties/ hybrids *viz.*, Red Inspiration and Delisha exhibited immunity against stem rot, whereas Pusa Deepti, Solon Hybrid- 2 and Nemlite expressed resistance, Green Pasarella and NS-280 moderately resistance, Green Massilia, Yellow Bachata, NS-292, NS-281, Apoorva and Asha were found to be susceptible. Hybrid Indra was highly susceptible to stem rot of capsicum.

Keywords: Screening, stem rot, *Sclerotium rolfsii*, capsicum, poly house

Introduction

Capsicum (*Capsicum annuum* var. *Grossum* Sendt.) is a member of solanaceous family mainly grown as vegetable throughout world including India. It is known by other names such as Shimla mirch, green pepper, bell pepper *etc.* India contributes one fourth of world production of capsicum with average annual production of 288 thousand MT from area of 46 thousand hectares with the productivity of 80-100 tonnes per hectare. In India, capsicum is extensively cultivated in Andhra Pradesh, Karnataka, Maharashtra, Himachal Pradesh, Tamil Nadu and hilly areas of Uttar Pradesh. Himachal Pradesh shares 19.90 per cent of total production with a production of 57.41 thousand tones whereas Karnataka stands second with share of 19.66 per cent, with a production of about 56.70 thousand tonnes (APEDA, 2017-18).

The crop is prone to several diseases *viz.*, anthracnose, cercospora leaf spot, charcoal rot, damping off, root rot, downy mildew, fusarium wilt, powdery mildew, stem rot and verticillium wilt *etc.* Among these stem rot caused by a soil borne pathogen *Sclerotium rolfsii* Sacc. is the emerging disease, causing major crop loss.

The significant problems caused by soil borne pathogens in crop production worldwide include reduced crop performance, decreased yield and higher production costs. The threats of soil borne disease epidemics in crop production, high cost of chemical fungicides and development of fungicide resistance, climate change, new disease outbreaks and increasing concerns regarding environmental as well as soil health are becoming increasingly evident.

Considering the soil borne nature of the pathogen, crop rotation is one among the effective management practices. However, the farmers in Karnataka rarely go for crop rotation as the cultivation of capsicum in poly house has become popular very recently because the crop is not only being protected from major pests and diseases but also fetches good yield. However, in India, the information on resistance source against stem rot disease of capsicum is scanty (Chowdary *et al.* 2000; Singh, *et al.* 2007; Rather *et al.* 2012) [4, 10, 7]. These necessitate the search for exploring the availability of resistant varieties/ hybrids as a disease management strategy for stem rot of capsicum. This article summarizes screening of capsicum varieties/hybrids resistant to stem rot disease caused by *Sclerotium rolfsii* Sacc. under poly house condition.

Material and Methods

An experiment was carried out to screen varieties/hybrids of capsicum against *S. rolfsii*. Fourteen different varieties/hybrids were selected from different sources based on generally

cultivated by the farmers (Table. 1) for screening against the stem rot disease under poly house condition (Plate. 1). The experiment was laid out in Completely Randomized Design (CRD) with five replications in College of Horticulture, Bengaluru, Karnataka during *khariif* 2018 which comes under Eastern dry zone of Karnataka.

Table 1: The varieties/hybrids used for screening against stem rot

Sl. No.	Varieties/ hybrids	Source
01	Red Inspiration	Rijk Zwaan India Seeds Pvt. Ltd.
02	Yellow Bachata	Rijk Zwaan India Seeds Pvt. Ltd.
03	Green Pasarella	Rijk Zwaan India Seeds Pvt. Ltd.
04	Green Massilia	Rijk Zwaan India Seeds Pvt. Ltd.
05	NS-280	Namdhari Seeds Pvt. Ltd.
06	NS-281	Namdhari Seeds Pvt. Ltd.
07	NS-292	Namdhari Seeds Pvt. Ltd.
08	Indra	Syngenta India Ltd.
09	Asha	H M Clause India Pvt. Ltd.
10	Nemlite	Enza Zaden
11	Delisha	Sakata Seeds
12	Apoorva	UHS, Bagalkot
13	Pusa Deepti	IARI- New Delhi
14	Solan Hybrid-2	IARI- New Delhi

Table 2: Disease reaction based on PDI

Sl. no.	Per cent disease incidence (PDI)	Category
1	0 per cent (no disease)	Immune (I)
2	Up to 1 per cent	Highly Resistant (HR)
3	2-10 per cent	Resistant (R)
4	11-20 per cent	Moderately Resistant (MR)
5	21-50 per cent	Susceptible (S)
6	>50 per cent	Highly Susceptible (HS)

Isolation and purification of the pathogen

Capsicum plants depicting typical symptoms of stem rot were collected from capsicum growing fields of Kolar district. The affected collar regions were cut into small pieces and were used for the isolation of the pathogen. The isolation was done according to tissue segment methodology (Rangaswami, 1958) [6]. The culture of *S. rolfisii* was purified by hyphal tip technique (Riker and Riker, 1936) [8]. The identification was done through colony colour, morphology of the pathogen. The pure culture of the pathogen was maintained on Potato Dextrose Agar (PDA) slants at 27±1 °C.

Pot experiment

Seeds collected from different sources were surface sterilized before sowing. Such surface sterilized seeds were sown in protrays containing moist coco peat and allowed the seeds to germinate. Thirty days old seedlings were transplanted to the pots containing sterilized soil. Required nutrients to the plants were provided by mixing the N: P: K at 10kg + 5kg + 10kg and mixed well in the soil. For each replication, ten plants were maintained in the pots individually. The capsicum plants were inoculated with mass multiplied culture of the pathogen by stem inoculation 30 days after transplanting. Five ml of inoculum was added at the collar region of the plant. Prior to this an artificial injury was made at collar region of the plant

with a sterile needle and then inoculum was added and moist cotton was placed at point of injury after inoculation.

The observations on total numbers of plants inoculated and infected plants were recorded at flowering and fruit harvesting stage. The per cent disease incidence (PDI) was calculated by using the following formula:

$$\text{Disease incidence (\%)} = \frac{\text{No. of infected plants}}{\text{Total no. of plants inoculated}} \times 100$$

Grouping of disease reaction was made based on their PDI as suggested by Nagaraja and Reddy (2009) [5] as shown in table 2.

Results and Discussion

The results revealed that initially, the early symptoms like drooping of plant, leaf withering, were expressed in hybrid Indra seven days after inoculation (Table 3; Plate 3). Later, other important symptoms like yellowing of leaves, stem rotting and fan like white mycelial mat on collar and stem region were observed.

At flowering stage, no disease incidence was observed in Red Inspiration, Nemlite and Delisha among the different varieties/hybrids screened against stem rot disease, followed by Pusa Deepti (10.00 %), Solon Hybrid-2 (10.00 %) and Asha (10.00 %) at flowering stage. The varieties Green Massilia, Green Pasarella, Yellow Bachata, NS-280 and Apoorva showed 20.00 per cent disease incidence whereas NS-292 and NS-281 showed 30.00 per cent of disease incidence. However, the hybrid Indra showed maximum disease incidence of 50.00 per cent.

At harvesting stage, the varieties Red Inspiration and Delisha showed immune response with 00.00 per cent disease incidence followed by Pusa Deepti, Solon Hybrid- 2 and Nemlite with 10.00 per cent of disease incidence. NS-280 and Green Pasarella showed 20.00 per cent of disease incidence. Varieties NS-292 and NS-281 showed 30.00 per cent of disease incidence followed by Green Massilia, Yellow Bachata and Apoorva with 40.00 per cent disease incidence. However, the hybrid Indra showed highest disease incidence of 70.00 per cent and considered as highly susceptible.

Antoine *et al.* (2016) [3] in their studies on screening of seven capsicum varieties against rot disease caused by *S. rolfisii* in semi-controlled conditions and open field at Abidjan, Côte d'Ivoire, observed that variety Nickly, was immune with severity of 0.00 per cent, followed by the varieties Tiela, Super and Demon which moderately resistant. The variety Yolo Wonder was observed to be highly susceptible.

Anahosur (2001) [1] screened potato varieties against *S. rolfisii* in sick plot. The studies revealed that, none of the varieties showed immune or highly resistance reaction against the sclerotium wilt. Among twenty varieties, nine varieties were highly susceptible and eleven showed moderate resistant reaction. Similarly Salvi *et al.* (2018) [9] conducted an experiment on screening of cultivars of pigeon pea against *S. rolfisii* and results revealed that five varieties *viz.*, BDN-711, TAT-10, ICPL-87119, T-Vishakha and UPAS-120 were found disease free from *S. rolfisii*.

Table 3: Screening of capsicum varieties/ hybrids against stem rot (*S. rolfisii*) under poly house conditions during *khariif* 2018

Sl. No.	Variety / Hybrid	Per cent disease incidence (PDI)				
		Wilted plants at flowering	Wilted plants at Harvesting	Total plants Infected	Disease incidence (%)	Reaction
1	Green Massilia	2	4	4	40	S
2	Pusa Deepti	1	1	1	10	R

3	Solon Hybrid- 2	1	1	1	10	R
4	Red Inspiration	0	0	0	0	I
5	Green Pasarella	2	2	2	20	MR
6	Yellow Bachata	2	4	4	40	S
7	Ns-292	3	3	3	30	S
8	Ns-280	2	2	2	20	MR
9	Ns-281	3	3	3	30	S
10	Apoorva	2	4	4	40	S
11	Nemlite	0	1	1	10	R
12	Delisha	0	0	0	0	I
13	Asha	1	3	3	30	S
14	Indra	5	7	7	70	HS

Reaction: 0 per cent (no disease)- Immune (I), Up to 1 per cent- Highly Resistant (HR), 2-10 per cent- Resistant (R), 11-20 per cent- Moderately Resistant (MR), 21-50 per cent- Susceptible (S), more than 50 per cent- Highly Susceptible (HS).



Plate 1: Experimental set up for screening of varieties/hybrids under polyhouse conditions

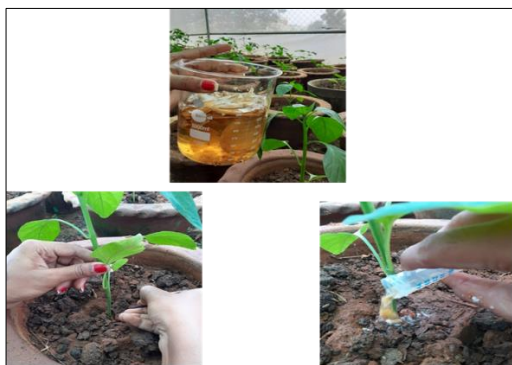


Plate 2: Artificial inoculation by stem injury



3(a)

3(b)

Plate 3a: Primary symptoms expressed by the plant, drooping and leaf withering

Plate 3b: Fan like white mycelial mat on collar and stem region

Conclusion

Soil borne diseases are among the most destructive elements in crop production. Most of the vegetable crops being perishable are extremely susceptible to wide range of pathogens that either reduces the yield or marketability. The culmination of many chemicals in a phased manner and increasing awareness towards resistance development, environmental health and climate change necessitates the search for alternative suitable management options. So non chemical option such as screening of resistant varieties / hybrids may prove cheap method among all other integrated disease management practices. The stem rot disease of capsicum, a soil borne disease is difficult to manage using chemicals. Therefore, exploring the resistant resource is the good option. In this direction, the experiment was conducted to screen 14 varieties/hybrids against this disease. Among the fourteen varieties/ hybrids screened, highest susceptibility to the stem rot was observed in Hybrid Indra which can be concluded as highly susceptible to the disease. Whereas, least per cent disease was observed in variety Red Inspiration and Delisha can be considered as immune to stem rot disease.

References

1. Anahosur KH. Integrated management of potato sclerotium wilt caused by *Sclerotium rolfsii* (Sacc.) Indian Phytopathology. 2001; 54(2):158-166.
2. APEDA. Annual report, 2017-18, 48.
3. Antoine BB, Kouabenan A, Gaston KK, Daouda K. Evaluation of resistance of seven pepper varieties to sclerotinia caused by *Sclerotium rolfsii* in the locality of Songon -Te, in the South of Cote d'Ivoire. International Journal of Agriculture Innovations and Research. 2016; 4(4):703-707.
4. Chowdary KA, Reddy DR, Rao KC, Reddy TB, Reddy Ip. Integrated management of sclerotial wilt disease of bell pepper (*Capsicum annum* L.). Indian Journal of Plant Protection. 2000; 28:15-18.
5. Nagaraja A, Reddy BA. Foot rot of finger millet- an increasing disease problem in Karnataka. Crop Research. 2009; 38(1, 2 & 3):224-225.
6. Rangaswami G. An agar block technique for isolating soil microorganisms with special reference to *Pythiaceus fungi*. Science and Culture. 1958; 24:85.
7. Rather TR, Razdan VK, Tewari AK, Shanaz, Efath, Bhat ZA *et al*. Integrated management of wilt complex disease in bell pepper. Journal of Agricultural Science. 2012; 4:141-147.
8. Riker AJ, Riker RS. Introduction to research on plant diseases. John Swift Co., St. Louis, Chicago, 1936, 117.
9. Salvi PP, Pande VS, Pawar SV, Joshi PV. *In vitro* evaluation of phytoextracts and screening of different

- cultivars of pigeon pea against collar and root rot disease caused by *Sclerotium rolfsii* Sacc. International Journal of Chemical Studies. 2018; 6(1):735-737.
10. Singh, Sheo Raj, Prajapati RK, Srivastava SSL, Pandey RK, Pandey PK. Evaluation of different botanicals and non target pesticides against *Sclerotium rolfsii* causing collar rot of lentil. Indian Phytopathology. 2007; 60:499-501.