Plant Archives Vol. 16 No. 1, 2016 pp. 164-166 *ISSN 0972-5210*

CROSS INFECTIVITY OF *SCLEROTIUM ROLFSII* ISOLATES ON FINGER MILLET

T. G. Manu*, A. Nagaraja, T. Satheesh Naik[1] and R. Murali[2]

Department of Plant Pathology, University of Agricultural Sciences, G.K.V.K., Bangalore - 560 065 (Karnataka), India
[1]Department of Plant Pathology, A. R. S., Gulberga, UAS, Raichur – 584 101 (Karnataka), India.
[2]Department of Plant Pathology, U.A.H.S., Shimogga - 577 201 (Karnataka), India.

Abstract

Finger millet [*Eleusine coracana* (L.) Gaertn.] is one of the important millet crops of India, commonly referred to as Ragi, Bird's foot, Nagli, Mandua in different regions of the country. Although, ragi is known to be one of the hardiest crops, relatively free from pests and diseases, it is attacked by many diseases. Among these diseases, foot rot caused by *Sclerotium rolfsii* is one of the important emerging diseases of ragi and is on the increase in the recent past particularly under irrigated and high rainfall situations. So, the experiment were conducted to know the cross infectivity of *Sclerotium rolfsii* isolates against the foot rot susceptible finger millet cultivar GN 4. The results revealed that all the isolates were infective to finger millet (table 1). At 15 days after transplanting, all the isolates except SrHO and SrDS shows more than 50% of infection and at the end of 60 days, the isolates Mandya ragi (96.66%); Mandya wheat and Hiriyur tomato (90.00%); isolates were showed highly virulent against finger millet as these isolates infected more than 50% of the plants. The other two *viz*., Dharwad soybean (5.00%) and Hiriyur onion (3.33%) isolates showed less virulent reaction as these isolates infected <5.00% of plants after 60 days after transplanting. Further, these two isolates did not show any infection on finger millet up to 45 days.

Key words : *Sclerotium rolfsii*, cross infectivity, finger millet, soil fertilization, pathogenic variability.

Introduction

Finger millet [*Eleusine coracana* (L.) Gaertn.] is one of the important millet crops of India, commonly referred to as Ragi, Bird's foot, Nagli, Mandua in different regions of the country. It is grown throughout the country extending from Tamil Nadu in the South to Uttarakhand in the North. This crop occupies more than 1.0 m. ha area in Karnataka and Karnataka alone contributes more than 60 per cent of its total production in the country. Finger millet is used as a staple food by many farming communities in south India because of its high nutritive value and is much recommended for diabetic patients. Although, ragi is known to be one of the hardiest crops, relatively free from pests and diseases, it is attacked by many diseases. Among these diseases, foot rot caused by *Sclerotium rolfsii* is one of the important emerging diseases of ragi and is on the increase in the recent past particularly under irrigated and high rainfall situations (Nagaraja and Reddy, 2009). The disease has been reported to cause more than 50 per cent yield loss (Batsa and Tamang, 1983).

Sclerotium rolfsii Sacc. is a well known and most destructive soil borne fungus. The *Sclerotium rolfsii* is widely distributed and causes severe damage to more than 500 crops (Aycock, 1966). *Sclerotium rolfsii* Sacc. is predominantly distributed throughout tropical and subtropical regions where, the temperature reaches higher levels during the rainy season.

Sclerotium rolfsii can infect more than 500 crops, but the severity of the disease varies with the crops and location. However, there are several reports where various isolates of *Sclerotium rolfsii* have showed significant variations not only in their morphology, but also in their pathological behavior (Harlton *et al*., 1995; Sarma *et al*., 2002 and Rekha and Pandey, 2008). Therefore, present investigation was carried out to study the pathogenic variability of different isolates of *Sclerotium rolfsii* collected from different hosts and geographic locations from Karnataka on finger millet.

Author for correspondence : E-mail : manutg.agri@gmail.com

Materials and Methods

Sclerotium rolfsii infected specimens were collected from 12 different crops and regions. The host species were ragi from Bangalore, Mandya and Tumkur; chickpea from Bangalore and Hiriyur; groundnut from Bangalore; tomato, onion and Cyperus from Hiriyur; wheat from Mandya; soybean and field bean from Dharwad. From these specimens causal organism was isolated by following standard tissue isolation method.

Soil sterilization

For testing the cross infectivity the soil was sterilized by using formaldehyde by following procedure.

A raised soil beds were watered up to saturation level of soil and left undisturbed for two days. After two days the soil was moistened by 4% formaldehyde solution (40 ml formaldehyde per liter of water) up to saturation level then covered by polythene sheet and kept undisturbed for five days. Polythene sheet was removed after five days and soil was exposed to open environment for seven days to remove the traces of formaldehyde present in the soil. These soils were filled to the disinfected pots to carry out further studies.

Evaluation of aggressiveness of *Sclerotium rolfsii* isolates on finger millet

The sterilized soil, sand and FYM were mixed in 1:1:0.5 proportion (w/w basis) and filled in disinfected earthen pots. Four per cent mass culture of *Sclerotium rolfsii* grown on sorghum seeds was added to soil in pots and mixed thoroughly. Apparently healthy seeds of ragi were surface sterilized with 0.1% sodium hypochlorite solution, washed thrice in tap water and sown in the pots containing sterile soil. After 20 days of sowing, these ragi seedlings were transplanted at the rate of 10 seedlings per pot. Pots without *Sclerotium rolfsii* culture served as control. Moisture content in the soil was maintained to field capacity by adding required amount of water daily. The observations regarding the incidence of the disease were made regularly at 15 days interval.

Results and Discussion

Sclerotium rolfsii infected foot/collar/stem portions of different crops were collected from 12 different crops and regions (table 1), from these specimens causal organism was isolated by following standard tissue isolation method.

Cross inoculation studies

The seedlings of finger millet were raised in soil infested with four per cent inoculum of different isolates of *Sclerotium rolfsii* as described in 'Material and Methods'.

The foot rot susceptible finger millet cultivar GN 4 was transplanted in to pathogen inoculated pots. The results revealed that all the isolates were infective to finger millet (table 1). At 15 days after transplanting, all the isolates except SrHO and SrDS shows more than 50% of infection and at the end of 60 days, the isolates Mandya ragi (96.66%); Mandya wheat and Hiriyur tomato

Table 1 : Reaction of different isolates of *Sclerotium rolfsii* of finger millet cultivar GN-4.

Crop	Place of collection	Designations	Days after transplanting			
			15	30	45	60
Ragi	Bangalore	SrBR	+	+	+	+
Chickpea	Bangalore	SrBC	+	+	+	+
Groundnut	Bangalore	SrBG	+	+	+	+
Ragi	Mandya	SrMR	+	+	+	+
Wheat	Mandya	SrMW	+	+	+	+
Chickpea	Hiriyur	SrHC	+	+	+	+
Onion	Hiriyur	SrHO	-	-	-	+
Tomato	Hiriyur	SrHT	+	+	+	+
Cyperus	Hiriyur	SrHCr	+	+	+	+
Soybean	Dharwad	SrDS	-	-	-	+
Fieldbean	Dharwad	SrDF	+	+	+	+
Ragi	Tumkur	SrTR	+	+	+	+

+ = Infection, - = No infection.

Table 2 : Cross infectivity of different isolates of *Sclerotium rolfsii* on finger millet cultivar GN-4.

Isolates	No. of seedlings transplanted	Days after transplanting								Mean
		15	PI	30	PI	45	PI	60	PI	
SrBR	30	17	56.67	19	63.33	20	66.67	20	66.67	**63.33**
SrBC	30	23	76.67	24	80.00	24	80.00	24	80.00	**79.17**
SrBG	30	25	83.33	25	83.33	25	83.33	25	83.33	**83.33**
SrMR	30	29	96.67	29	96.67	29	96.67	29	96.67	**96.67**
SrMW	30	27	90.00	27	90.00	27	90.00	27	90.00	**90.00**
SrHC	30	23	76.67	23	76.67	23	76.67	23	76.67	**76.67**
SrHO	30	0	0.00	0	0.00	0	0.00	4	13.33	**3.33**
SrHT	30	27	90.00	27	90.00	27	90.00	27	90.00	**90.00**
SrHR	30	20	66.67	21	70.00	21	70.00	21	70.00	**69.17**
SrDS	30	0	0.00	0	0.00	0	0.00	6	20.00	**5.00**
SrDF	30	24	80.00	25	83.33	25	83.33	25	83.33	**82.50**
SrTR	30	17	56.67	18	60.00	19	63.33	19	63.33	**60.83**
	Mean		**64.44**		**66.11**		**66.66**		**71.12**	

(90.00%); Bangalore groundnut (83.33%); Dharwad Field bean (82.50%); Bangalore chickpea (79.17%); Hiriyur chickpea (76.67%); Hiriyur Cyperus (69.17%); Bangalore ragi (63.33%) and Tumkur ragi (60.83%) isolates are highly virulent against finger millet as these isolates infected more than 50% of the plants (table 2). The other two *viz*., Dharwad soybean (5.00%) and Hiriyur onion (3.33%) isolates showed less virulent reaction as these isolates infected <5.00% of plants after 60 days after transplanting. Further, these two isolates did not show any infection on finger millet up to 45 days.

Higgins (1927) suggested that, the pathological infectivity varies among the isolates from different crops which were mainly attributed to various pedological factors, nutritional status of the crops, environmental conditions and also to host- pathogen preferences. In the present study, the isolates from different crops and agroclimatic regions were tested on finger millet. All the isolates showed the infection but, with varied level of infection. These findings are similar to Epps *et al*. (1951); Fouzia Yaqub and Saleem Shahzad (2005); Rekha and Pandey (2008).

References

Aycock, R. (1966). Stem rot and other diseases caused by *Sclerotium rolfsii. North Carolina Agri. Exp. St. Tech. Bulletin*, **174** : 202.

Batsa, B. K. and D. B. Tamang (1983). Preliminary report on the study of millet diseases in Nepal. In : *Maize and Finger millet*. 10th Summer workshop 23-28 Jan., 1983, Rampur, Chitwan, Mysore.

Epps, W. M., J. C. Patterson and I. E. Freeman (1951). Physiology and parasitism of *Sclerotium rolfsii*. *Phytopathology*, **41** : 245-255.

Fouzia, Yaqub and Saleem Shahzad (2005). Pathogencity of *Sclerotium rolfsii* on different crops and effect of inoculum density on colonization of mungbean and sunflower roots. *Pakistan J. Bot*., **37(1)** : 175-180.

Harlton, C. E., C. A. Le vesque and Z. K. Punja (1995). Genetic diversity in *Sclerotium* (*Athelia*) *rolfsii* and related species. *Phytopathology*, **85** : 1269–1281.

Higgins, B. B. (1927). Physiology and parasitism of *Sclerotium rolfsii* Sacc. *Phytopathology*, **17** : 417-448.

Nagaraja, A. and B. Anjaneya Reddy (2009). Foot rot of finger millet - an increasing disease problem in Karnataka. *Crop Res*., **38(1, 2 & 3)** : 224-225.

Rekha, S. and A. K. Pandey (2008). Pathogenic diversity of *Sclerotium rolfsii* isolates, a potential biocontrol agent against *Parthenium hysterophorus* L. *African J. Environ. Sci. Technol*., **2(5)** : 124-126.

Sarma, B. K., U. P. Singh and K. P. Singh (2002). Variability in Indian isolates of *Sclerotium rolfsii. Mycologia*., **94(6)** : 1051–1058.