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Symptomatology of two intraspecific, morphologically distinct anastomosis group of *Rhizoctonia solani* causing Rhizoctonia aerial blight of soybean

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Symptoms incited by I(A) group on leaves first appeared water soaked, hot water scalding, grayish green in colour and later turned tan to brown leaves appeared as leathery and wet. Leaves infected with I(B) group showed primary lesions consisting of small, circular spots dark brown in colour at margin but light in centre. On seeds various degree of infection was observed such as reduction in size, deformity and shriveling for I(A) group. In I(B) group seeds were found discoloured and changed into brown to dark brown in colour

Key words: Soybean, Rhizoctonia aerial blight, anastomosis, symptoms

INTRODUCTION

Soybean [*Glycine max* (L.) Merrill] has become an important oil yielding crop with a steady increase in world wide production. Major soybean producing countries are U.S.A, Brazil, Argentina, China and India. Soybean is number one oilseed crop in India. Among major soybean growing states Madhya Pradesh ranks first. Over the past decade productivity trend of soybean indicates that the achievable impressive yields are not attained due to several abiotic and biotic factors. Soybean suffers from many diseases such as Yellow mosaic disease (Mungbean yellow mosaic virus), Charcoal rot (*Rhizoctonia bataticola),* Collar rot *(Sclerotium rolsfii),* Rhizoctonia root rot and Rhizoctonia aerial blight caused by *Rhizoctonia solani.* Rhizoctonia aerial blight (RAB) is also known as Rhizoctonia foliar blight. Rhizoctonia foliar blight has been reported to cause epiphytotics in soybean throughout the world (Jones and Belmar, 1989; Yang *et al.*, 1990; Liu and Sinclair, 1992; Muyolo *et al.*, 1993; Embrapa, 1999).

It has attained serious proportion ever since it was first reported in India. In India this disease was first time came in record from Sikkim in 1987-88 (Srivastava and Gupta, 1989). RAB is found throughout the tropics and subtropics and observations suggest that pod and foliage losses were up to 70 per cent. Rhizoctonia aerial blight in caused by two intraspecific, morphologically distinct groups of *Rhizoctonia solani* in India, one producing macro and another micro sclerotia (Jones and Belmar, 1989).

MATERIALS AND METHODS

Collection of infected samples and study of

symptomatology. The diseased samples were collected from Breeder Seed Production Unit, Farm and experimental area, Department of Plant Breeding and Genetics, JNKVV, Jabalpur in *Kharif,* 2009-2011.

Symptoms of Rhizoctonia aerial blight caused by *R. solani* were observed during *kharif* season from August to October. Water soaked and grayish green lesions occurred on leaves which later turned tan to brown. Brown lesions were also found on stems and pods.

The aerial blight disease more frequently occurred on foliage at its early stage almost every year in the vicinity of Jabalpur. Diseased foliage from different varieties/ lines were collected, graded and studied for the association of the fungus. Symptoms produced on young stem and petiole as well as on old and dried infected stems and petioles were studied. Naturally infected pods of different varieties of soybean were collected. Symptoms were studied and isolations were made for confirming the association of the pathogen.

RESULTS AND DISCUSSION

Symptoms produced by I(A) and I(B) studied in *kharif,* 2009 and 2011 are shown below

Symptoms caused by I(A)

Leaves

On leaves lesions first appeared water soaked, hot water scalding, grayish green in colour, later turned tan to brown and appeared as leathery and wet. (Fig. 1A) Defoliation is common and mycelium might adhere to detached leaves. In early stages of infection white mycelium aggregated and change into spherical shape and later turn as mature large size (1-3 mm) dark brown sclerotia as the leaf completely rotted and as well as on defoliated leaves. During the development of spot, if there was sudden increase in temperature, rooted portion become dry.

Petiole/Stem

On petiole and stem brown to reddish brown oblong lesions were observed. As the infection increased lesion size also increased, covering whole

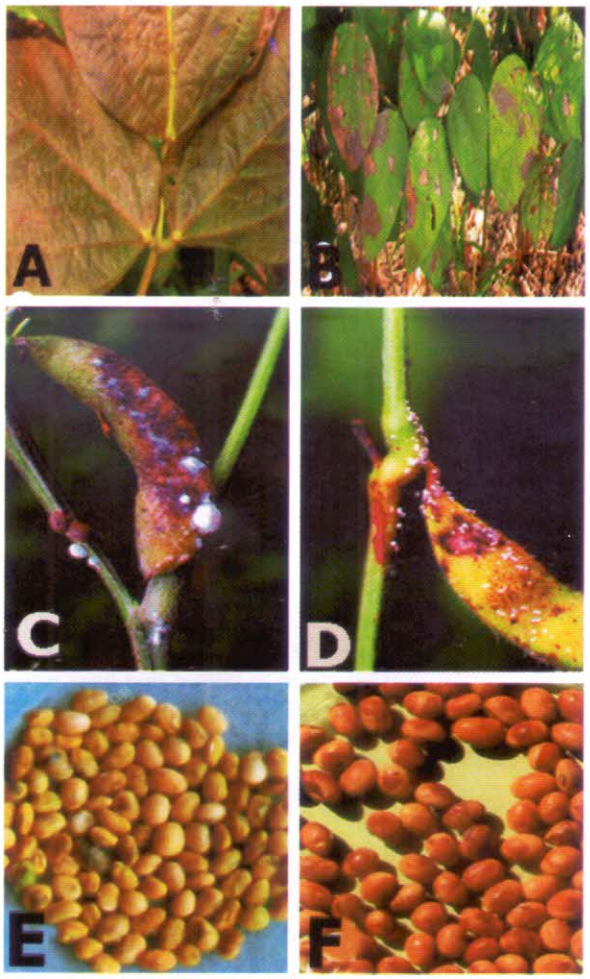

Fig. 1 : Showing symptoms of Rhizoctonia aerial blight caused by *Rhizoctonia solani* anaastomosis group I(A) and I (B) of soybean

petiole/ stem and become dark brown to black in colour, few sclerotial formation was observed over stem/ petiole. (Fig.1C).

Pods

Tan to brown lesions formed, lesions became darker in colour and covered large area. Completely infected pods became dark brown and size was reduced with few sclerotia only. (Fig.1C).

Seeds

Various degrees of infection were observed on seeds such as reduction in size, deformity and shriveling of seeds. No symptoms were observed on seeds which were matured prior to infection. Discolourations of seeds (green, brown and black) were also observed (Fig.1E). No seeds were formed in severely infected pods.

Symptoms produced by (IB)

Leaves

On leaves first water soaked grayish green type symptoms appeared as primary lesions consisting of small, circular spots dark brown colour in margin but light in centre -1mm in diameter, followed by secondary lesions showing circular to irregularly shaped and large sized areas of necrosis (Fig.1B) around the primary lesions under humid conditions. At advanced stage leaves become wrinkled, straw in colour and vein-let of leaves look prominent.

Petioles/Stem

On petioles and stems, under normal condition, linear lesions of reddish brown in colour were formed. As the humidity increased lesions spread in all directions. Abundant sclerotia formation was observed, which were initially white to pink in colour and later turn dark brown and black in colour (Fig.1D).

Pods

On pods first lesions were formed and found surrounded by reddish brown margin. Under humid condition, white mycelium was observed all over the infected portion early in the morning or humid condition. Abundant small, spherical sclerotial formation took place on infected pods which were initially pink in colour later turn dark brown and black in colour (Fig.1D).

Seeds

Various degrees of symptoms were recorded on seeds such as discolouration (brown to dark brown and black), reduction in size and seeds became chaffy. Severally infected pods had no seeds (Fig.1F).

Symptoms of Rhizoctonia aerial blight caused by *Rhizoctonia solani* produced on different plant parts such as leaves, stems, pods, petioles and seeds have been discussed by various authors which are in accordance with the present investigation with anastomosis group I(B). Patel and Bhargava (1998) reported that although anastomosis group I(A) was also reported to cause RAB in soybean but detail symptoms were not described by Verma and Thapliyal (1976). Naito and Kanematsu (1994) reported that symptoms of RAB as circular to irregularly shaped and larged sized area of necrosis around the primary lesion under humid condition but they did not described the symptoms according to the anastomosis group I(A) and I(B) but their symptoms matched with the anastomosis group I(B).

Hartman and Sinclair (1999) reported that on leaves lesion first appear water soaked and grayish green and later turn tan to brown. Defoliation is common and mycelium may adhere to detached leaf and re-infect leaves, pods and stem. Reddish brown to brown lesion can form on stems, pods and petiole scars. Symptoms accompanied by a web like, spreading growth of fungal mycelium in which sclerotia are found to be attached to affected plant parts. Therefore symptoms described is not based on anastomosis group I(A) and I(B). They classified the organism on the basis of size of sclerotia, i.e. large (1-3 mm) and small (≤1 mm), however these symptoms are matched with the anastomosis group I(B) only.

Identification was made on the basis of cultural and morphological characteristics. The mycelium of both the group I (A) and I (B) consist of hyphae partitioned into individual cells by a septum containing a dough nut shaped pore. The hyphae often branch at a 90° angles and usually possess more than three nuclei per hyphal cell. However there are distinct difference between I (A) and I (B) group. The vegetative mycelium of I (B) was colourless when young but become brown colour on maturity. Hypha measured 4 to 6 µm in diameter and sclerotia irregular 0.10 to 0.80 mm in diameter and black in colour and more prominent when it was produced on petiole but when grown in PDA medium it does not produce sclerotia. This culture matched (Hartman and Sinclair,1999) with the specification for *Rhizoctonia solani* intraspecific group I (B). Whereas the vegetative mycelium of I (A) group was white. Hypha measured 8 to 12 µm and sclerotia when young were white and spherical later turning dark brown in colour. Size of the sclerotia varies from 0.75 to 2.70 mm. Sclerotia are also produced on PDA medium, this culture was identified as *Rhizoctomia solani* intraspecific group I (A).

REFERENCES

Embrapa.1999. Recomendacoes tecnicas oara a culturada

soja na regiao centrol do Brasil. Londrina Embrapa soja. Docsuments. 132.

Hartman, G.L. and Sinclair, J.B.1999. *Compendium of Soybean Diseases*. The American Phytopathological Society, St Paul Minnesota, USA.

Jones, R.K. and Belmar, S.B.1989. Characterization and pathogenicity of *Rhizoctonia* spp. Isolated from rice, soybean and other crops grown in rotation with rice in Texas. *Plant Dis.*, **73:**1004-1010.

Liu, Z. and Sinclair, J.B.1992. Isolates of *Rhizoctonia solani* anastomosis group 2-2 Pathogenic to soybean. *Plant Dis.*, **76**:682-687.

Muyolo, N.G., Lipps, P.E. and Schmitthenner, A.F.1993. Anastomosis grouping and *Rhizoctonia solani* associated with dry been and soybean in Ohio and Zaire. *Phytopathology*, **83:** 438-444.

Naito, S. and Kanematsu, S.1994. Characterization and pathogenicity of a new anastomosis sub group AG-2-3 of *Rhizoctonia solani* Kuhn isolated from leaves of soybean. *Anna. Phytopathol. Soci. Japan.*, **60:** 681-690.

Patel, B.L. and Bhargava, P.K.1998. Aerial blight of soybean (*Glycine max*) caused by *Rhizoctiona solani. Indian J. Agric. Sci.*, **68**: 277-278.

Srivastava, L.S. and Gupta, D.K.1989. Aerial blight of Soybean, Frenchbean, groundnut, black, green, and horsegram-a new record from India. *Pl. Dis. Res.*, **4:** 163-164.

Verma, H.S. and Thapliyal, P.N.1976. Rhizoctonia Aerial blight of soybean. *Indian Phytopath.*, **29:** 389-391.

Yang, X.B., Berggren, G.T. and Snow, J.P. 1990. Types of Rhizoctonia foliar blight on soybean in Louisiana. *Plant Dis.*, **74:** 501-504.