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RESEARCH ARTICLE

A new record on sheath blight disease of finger millet from Uttarakhand, India

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SUMMARY

Sheath blight, a new disease of finger millet appeared in Kotabagh, Nainital, situated in hills of Uttarakhand. Wide spread occurrence of this disease in this region can have alarming consequences as it causes serious yield loss. This could adversely affect the livelihood of marginal farmers of Uttarakhand. The causal agent was identified as *Rhizoctonia solani* Kuhn. The pathogenicity of the fungus was established by artificial inoculation on healthy plants.

Key Words : Finger millet, Small millet, Sheath blight, *Rhizoctonia solani*, *Eleusine coracana*

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Among the important millet crops grown all over the world, finger millet [*Eleusine coracana* (L.) Gaertn.] ranks fourth in importance after sorghum, pearl millet and foxtail (Kumar and Prasad, 2010a). It accounts for 12 per cent of the global millets area and is grown in more than 25 countries in eastern and southern Africa, and across Asia from the Near East to the Far East. The major fin- ger millet producing countries are Uganda, India, Nepal and China (*www.cgiar.org*). India is the largest producer of various kinds of millets. Out of the total minor millets produced, finger millet (ragi) accounts for about 85 per cent of production in India (Divya, 2011). Due to unique adaptability, these crops are successfully grown from sea level in south upto 8000 ft. altitude in North particularly in Himalayas and North Eastern hills (Kumar and Kumar, 2009). In India during 2015-16, it was grown over an area of 1.26 million ha with annual production and productivity of 1.79 million tones and 14.24 q/ha, respectively (*http://mospi.nic.in*). Karnataka accounts for highest area of about 60 per cent followed by Maharashtra (10.56%), Tamil Nadu (9.94%) and Uttarakhand (9.40%) (Nagaraja *et al.*,2012). Finger millet is important ancient crop of dry land agriculture and the potential climate-resilient crops for food and nutritional security in the climate change scenario (Vetriventhan *et al.*, 2016). It is an important cereal crop

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grown under rainfed conditions by small and marginal farmers of mid hills of Himalayas ensuring their food security. Finger millet locally known as ragi, mandua, nagli, kapai and marua occupies a special position in the hill agriculture of Uttarakhand occupying the largest area next only to rice (Kumar and Kumar, 2011). During 2015-16, it was grown over an area of about 107 thousand ha in the state, with annual production of 151 thousand tones and productivity of 14.11 Q/ha (*http://mospi.nic.in*). Like other economically important field crops, finger millet is also known to be attacked by several diseases causing considerable losses (Nagaraja *et al.,* 2007). During 2017, in a routine survey for plant diseases in district Nainital, symptoms of leaf and sheath blight were observed on finger millet plants at Kotabagh, Nainital, Uttarakhand. (Fig. 1).

MATERIAL AND METHODS

The pathogen was isolated from the diseased leaves and leaf sheaths, depicting typical symptoms, on potato dextrose agar (PDA) (Dhingra and Sinclair, 1986). The infected plants showing typical sheath blight symptoms were cut in small pieces; surface sterilized and then transferred on the PDA at 28±2 ^{0}C. The fungus was purified through hyphal tip/single sclerotial method (Rangaswami and Mahadevan, 2004). The pure culture yielded numerous dark colored sclerotia (Fig. 1e and f). The cultural and morphological characteristics of the isolate were studied to identify the fungus associated with the diseased plants. The fungus was multiplied on PDA. One month old plants were artificially inoculated by placing the sclerotia between the leaf sheaths and covered with wet cotton swab to maintain the proper moisture. Periodic observations were made on the development of symptoms. The fungus was reisolated after appearance of symptoms.

RESULTS AND DISCUSSION

Sympatomatological studies revealed that the disease appeared as elliptical or ovoid, grayish brown lesions on the leaf sheath between soil level and leaf blade. The lesion were 2-3 cm long, oval to irregular and light grey to dark brown lesions on the leaf sheath. The central portions of the lesions later turned grayish white with narrow, reddish–brown margins, which appeared as series of copper and brown colour bands across the leaf sheaths giving a very characteristic banded appearance (Fig. 1b). The lesion rapidly extended, coalesced with one another, spread upwards causing blighting of the leaf sheath and leaf blade (Fig. 1b and c).

High RH (~70%) and temperatures between 28 and 30^{0}C are known to favour banded leaf and sheath blight disease development (Nagaraja *et al.,* 2007). The weather during *Kharif* 2017 was highly conducive for the development of this disease. There was incessant rainfall and temperature during the crop season was also high.

Isolation from infected tissues on PDA yielded a dull white mycelium, which after a few days turned light brown on ageing (Fig. 1f). Small brown sclerotia were formed in great numbers as the culture became old (Fig. 1d and e). The microscopic studies revealed septate hyphae having hyphal branching characteristically at right angle, constriction at the point of origin of the mycelium and presence of a septum near the branching junction (Fig. 1g). On the basis of cultural, morphological and microscopic examinations the fungus was identified as *Rhizoctonia solani* Kuhn (Dubey and Pandey, 2008; Kumar and Prasad, 2009; Kumar and Prasad, 2010b; Parmeter and Whitney, 1970 and Sneh *et al.,* 1991). One month old plants were artificially inoculated by placing the sclerotia between the leaf sheaths (Fig 1d). Symptoms appeared after 2-3 days and were identical to those observed in natural infection. Fungus identical to the original culture was obtained on reisolation. A perusal of the literature revealed that the sheath blight of finger millet was first recorded in a severe form at Vellayani, Kerala, India (Lalu and Girija, 1989). Subsequently, the disease was recorded in a severe form in the experimental plots of Birsa Agricultural University, Ranchi, Bihar (now in Jharkhand) (Dubey 1995 and Nagaraja *et al.,* 2016), Agricultural Research Station, Vizianagaram, Andhra Pradesh (Patro, 2008), Karnataka (Nagaraja and Anjaneya Reddy, 2010). Although, sheath blight caused by *R. solani* has been reported from Uttarakhand on proso millet (Kumar and Prasad, 2010b and Kumar, 2016) and barnyard millet (Kumar and Dinesh, 2009), however, no record is available in the literature, on the occurrence of leaf and sheath blight disease on finger millet in Uttarakhand. Therefore, this constitutes the first record of leaf and sheath blight disease on finger millet in Uttarakhand.

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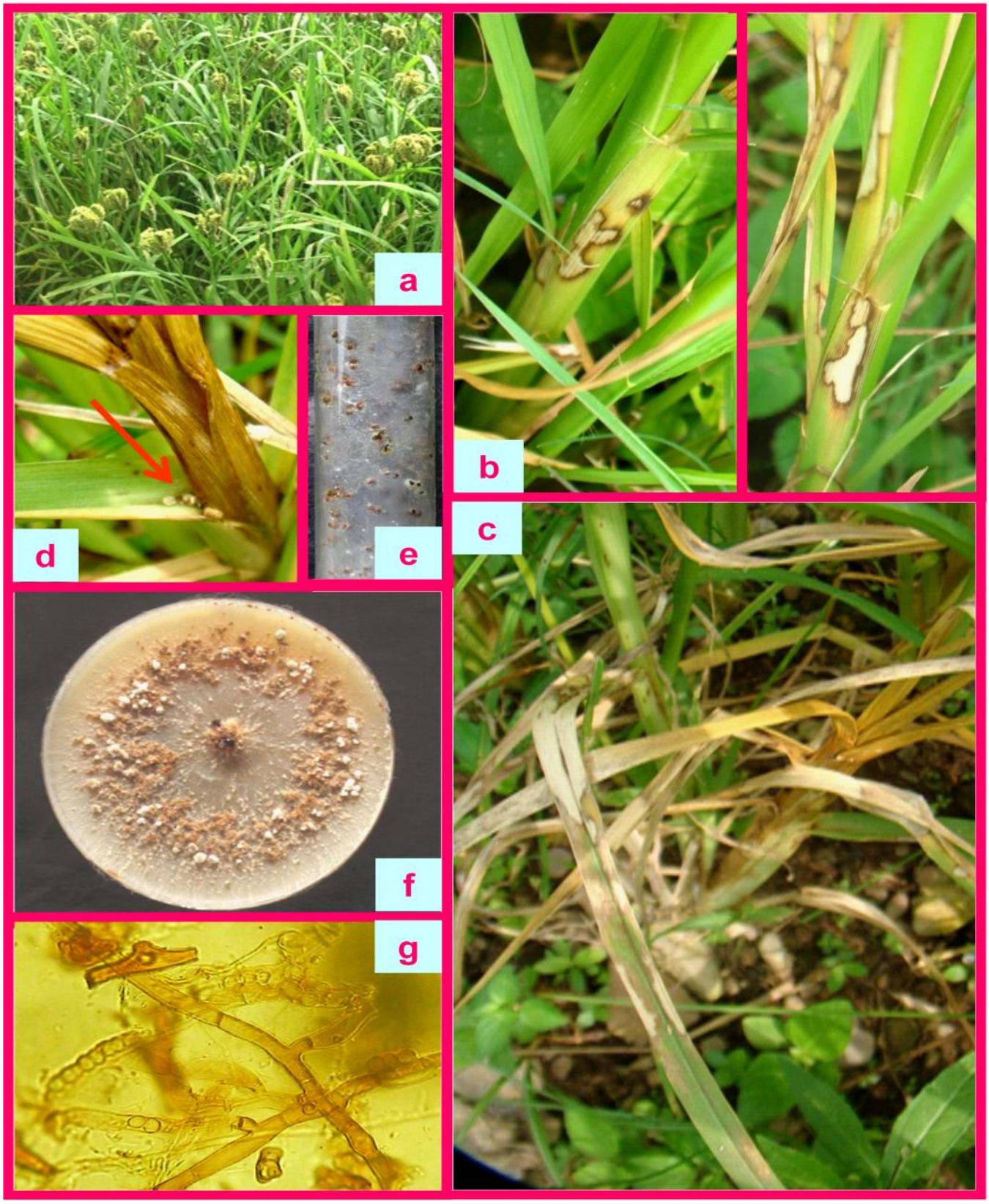

Fig 1: Sheath blight of finger millet: a: Healthy crop, b and c: Blight symptoms on sheath and leaf, d: Sclerotia in plant, e: Sclerotia in test tube, f: Pure culture of *Rhizoctonia solani*, g: Hypha at right angle branching

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