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First Record of Leaf Blast Disease in Browntop Millet in Mid Hills of Uttarakhand

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Abstract

Incidence of leaf blast disease has been recorded for the first time in Browntop millet at Plant Pathology Block, College of Forestry, Ranichauri in *Kharif*- 2019 under coordinated research trials of project entitled "AICRP Small Millets" funded by ICAR. The isolate was studied by culturing on Oat Meal Agar (OMA) medium and identified as *Pyricularia grisea* by cultural, morphological and microscopic characteristics. The pathogenicity test of the isolate was conducted following Koch's postulates on the cultivar of browntop millet and confirmed as *Pyricularia grisea*.

Introduction

Browntop millet (*Brachia riaramosa* (L.) Stapf; *Panicum ramosum* L.) is an introduced annual grass that originated in South-East Asia. It is grown in Africa, Arabia, China and Australia (**Clayton *et al.*, 2006**). Browntop millet is drought hardy and heat tolerant, but can also be planted in low areas that get flooded. In India, browntop millet is grown especially in rainfed tracts of Tumakuru, Chitradurga and Chikkaballapura districts of Karnataka state. The crop is popular in this region and used mostly for food purposes especially by people of economically weaker sectors. This millet seed is grown in a variety of soils and climates. Like other millets, it is a hardy crop and well suited for dry land. Browntop millet is an annual warm-season species that grows 1 to 3 ft tall and mature in approximately 60 days.The smooth stems have pubescent nodes and may stand erect or ascend from a decumbent base. It grows with either a compact or open panicle and can have either shattering or indehiscent spikelets. The leaves are 2.2 to 18cm long and 6-18mm wide and both the surfaces are smooth. The inflorescence in browntop millet is

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indeterminate, open, spreading with simple axis and stalked flowers. It has 3-15 inflorescences and having white flowers (**Sheahan, 2014; Bhat *et al.*, 2018**).

Under the AICRP on Small Millets, a coordinated research trial of browntop millet (BTIAVT) was conducted at the Ranichauri Centre, Uttarakhand during *Kharif* 2019 for recording the incidence of important endemic diseases of browntop millet in mid hills of Uttarakhand **(Figure 1 a & b)**. Incidence of leaf blast on browntop millet for the first time was recorded during *Kharif*-2019 while recording observations on important endemic diseases and which was later on also verified by the monitoring team during their monitoring visit in 2019 at Plant Pathology Block, Ranichauri Centre **(Figure 1c)**. In the field, the disease manifested from vegetative to grain formation stage and covered the leaf areas. As a consequence, reduction in yield was observed in affected plants. The symptoms appeared on leaves in the form of typical spindle shaped spots that were of different sizes.

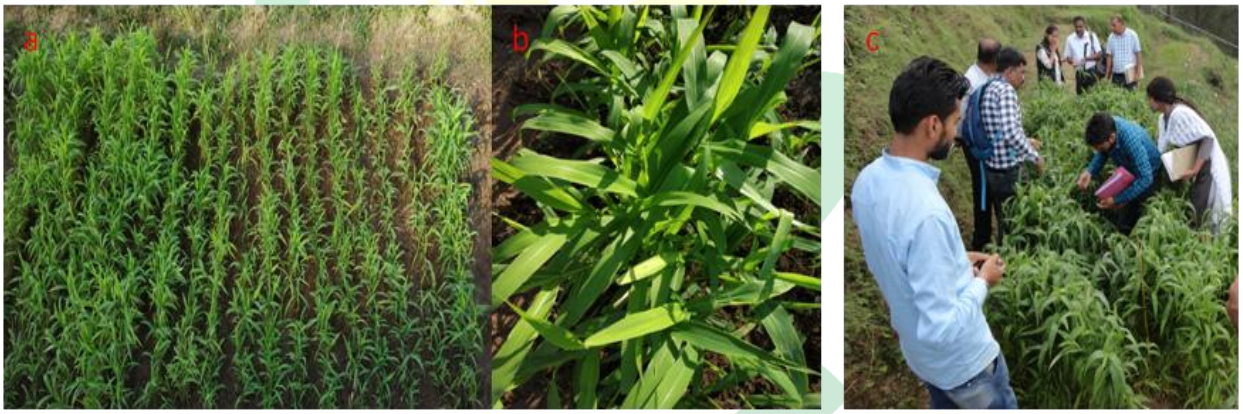

Figure1. a) & b) Coordinated trial of BTIAVT (Brwontop millet Initial and Advance varietal Trial) conducted during *Kharif* 2019; **c)** Monitoring team recorded and verified the leaf blast disease in browntop millet at Plant Pathology B-Block, Ranichauri

Initially, the spots were with yellowish margin and grayish centre. Later, the centers became ash colored. Under humid conditions, an olive grey overgrowth of the fungus developed at the centre of spots. In the beginning, the lesions were isolated but coalesced afterwards. The pathogen causing leaf blast symptoms was isolated on oat meal agar medium under aseptic laboratory conditions from the diseased leaf, depicting typical leaf blast

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symptoms **(Figure 2)**. The infected portions were cut into small pieces and surface sterilized. They were kept in a moist chamber at 28±2°C for 3 days to initiate vegetative growth and sporulation. The pieces were then transferred on the OMA (Oat Meal Agar) medium. The cultural and morphological characteristics of the isolate were studied to identify the fungus associated with the diseased plants. The fungus when cultured on OMA medium produced luxuriant growth and abundant dark coloured chlamydospores in culture **(Figure 3)**.

Figure 2. Browntop millet showing typical leaf blast symptoms

Conidiophores were simple, septate, basal portion being relatively darker (observed under microscope). Conidia produced acrogenously, one after another, were hyaline and obpyriform in shape. Conidia were three celled, the middle cells being wider than end cells. Globose, thick walled, olive brown terminal or intercalary chlamydospores were common. On the basis of cultural, morphological and microscopic examinations, the fungus was identified as *Pyricularia grisea* (Cke.) Sacc.

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The pathogenicity of the isolate was tested on browntop millet. Seeds of the browntop millet were then sown in 15 cm diameter plastic pots filled with sterilized soil-sand-FYM (farmyard manure) mix (2:1:1) and placed in a greenhouse and maintained at 28-30°C. Seedlings were thinned at one-leaf stage to keep 10 plants per pot. The inoculum was prepared by inoculating 6 mm mycelial discs of isolate cut from 7 day-old-culture of *P. grisea* on OMA medium at 26±1ºC. Mass multiplication of spores for inoculation was achieved by growing isolate (5 discs/plate) on OMA medium at 26±1ºC for 15 days. The plates were flooded with 10 ml of distilled water and the fungal growth containing mycelium and conidia was gently removed by scrapping with a sterile plastic inoculation loop. Approximately 30 ml of a spore suspension of isolate was transferred into 100 ml conical flask, mixed thoroughly by vortexing for release of conidia into water.

Harvested spores were filtered through a double-layer muslin cloth, the resultant concentration was adjusted to 1×10^5 conidia ml^{-1} and 0.02% (vol/vol) Tween 20 was added to the suspension just before the inoculation. 15-day-old pot-grown seedlings were inoculated artificially by spraying the inoculum on the foliage using a hand-operated atomizer. Inoculated plants were allowed to partially dry for 30 min to avoid dislodging of the spores and the seedlings sprayed with water were maintained as control. All the inoculated seedlings were incubated at 23°C with >95% Relative Humidity (RH) and leaf wetness under 12 h photoperiod for 7 days. Leaf blast severity of the isolate was recorded on leaves of the cultivar (**Rawat *et al*., 2016**)

The symptoms appeared on leaves in the form of spindle shaped spots. The spots were with yellowish margin and grayish centred which later on became ash coloured (as observed in field). The pathogen was re-isolated following the protocol as described previously and compared with the original culture. Based on cultural, morphological and microscopic studies the re-isolated pathogen was confirmed as *P. grisea*

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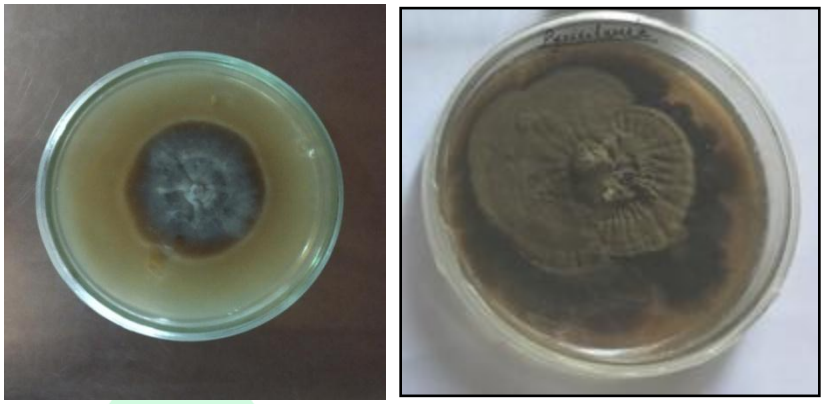

Figure 3. Culture of isolated *P. griseaon* Oat meal agar medium

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