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Status of fungal diseases of Finger Millet [*Eleusine coracana* (L.) Gaertn.] in Manipur Hills

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Finger millet (*Eleusine coracana*) is the only millet crop cultivated in certain pockets of Manipur hills particularly in the two hill districts namely – Kangpokpi and Senapati districts. Although, it is resistant to pests and diseases to some extent, yet, the crop is vulnerable to certain fungal diseases in Manipur's climatic conditions. Blast, being an important disease of millet, infects mainly plant parts such as leaf, neck and finger beginning from seedling to the crop maturity stage as revealed during a survey in the hills of Manipur in 2021. Other fungal diseases recorded include banded blight and brown spot. Causal organisms were identified as *Pyricularia grisea*, *Rhizoctonia solani* and *Helminthosporium nodulosum* for blast, banded blight and brown spot respectively. Except for blast disease where infection occurred in almost all the crop fields significantly at different crop stages, other fungal diseases were found in a few crop fields only and also infection is lesser as compared to blast.

Key words: Banded blight, blast, brown spot, finger millet, Manipur.

INTRODUCTION

Millet is one of the oldest cultivated cereal crops in the world and are critical plant genetic resources for the agriculture that extends food security to deprived farmers inhabiting arid, infertile, marginal and poor lands especially in Asia and Africa (Gupta *et al.* 2017). Finger millet [*Eleusine coracana* (L.) Gaertn.] is considered as important among all the millets due to its rich nutritional content. However, the crop is less known in the north-eastern region of India. It is grown mainly by subsistence farmers and serves as a food security crop because of its high nutritional value and excellent storage qualities (Dida *et al.* 2007). The crop has gained focus of scientific research for their extraordinary potential to grow under high temperature, low moisture and poor soils (Shukla *et al.* 2015). Finger millet is resistant to various types of pests but it is prone to certain fungal diseases. Finger millet is affected by sixteen fungal, three viral, and one bacterial pathogen and blast disease happens to be the most important among the fungal diseases (Bhandari *et al.* 2018).

Finger millet blast is caused by a heterothallic filamentous fungus pathogenic to almost 50 plant species in 30 genera of Poaceae including *Eleusine*. The major constraint in the profitable production of finger millet in all the millet-growing regions of the world is blast disease caused by the fungus *Pyricularia grisea* Sacc. [perfect stage *Magnaporthe grisea* (Hebert) Barr.](Patro and Madhuri, 2014). Blast disease has been reported in India since the beginning of this century with a predicted a grain loss of up to 50 percent depending upon the weather conditions. The symptoms appear on leaf lamina with typical spindle shaped spots with grey or whitish centers and brown or reddish-brown margin that enlarge and coalesce to give blasted appearance (Babu, 2011). Further studies have reported blast as the most destructive disease of finger millet and the pathogen can invade the crop at any growth stage, even leading to the death of seedlings at nursery stage. Severe incidence of blast, 70-90% seedling blast, 60% neck blast, 3-80% finger blast was reported at Lumle, Kaski of Nepal. A temperature of around 28-30° and a relative humidity of 70% or above favours the rapid disease development (Patro *et al.* 2016). Kumar (2016) reported a varied

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nature in the incidence of blast and *Cercospora* leaf spot at different locations of Uttarakhand which he observed may be attributed due to difference of altitude at different crop fields.

Brown spot or seedling blight or leaf blight incited by *Helminthosporium nodulosum* (Berk and Curt.) is next only to blast both in severity and distribution. Severity of brown spot is high in maturity stage as compared to pre-flowering stage (Madhuri *et al.* 2014). Another disease called banded blight caused by *Rhizoctonia solani* is also reported as a severe disease of finger millet by Anilkumar *et al.* (2003). Banded blight of finger millet was reported from Karnataka (Nagaraja and Reddy, 2010) and Uttarakhand (Kumar 2019). Patra (2007) also reported banded leaf and sheath blight of maize for the first time in West Bengal. Since the crop is mainly grown as a subsistence crop in the rural areas, it has little or no significance in the state's economy and so no scientific investigation on finger millet crop has not been carried out in Manipur as per the available scientific literatures. Research on the cultivation prospects and its constraint due to fungal diseases associated with this crop is almost nil and therefore, the present study is being focused to highlight the status of the different fungal pathogens infecting the finger millet crop in Manipur hills.

MATERIALS AND METHODS

A survey conducted in all the hill districts of Manipur, revealed that finger millet was cultivated only in two hill districts namely- Kangpokpi and Senapati. Two crop fields each were selected for the study in five locations of the two hill districts namely- Thodne, Toribari, Maohing Gorkha Village, 10th Mile Gorkha Village, and Oaklung Gorkha Village. Survey was conducted beginning from the seedling stage up to the harvesting stage of the crop for observing symptoms of fungal diseases in the selected crop fields. The plants were examined for disease symptoms on the different parts such as leaves, leaf sheaths, stem, panicles and fingers. Affected plant parts showing disease symptoms were collected in sterile polythene bags and brought to the laboratory for isolation, identification and pure culture preparation for further investigation in Potato Dextrose Agar (PDA) medium. Cultural growth characteristics including reproductive bodies formed the basis of identification in consultation with relevant and

standard literature. The disease incidence and disease severity rates were recorded from five randomly selected quadrates in each field following standard procedures. The scoring pattern for leaf blast was recorded during vegetative stage using 0-9 rating scale (SES, 2013), neckblast and finger blast were recorded using 0-9 rating scale (Mayee and Datar, 1986) during the dough stage and mature stage respectively. For banded blight it was recorded using 0-5 rating scale (Patro *et al.* 2020) and for brownspot or leaf blight it was 0-5 rating scale (Nagaraja *et al.* 2007).

RESULTS AND DISCUSSION

During one year survey in the hill areas of Manipur and mostly in the two districts namely-Kangpokpi and Senapati, only one local variety of finger millet locally known as 'Kodo' (Figs.1a & b) was found cultivated in isolated villages under organic and traditional system of cultivation. In the course of investigation, occurrence of blast disease caused by *Pyricularia grisea*, was observed in almost all the selected study sites located at different altitudinal heights. Fig. 1 c shows the occurrence of banded blight in the field. Blast disease infects mainly the neck and finger (Fig.1d) and leaves (Fig. 1 e) of the plant at different crop stages. Other fungal diseases such as brown spot (Fig. 1f) were also found in few study sites with relatively lower intensity. The causal organisms of these the diseases were identified as *Rhizoctonia solani* (banded blight) and *Helminthosporium nodulosum* (brown spot). Disease Incidence (DI) and Disease Severity (DS) of leaf blast was found within the range of 2% to 28% and 0.22% to 3.08% respectively and, DI and DS of neck blast in the range of 2% to 8% and 0.22 to 0.88% respectively. Similarly, DI and DS of finger blast was in the range of 2% to 4% and 0.22% to 0.44%. DI and DS of banded blight were found in the range 2% to 6% and 2.40% to 7.20% respectively and, DI and DS of brown spot were found in the range 2% to 8% and 2.40% to 9.60% respectively. All these findings have been presented in consolidated tables for easy grasp.

One year investigation through survey, related to the occurrence of fungal diseases in finger millet crop, led to the conclusion that finger millet is prone to fungal diseases such as blast, banded blight and brown spot that cause negligible damage to the crop. Of all the fungal diseases occurred, blast

Table.1: Disease Incidence (DI) and Disease Severity (DS) of Leaf Blast, Neck Blast, Finger Blast, Banded blight and Brown spot found in different study sites. The given values are average of the data recorded in each location.

Location	Crop stage	Leaf Blast		Neck Blast		Finger Blast		Banded blight		Brown spot	
		DI (%)	DS (%)	DI (%)	DS (%)	DI (%)	DS (%)	DI (%)	DS (%)	DI (%)	DS (%)
Thodne Village	Vegetative	2.00	0.22	-	-	-	-	0.00	0.00	0.00	0.00
	Dough	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Mature	-	-	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Toribari Village	Vegetative	4.00	0.44	-	-	-	-	0.00	0.00	2.00	2.40
	Dough	-	-	0.00	0.00	0.00	0.00	0.00	0.00	6.00	7.20
	Mature	-	-	0.00	0.00	0.00	0.00	0.00	0.00	8.00	9.60
Maohing Gorkha Village	Vegetative	12.00	1.32	-	-	-	-	0.00	0.00	0.00	0.00
	Dough	-	-	2.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00
	Mature	-	-	2.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00
10 th Mile Gorkha Village	Vegetative	28.00	3.08	-	-	-	-	2.00	2.40	0.00	0.00
	Dough	-	-	8.00	0.88	2.00	0.22	6.00	7.20	0.00	0.00
	Mature	-	-	8.00	0.88	4.00	0.44	6.00	7.20	0.00	0.00
Oaklung Gorkha Village	Vegetative	4.00	0.44	-	-	-	-	0.00	0.00	0.00	0.00
	Dough	-	-	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.80
	Mature	-	-	0.00	0.00	0.00	0.00	0.00	0.00	4.00	4.80

**Fig. 1:** Diseases of finger millet. A- Crop survey site; B- Healthy Panicle /finger; C- Banded blight disease in the field; D- Neck blast and Finger blast; E- Leaf blast disease; F- Leaf spot disease

happens to be the most significant one and occurred at almost all selected study sites. For blast disease, a few symptoms appeared during the seedling stage and increased rapidly during tillering of the crop and infection continued up to the dough stage thereby affecting seed formation and even showed disease symptoms on the fingers of some plants. Banded blight occurred only in one location and brown spot occurred in two locations. If timely intervention for control of such minor fungal diseases of finger millet is not taken up, the disease may turn into a major fungal disease that might cause significant damage to the crop and decrease crop yield. Findings related to the occurrence of fungal diseases of Kodo i.e., finger millet have been reported by many plant pathologists around India and Nepal (Anilkumar *et al.* 2003; Kumar, 2016; Nagaraja and Reddy, 2010; Patro *et al.* 2020). However, occurrence of fungal disease of this crop in Manipur is being reported in this paper for the first time barring astray information in state level dailies (Chhetry, 2021).

REFERENCES

- Anilkumar, T.B., Mantur, S.G., Madhukeshwara, S.S. 2003. Diseases of finger millet. Project coordination cell. All India Coordinated Small Millets Improvement Project. ICAR, GKVK, Bangalore. 89.
- Babu, T.K. 2011. Epidemiology, virulence diversity and host-plant resistance in blast [*Magnaporthe grisea* (Hebert) Barr.] of finger millet [*Eleusine coracana* (L.) Gaertn.]. Acharya N.G Ranga Agricultural University, Rajendranagar, Hyderabad, India.
- Bhandari, Y., Shrestha, R.K., Chhetri, L.B., Lamsal, S and Kandel, B.P. (2018). Screening of the varieties of Finger millet [*Eleusine coracana* (L.) Gaertn.] against *Cercospora* Leaf Spot at Lamjung, Nepal. *World Scientific News* 111:175-182.
- Chhetry, G.K.N. 2021. Kodo-A miracle food security millet crop in the hills of Manipur. *The Sangai Express*, Dec.27, 2021
- Dida, M. M., Srinivasachary, R.S., Bennetzen, J. L., Gale, M. D., Devos, K. M. 2007. The genetic map of finger millet, *Eleusine coracana*. *Theor. Appl. Genet.* 114:321–332.
- Gupta, S.M., Arora, S., Mirza, N., Pande, A., Lata, C., Puranik, S., Kumar, J., Kumar, A. 2017. Finger millet: a “Certain” crop for an “Uncertain” future and a solution to food insecurity and hidden hunger under stressful environments. *Front. Plant Sci.* 8:643
- Kumar, B. 2016. Status of small millets diseases in Uttarakhand. *Inter. J. Plant Protect.* 9 : 256-263.
- Kumar, B. 2019. A new record on sheath blight disease of finger millet from Uttarakhand, India. *Inter. J. Plant Sci.* 14: 77-80.
- Madhuri, J., Patro, T.S.S.K., Suma, Y., Sowjanya, A. 2014. Effect Of Age Of Seedlings On Incidence Of Brown Spot Of Finger Millet Incited By *Helminthosporium nodulosum* (Berk and Curt.) In Different Cultivars. RESMISA, A.N.G.R. Agricultural University.
- Mayee, C.D., Datar, V.V. 1986. Phytopathometry. Technical Bulletin-1 (Special Bulletin-3), Marathwada Agricultural University, Parbhani.
- Nagaraja, A., Reddy, B.A. 2010. Banded blight-a new record of finger millet in Karnataka. *J. Mycopathol. Res.* 48: 169-170
- Nagaraja, A., Kumar, J., Jain, A.K., Narasimhudu, Y., Raghuchander, T., Kumar, B. Gowda, H.B. 2007. *Compendium of small millets diseases*. Project Coordination Cell, All India Coordinated Small Millets Improvement Project, University of Agricultural Sciences, Gandhi Krishi Vigyan Kendra Campus, Bangalore.
- Patra, D.K. 2007. Occurrence of Banded leaf and Sheath Blight diseases of maize in West Bengal. *J. Mycopathol. Res.* 45: 137-138.
- Patro, T.S.S.K., Madhuri, J. 2014. Identification Of Resistant Varieties of Finger Millet For Leaf, Neck and Finger Blast. *Inter. J. Food, Agric. Vet. Sci.* 4 : 7-11.
- Patro, T.S.S.K., Divya, M., Sandhya Rani, Y., Triveni, U., Ashok, S. 2016. Identification of Resistant Sources of Finger Millet against *Pyricularia grisea* Sacc. *J. Agricult. Technol.* 12:1519-1523.
- Patro, T.S.S.K., Georgia, K.E., Raj Kumar, S., Anuradha, N., Sandhya Rani, Y., Triveni, U., Jogarao, P. 2020. Identification of foxtail millet varieties against banded blight disease incited by *Rhizoctonia solani* Kuhn. *J. Pharmacog. Phytochem.* 9: 1265-1267.
- Shukla, A., Lalit, A., Sharma, V., Vats, S., Alam, A. 2015. Pearl and finger millets: the hope of food security. *Appl. Res. J.* 1:59–66
- Standard Evaluation System (SES) for Rice. 2013. International Rice Research Institute, Manila, Philippines. 5