

**Original Research Article**  
**Seasonal Occurrence and Management of**  
**Foliar Diseases blast and leaf blight in of**  
**Browntop Millet (Brachiaria ~~ramosa~~ ramosa (L.)**  
**Stapf)**

**ABSTRACT**

Brown top millet is an underutilized millet crop and grown in Southern Peninsular region of India. Blast as well as leaf blight diseases are frequently noticed in Browntop millet. A study was carried to find out the seasonal occurrence and management of major diseases of the crop at Centre of Excellence in Millets, Athiyandal during 2022-23 and 2023-24. The crop was sown during Second week of July ~~every of both years~~ and the blast symptom noticed from 10 days after sowing (DAS) and ~~shows increasing trend upto 40 DAS and later shows decreasing trend till the maturity of the crop.~~ However, the leaf blight noticed from 20 DAS and reached maximum level at 60 DAS in both years. Field experiments were conducted to study the effect of biocontrol agents and fungicides on incidence of blast as well as leaf blight in browntop millet. The results ~~shows show~~ significant variation observed between the treatments on the disease incidences in both the years. Seed treatment with B. subtilis @10g/kg of seed +Foliar spray of Azoxystrobin 23% SC @ 1ml/l at 20 and 40 DAS recorded the lower incidence of blast as well as leaf blight disease incidence and produced more grain yield when compared to other treatments ~~patients. These predictors, however, need further work to validate reliability.~~

**Keywords:** Browntop millet, blast, leaf blight, occurrence, management

**1. INTRODUCTION**

Brown top millet (*Brachiaria ramosa* (L.) Stapf), which is native to the United States, was recently introduced into India as one of the small millet crops, ~~and it is grown in Africa, Arabia, China and Australia [1].~~ The crop is drought hardy and heat tolerant, but can also be planted in low lying areas. ~~The crop is cultivated especially in rainfed tracts of Karnataka and Andhra Pradesh for food purposes for and is part of major diet economically of economically weaker section. The crop is a hardy crop and well suited for dry land condition and matures approximately 60 days. The crop is still but still is an underutilized one crop in India. Diseases such as and there are reports available on diseases of browntop millet. Blast as well as and leaf blight disease is are major and frequently observed [2]. The findings on No reports on management of the diseases in browntop millet at field level are not reported are available till now. Hence, the study was undertaken during 2022-23 and 2023-24 on the seasonal occurrence and management of these diseases.~~

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## 2. MATERIAL AND METHODS

### 2.1 Survey on the occurrence of diseases of Browntop millet

The study was undertaken to assess the level of disease incidence in browntop millet at CEM, Athiyandal under North East Region of Tamil Nadu. Browntop millet crop was raised during 2022-23 and 2023-24 without any plant protection measures in order to study the natural occurrence of the diseases of the crop variety. The crop var GBUBT2, used for this purpose and the incidence of blast as well as leaf blight disease incidence was recorded from 20 days after sowing till to the period of the crop maturity of the crop using standard scale and per cent disease index were calculated using formula. The leaf blast incidence was recorded using standard evaluation system [3]. The score 1: Small brown specks of pinhead size without sporulating centre, 2: Small roundish to slightly elongated, necrotic grey spots, about 1–2 mm in diameter with a distinct brown margin and lesions are mostly found on the lower leaves, 3: Lesion type is the same as in scale 2, but significant numbers of lesions are on the upper leaves, 4: Typical sporulating blast lesions, 3 mm or longer, infecting less than 2% of the leaf area, 5: Typical blast lesions infection in 2–10% of the leaf area, 6: Blast lesions infecting 11–25% leaf area, 7: Blast lesions infecting 26–50% leaf area, 8: Blast lesions infecting 51–75% leaf area and 9: More than 75% leaf area affected. Per cent disease index was calculated as  $PDI (\%) = \frac{\text{sum (class frequency} \times \text{score of rating class)}}{(\text{total number of plants}) \times (\text{maximal disease index})} \times 100$ .

### 2.2 Correlation between weather factors and disease incidence of browntop millet

The data on disease incidence and weather factors recorded in the field were subjected to analysis of correlation to study of influence of weather factors on the disease incidence. The Data on the daily weather factors viz., maximum temperature, minimum temperature, relative humidity, rainfall, sunshine hours and leaf wetness hours were recorded taken for the study.

### 2.3 Effect of biocontrol agents and chemicals on major diseases of browntop millet

Field trials were conducted to find out the effect of biocontrol agent and fungicides on the diseases of browntop millet at Centre of Excellence in Millets, Athiyandal, Tamil Nadu during 2022-23 and 2023-24. There were nine treatments imposed in the trials. The biocontrol agent's viz., *Bacillus subtilis* and *Trichoderma viride* were taken included in for the study. The crop was maintained by following necessary crop management practices. The incidence of blast and leaf blight recorded using scale 1-9 and per cent disease index were calculated using formula.

### 2.4 Statistical analysis

The experimental data statistical analysis was carried out by adopting the standard method. The field experiment was conducted in a randomized block design with three replications. The data was analysed by analysis of variance (ANOVA) of randomized block design (RBD). Data for correlation studies from each experiment were analysed by one-way analysis of variance using IBM SPSS (v. 28.0).

## 3. RESULTS AND DISCUSSION

The study was undertaken to assess the level of disease incidence in browntop millet at CEM, Athiyandal under North East Region of Tamil Nadu. The disease incidences was recorded during 2022-23 and 2023-24 and are presented in Table 1. The results revealed that blast symptoms, noticed were noticed from 10 DAS and shows showed an increasing trend upto 40 DAS and later shows decreasing trend which declined till the maturity of the crop thereafter. However, the leaf blight was noticed from 20 DAS and reached maximum level at 60 DAS in both years. [4] reported that about *H. setariae* causing

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leaf spot on browntop millet ~~and but so far no further there is no advance work work~~ on the pathogen has been ~~taken done till now. First occurrence~~ ~~The first report of~~ leaf blight caused by *Bipolaris setariae* on browntop millet in Peninsular India ~~and as well as its~~ the molecular characterization ~~was by~~ [5]. ~~Reports also available on~~ The prevalence of leaf blast in Uttarakhand region ~~has been summarized by~~ [6]. Correlation between weather variables and disease incidence also carried out to find out influence of weathers on disease incidence and the results ~~are~~ presented in Table 2. The results indicated ~~that only the negative influence - minimum of minimum temperature and positive influence of rainfall influences on the incidence of both both diseases incidences in the crop. Negative correlation observed between minimum temperature and disease incidence and positive correlation observed between rainfall and disease incidence.~~ Earlier, weather parameters ~~viz., average minimum and maximum temperatures of 21°C and 29°C respectively and a 70-81% relative humidity of 70-81% were found to favours~~ blast disease development [7].

~~Field~~ ~~The results of the field~~ experiments ~~were~~ carried out to study the effect of biocontrol agents and fungicides on incidence of blast as well as leaf blight in browntop millet at CEM, Athiyandal during 2022-23 and 2023-24 and results are presented in Table 3 and 4. ~~The results shows showed~~ significant variation ~~observed between among~~ the treatments on the disease incidences in both years (Table 3 and 4). The ~~treatment~~ Seed treatment with *B. subtilis* @10g/kg of seed +Foliar spray of Azoxystrobin 23% SC @ 1ml/l at 20 and 40 DAS recorded the lower incidence of blast as well as leaf blight disease incidence and produced more grain yield (1241.0 kg /ha) ~~and which was~~ followed by Seed treatment with *B. subtilis* @10g/kg of seed + Foliar spray of Propiconazole 25 % EC @ 1ml/l at 20 and 40 DAS. Seed treatment with biocontrol agents also performed better compared to untreated control. ~~Various biocontrol agents and chemicals against leaf blight pathogen under in vitro and he found that~~ Biocontrol agents ~~such as~~ *T. viride* and *B. velezensis* and chemicals ~~viz., propiconazole and mancozeb~~ exhibited the maximum inhibition of mycelia growth of the ~~pathogen leaf blight pathogen under in vitro conditions~~ [8]. The fungicide azoxystrobin ~~had been reported to be more efficacious-effective~~ than propiconazole in controlling rice blast disease [9]. ~~It was found that~~ Chemicals ~~such as~~ tricyclazole, azoxystrobin + difenoconazole, and azoxystrobin + tebuconazole ~~showing showed~~ the highest levels of blast reductions in rice [10]. The endophytes ~~viz., Curtobacterium, Microbacterium, Methylobacterium and Bacillus amyloliquefaciens~~ inoculated onto seeds proved very effective ~~against the pathogens which attack seeds as well as seedlings in Browntop millet~~ [11]. ~~A combination of Earlier, seed seed treatment with with 0.6% suspension of Pseudomonas fluorescens @ 0.6% followed by its two foliar sprays (@ 0.6 of 0.6% P. fluorescens) followed by and two sprays of hinosan @ 0.1% were was most significantly most~~ effective in reducing blast disease in finger millet [12].

**Table 1. Occurrence of blast incidence in browntop millet at CEM, Athiyandal (North east of Tamil Nadu)**

Sl.No	Days after sowing	Blast incidence (PDI)		Leaf blight incidence (PDI)	
		2022-23	2023-24	2022-23	2023-24
1	10	1.02	0.86	0.0	0.0
2	20	6.85	6.32	1.32	1.94
3	30	19.24	14.84	11.20	12.94
4	40	21.24	20.62	16.52	18.31
5	50	20.31	21.06	29.63	30.47
6	60	18.20	16.32	33.41	35.36
	CD (0.05% level)	1.02	0.86	3.52	3.96

Mean of four replications, each replication ~~contains~~ contains of PDI of 100 leaves.

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**Table 2. Correlation coefficient between significant weather variables and disease incidence**

Correlation Coefficient value	Blast incidence (PDI)		Leaf blight incidence (PDI)	
	2022-23	2023-24	2022-23	2023-24
Min Temperature	-0.802*	-0.832**	-0.702*	-0.729*
Rainfall	0.724*	0.831**	0.802*	0.812**

Significant level \*=p<0.001, \*\*= p<0.01

**Table 3. Effect of biocontrol agents and fungicides on blast and leaf blight of browntop millet during 2022-23**

Sl.No	Treatments	Blast incidence (PDI)			Leaf blight (PDI)			Yield (kg/ha)	B:C ratio
		15 DAS	30 DAS	45 DAS	15 DAS	30 DAS	45 DAS		
1	T1: Seed treatment with <i>Bacillus subtilis</i> @10g/kg of seed	1.6	10.2	14.3	0.85	8.25	17.3	1125.0	1.74
2	T2: Seed treatment with <i>Trichoderma viride</i> @ 4g/kg of seed	2.0	15.3	17.6	0.61	11.6	24.3	1025.3	1.59
3	T3: T1+ foliar spray of <i>B. subtilis</i> at 1g/lit at 20 and 40 DAS	1.5	6.20	10.0	0.49	6.02	14.3	1195.2	1.83
4	T4: T1+ Foliar spray of Azoxystrobin 23% SC @ 1ml/l at 20 and 40 DAS	1.8	2.68	4.12	0.73	3.68	7.24	1205.0	1.84
5	T5: T1+ Foliar spray of Propiconazole 25 % EC @ 1ml/l at 20 and 40 DAS	1.6	2.02	3.08	0.68	3.20	6.25	1241.0	1.90
6	T6: T2 + Foliar spray of Propiconazole	1.6	3.06	4.63	0.59	4.12	8.62	1185.6	1.81

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	e 25 % EC @ 1ml/l at 20 and 40 DAS								
7	T7: T2 + Foliar spray of Azoxystrobin 23% SC @ 1ml/l at 20 and 40 DAS	1.9 4	2.84	4.31	0.81	5.02	11.3 2	1174.5	1.79
8	T8: Foliar spray of Mancozeb 75 % WP @ 2.5g/L at 20 and 40 DAS	3.2 5	4.25	6.12	0.64	5.21	12.6 1	1162.3	1.80
9	T9: Control	3.6 1	18.3 2	22.1 5	0.81	12.5 2	28.9 6	985.0	1.55
	CD (0.05% level)	0.1 5	0.85	0.91	0.02 4	0.87	1.05 32.5	32.5	

Mean of three replications

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**Table 4. Effect of biocontrol agents and fungicides on blast and leaf blight of browntop millet during 2023-24**

Sl. No	Treatments	Blast incidence (PDI)			Leaf blight (PDI)			Yield (kg/ha)	B:C ratio
		15 DAS	30 DAS	45 DAS	15 DAS	30 DAS	45 DAS		
1	T1: Seed treatment with <i>Bacillus subtilis</i> @10g/kg of seed	1.21	11.3	15.2	0.34	10.4	19.3	1025.62	1.59
2	T2: Seed treatment with <i>Trichoderma viride</i> @ 4g/ kg of seed	2.08	13.6	18.3	0.42	13.6	25.1	984.5	1.53
3	T3: T1+ foliar spray of <i>B. subtilis</i> at 1g/lit at 20 and 40 DAS	1.41	5.05	11.2	0.61	8.24	15.2	1145.3	1.75
4	T4: T1+ Foliar spray of Azoxystrobin 23% SC @ 1ml/l at 20 and 40 DAS	1.25	1.93	4.01	0.48	4.62	7.02	1189.6	1.82
5	T5: T1+ Foliar spray of Propiconazole 25 % EC @ 1ml/l at 20 and 40 DAS	1.30	2.04	4.63	0.52	5.17	8.32	1175.0	1.80
6	T6: T2 + Foliar spray of Propiconazole 25 % EC @ 1ml/l at 20 and 40 DAS	1.62	2.68	5.27	0.61	6.31	8.67	1085.3	1.66
7	T7: T2 + Foliar spray of Azoxystrobin 23% SC @ 1ml/l at 20 and 40 DAS	2.01	3.06	5.30	0.47	7.02	8.49	1052.5	1.61
8	T8: Foliar spray of Mancozeb 75 % WP @ 2.5g/L at 20 and 40 DAS	2.60	4.92	7.02	0.53	8.32	13.0	1046.3	1.62
9	T9: Control	4.02	14.6	22.6	0.71	15.2	27.6	915.0	1.44

CD (0.05% level)	0.19	<sup>2</sup> 0.74	<sup>7</sup> 0.86	0.01	<sup>3</sup> 1.08	<sup>2</sup> 1.04	36.4
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#### 4. CONCLUSION

It is concluded that both blast and leaf blight symptoms were observed in browntop millet and blast symptom Blast occurred noticed from 10 DAS showing an increasing trend upto 40 DAS and later shows decreasing trend till the maturity of the crop which declined thereafter. However, the leaf blight was noticed from 20 DAS and reached reaching the maximum level at 60 DAS in both years. The A combination of seed treatment with *B. subtilis* @ 10g/kg of seed + foliar spray of Azoxystrobin 23% SC @ 1ml/l at 20 and 40 DAS is was effective in managing the two major diseases in browntop millet under field conditions.

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