

Investigations on magnitude and symptomatology of newly invasive leaf spot and tip blight of Nandi (*Lagerstroemia lanceolata* Wall.)

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Abstract: Leaf spot and tip blight of *Lagerstroemia lanceolata*, two new invasive foliar diseases pose a serious threat to the quality planting stock production. Investigations were done in three eco-climatic zones of Canara circle (*i.e.*, plain, hilly and coastal of Uttara Kannada district) revealed the incidence positivity of both the diseases in all nine nurseries surveyed. Maximum mean leaf spot incidence was in hilly zone (DI- 85.46%; PDI- 69.55) and coastal zone had highest tip blight (DI- 76.71; PDI- 59.49). The leaf spot disease induced seedling mortality was dominated by Kyadagi nursery in hilly zone (32.37%) and Sharavathi nursery (coastal zone) for tip blight disease (37.21%). The distinct leaf symptoms were red circular spots covered by a yellow halo. Similarly, tip blight showed white cottony growth on lower and corresponding yellow symptoms on upper leaf lamina.

Key words: Eco-climate, Leaf spot, Tip blight, Mortality, Survey, Symptom

Introduction

Lagerstroemia lanceolata Wall. (Syn. *L. microcarpa*) is commonly known as Benteak and locally as Nandi in Kannada. It is a timber valued large deciduous tree belongs to family Lythraceae. It is native to Indian sub-continent, south east Asia, northern Australia and other parts of Oceania. The tree is a strong associate of Teak and is majorly found in the patches of tropical semi-evergreen forest from Bombay southwards to Kerala. It is also distributed in the deciduous forest of Karnataka, Andhra Pradesh and Telangana (Fatima *et al.*, 2019).

The tree grows up to 30 m height with a clear bole of 12-15 m and a girth of 2.5-3 m. Its bark is greyish or greyish-white which is peelable and hence the tree is called 'Naked Queen of the forest' or 'Nude lady of the forest' (Florence *et al.*, 2015). Its timber is used in the construction of beams, rafts, agricultural implements, furniture, carts, boxes and tool handles (Meena, 2014). The seed and leaves have the potential to cure conditions such as asthma, chronic bronchitis, diabetes, common cold and cough. (Bhusnure *et al.*, 2010).

Presently the leaf spot and tip blight, two devastating seedling diseases hindering the quality planting stock production and supply. By considering its economic impact and commercial value of species the present study on "Investigations on magnitude and symptomatology of newly invasive leaf spot and tip blight of Nandi (*Lagerstroemia lanceolata* Wall.)".

Material and methods

The investigation was carried out at College of Forestry, Sirsi during 2022-23. Details of disease documentation, disease measurements, symptoms recording and disease induced mortality assessment methodology is narrated here under.

Disease survey: Disease documentation survey in *L. lanceolata* was conducted in nine different nurseries falling under three eco-climatic zones (plain, hilly and coastal) of Canara circle (Fig. 1). The information on the nurseries with their geo-reference details are mentioned in Table 1.

Disease measurements: Assessment of disease parameters [Disease incidence (DI) and Percent disease index (PDI)] was conducted in each of the nine nurseries distributed in each of the 3 eco-climatic zones.

Table 1. Study of forest nurseries in different eco-climatic zones of Canara circle

Eco-climatic zone	Division	Mean annual rainfall (mm)	Range	Name of the nursery	Geo- details reference
Plain	Yellapura	2313	Kathur	Kathur	N14°47' 37.34" E74° 41' 12.77"
				Yellapura Sabageri	N14°57' 51.51" E74° 42' 43.46"
				Hulekal Kengre	N14°39' 41.91" E74° 45' 57.54"
Hilly	Sirsi	3230	Sirsi	Kansur	N14°51' 20.16" E74° 46' 20.74"
				Kyadagi Kyadagi	N14°21' 29.22" E74° 44' 34.56"
				Janmane Amminalli	N14° 46' 20.74" E74° 14' 24.90"
Coastal	Honnavar	4096	Gerusoppa	Sharavathi	N14° 14' 36.61" E 74° 40' 7.98"
				Honnavar Kasarkod	N 14° 16' 7.18" E 74° 26' 0.60"
				Manki Beranki	N 14° 14' 0.80" E74° 32' 40.72"

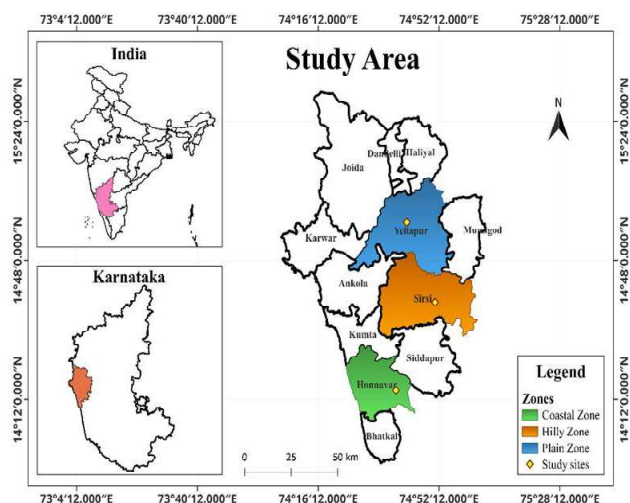


Fig. 1. Study locations in different eco-climatic zones of Canara circle

Disease Incidence: Count of infected plants and total seedlings raised was done and the disease incidence was calculated using the formula $[DI = (\text{No. of diseased seedlings} / \text{Total number of seedlings raised}) \times 100]$ and expressed in percentage scale to understand proportionate of seedlings damage.

Disease severity: It was estimated with the criteria of proportionate diseased leaf area covered over total leaf area assessed with visual acuity. The sampled populations of 100 seedlings randomly of 5 sets in each of the nursery were selected for observations. Disease severity in 0-4 scale as described by Naik and Lakkund (1997) was employed [Scale 0 (No symptoms), Scale 1 (1-10% leaf area covered), Scale 2 (11-25% leaf area covered), Scale 3 (26-50% leaf area covered) and Scale 4 (51-100% leaf area covered)].

Per cent disease Index: It was calculated by using formula described by Wheeler (1969).

$$PDI = \frac{(n_1 \times s_1) + (n_2 \times s_2) + (n_3 \times s_3) + (n_4 \times s_4) + (n_5 \times s_5)}{\text{Total number of leaves observed} \times \text{maximum grade}} \times 100$$

where n_1, n_2, n_3, n_4, n_5 is number of leaves under $s_1, s_2, s_3, s_4,$ and s_5 scales, respectively.

Symptoms: Detailed progressive symptoms of leaf spot and tip blight diseases on seedlings were recorded and photographed.

Disease induced mortality: It was tabulated by using the formula, per cent disease mortality = $(nd/N) \times 100$ as described by Singh (2005).

where, nd = number of plants died and N= total number of plants raised.

Results and discussion

The results generated in different studies are arranged under different suitable headings with explanations which is as follows

Disease survey: Disease documentation survey in *L.lanceolata* revealed two new invasive diseases, leaf spot and tip blight in all surveyed nine nurseries spread over three different eco-climatic zones of Canara circle (Table 2). The data indicated ubiquitous nature of disease which can sustain varied climatic factors. These diseases which were not there earlier and appearing in recently is an indicator of climate change impactation. Based on the symptoms, diseases were named as leaf spot and tip blight and uniqueness in symptoms to this species only.

Disease Incidence: Information gathered on Pestalotiopsis leaf spot and Cunning hamellatip blight incidence in *L. lanceolata* is presented in Table 3. Eco-climatic zone wise mean leaf spot incidence was high in hilly (85.46%) followed by coastal (73.25%) and plain (72.43%). Pertaining to nine nurseries data, Kyadagi (hilly) and Sharavathi (coastal) nurseries had cent per cent leaf spot incidence followed by Amminalli nursery in hilly (97.90 %). The least was in Beranki nursery of coastal (43.21%).

Whereas mean tip blight incidence was highest in coastal (76.71%) followed by hilly (68.34%) and plain zone (63.05 %). In nursery wise record, like leaf spot, tip blight was also high in Sharavathi (100%) followed by Kasarkod (83.17%) and Beranki had lowest (46.98%). This variation in disease incidence across zones might be due to regional differences in weather parameters that support the development of disease which could explain the diversity in disease incidence among zones. This was in accordance with the leaf spot and leaf blight of *Pongamia pinnata* in different nurseries of Haveri division as reported by Krishnambika (2009).

Per cent Disease Index:-In all the nine nurseries, severity scale of 0-4 was observed in the sampled populations of 100 each assessed. PDI estimates of Pestalotiopsis leaf spot and Cunning hamella tip blight in each of the nurseries raised in different locations under different eco-climatic zones is expressed and

Table 2. Eco climatic zone wise leaf spot and tip blight diseases of *Lagerstroemialanceolata* in different forest nurseries of Canara circle

Eco-climatic zone	Division	Range	Name of the nursery	Pestalotiopsi leaf spot	Cunninggha mella tip blight	Mortality	
						Leaf spot	tip blight
Plain	Yellapura	Kathur	Kathur	+	+	+	+
		Yellapura	Sabageri	+	+	+	+
		Hulekal	Kengre	+	+	+	+
Hilly	Sirsi	Sirsi	Kansur	+	+	-	+
		Kyadagi	Kyadagi	+	+	+	+
		Janmane	Amminalli	+	+	+	+
Coastal	Honnavar	Gerusoppa	Sharavathi	+	+	+	+
		Honnavar	Kasarkod	+	+	+	+
		Manki	Beranki	+	+	-	-

+ = Presence of disease; - = Absence of disease

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tabulated (Table 4). Hilly zone had maximum mean PDI for leaf spot (69.55%) followed by plain (58.51%) and coastal (57.66%). Among nine nurseries, highest leaf spot severity was in Kyadagi of hilly (87.04%) followed by Sharavathi of coastal zone (84.81%) and Beranki of coastal with lowest (32.10%).

The mean maximum tip blight severity was in coastal zone (PDI- 59.49 %) followed by hilly (PDI-50.07%) and plain

(PDI-45.58%). Sharavathi was with maximum (82.56%) followed by Kasarkod (63.51%) and the least in Beranki nursery (32.41%). A huge variation in disease severity was observed in three nurseries of coastal. High severity of leaf spot and tip blight might be due to sustainable inoculum sources namely infected voluntary sapling, infected un-disposed seedling stock in the nursery premises and high adaptation of pathogen to

Table 3. Eco-climatic zone wise leaf spot and tip blight incidence in *Lagerstroemialanceolata* in different nurseries of Canara circle

Eco-climatic Zone	Division	Range	Name of the nursery	Disease Index (%)	
				Pestalotiopsis leaf spot	Cunninghamella tip blight
Plain	Yellapura	Kathur	Kathur	56.42	62.56
		Yellapura	Sabageri	91.70	59.21
		Hulekal	Kengre	69.18	67.40
Mean				72.43	63.05
Hilly	Sirsi	Sirsi	Kansur	58.50	64.78
		Kyadagi	Kyadagi	100.00	78.44
		Janmane	Amminalli	97.90	61.81
Mean				85.46	68.34
Coastal	Honnavar	Gerusoppa	Sharavathi	100.00	100.00
		Honnavar	Kasarkod	76.54	83.17
		Manki	Beranki	43.21	46.98
Mean				73.25	76.71
Overall mean				77.05	69.37
S Em±				0.42	0.60

Table 4. Eco-climatic zone wise seedling diseases severity in *Lagerstroemialanceolata* in different nurseries of Canara circle

Eco-climatic Zone	Division	Range	Name of the nursery	Per cent Disease Index (%)	
				Pestalotiopsis leaf spot	Cunninghamella tip blight
Plain	Yellapura	Kathur	Kathur	46.17	48.74
		Yellapura	Sabageri	76.89	42.63
		Hulekal	Kengre	52.49	45.37
Mean				58.51	45.58
Hilly	Sirsi	Sirsi	Kansur	37.07	51.49
		Kyadagi	Kyadagi	87.04	49.57
		Janmane	Amminalli	84.55	49.17
Mean				69.55	50.07
Coastal	Honnavar	Gerusoppa	Sharavathi	84.81	82.56
		Honnavar	Kasarkod	55.97	63.51
		Manki	Beranki	32.10	32.41
Mean				57.66	59.49
Overall mean				61.90	51.71
S Em±				0.37	0.64



Plate 1. Symptoms progression of leaf spot disease in *Lagerstroemialanceolata*

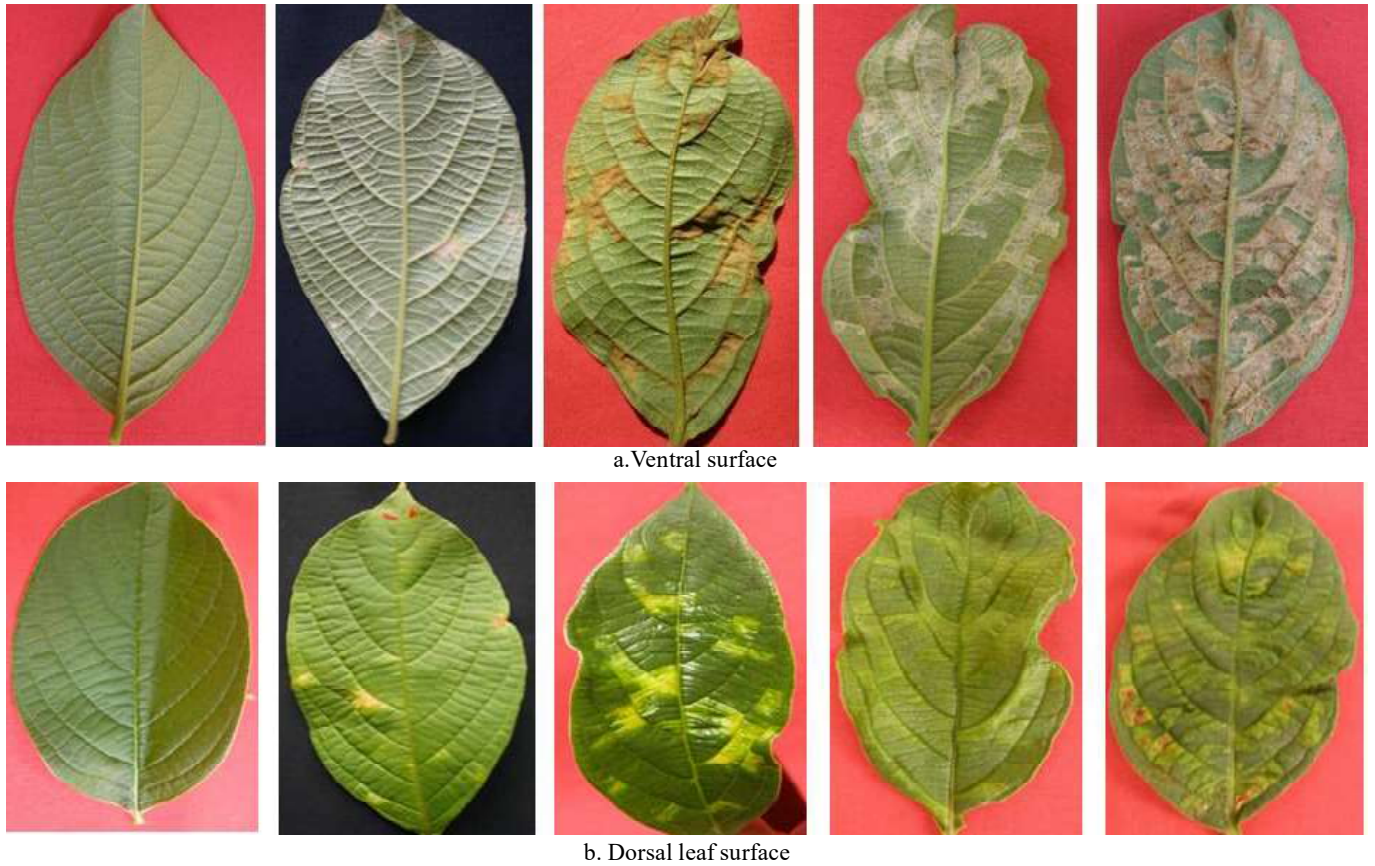


Plate 2. Symptoms progression of tip blight disease in *Lagerstroemia lanceolata*

Table 5. Eco-climatic zone wise leaf spot and tip blight diseases induced seedling mortality in *Lagerstroemia lanceolata* in different nurseries of Canara circle

Eco-climatic zone	Division	Range	Name of the nursery	Disease incidence(%)	
				Pestalotiopsis leaf spot	Cunninghamella tip blight
Plain	Yellapura	Kathur	Kathur	14.47	13.97
		Yellapura	Sabageri	24.34	8.16
		Hulekal	Kengre	8.50	10.42
Mean				15.77	10.85
Hilly	Sirsi	Sirsi	Kansur	0.00	1.40
		Kyadagi	Kyadagi	32.37	26.39
		Janmane	Amminalli	20.16	4.29
Mean				17.51	10.69
Coastal	Honnavar	Gerusoppa	Sharavathi	16.32	37.21
		Honnavar	Kasarkod	3.12	4.51
		Manki	Beranki	0.00	0.00
Mean				06.48	13.90
Overall mean			13.25	11.81	
S.Em±				0.39	0.51
C.D. @ 5%				1.19	1.55

changing environmental conditions has a major impact. Being the literature reveals no such diseases earlier, the findings are in consistent with previous records on related timber tree species viz., leaf spot and leaf blight of *Syzygium cumini* in multiple locations (Balasaheb, 2020).

Symptoms: Symptoms of yellow specks to deep red spots with distinct yellow halo initially on all aged leaves, which turned dark brown lesions covering entire leaf were predominant for Pestalotiopsis leaf spot (Plate 1). This is in concurrence with

the earlier recordings in leaf spot of *Plumeria rubra* (Xie et al., 2017). Similarly, Cunninghamella tip blight exhibited white cottony growth to brown woolly cover on lower leaf with corresponding yellow patches on the dorsal side (Plate 2). Similar symptoms were earlier recorded in blight disease of Indian mustard (Sangeetha and Siddaramaiah, 2007).

Disease induced mortality: Nursery wise data in different eco-climatic zones including zone wise mean mortality recordings are depicted in Table 5. Highest leaf spot induced mean mortality

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was seen in hilly zone (17.51%) followed by plain (15.77%) and coastal (6.48%). Among the nine nurseries, Kyadagi had highest leaf spot disease induced seedling mortality (32.37%) followed by Sabageri (24.34%) and Amminalli (20.16%). No mortality was observed in Kansur and Beranki nurseries.

For tip blight, the maximum mean mortality was in coastal zone (13.90%) followed by plain (10.85%) and hilly (10.69%). Sharavathi nursery in coastal zone had the highest seedling mortality (37.21%) followed by Kyadagi nursery in hilly zone

(26.39%). The least was in Kansur nursery of hilly zone (1.40%). No mortality was observed in Beranki nursery. This could be as a result of the short pathogenic cycles with high spore production and viability over numerous generations and diverse climatic circumstances, as well as the non-application of fungicides, which leads to the high mortality. Earlier reports are recorded with seedling mortality of 93.33 per cent in *Dalbergia sissoo* (Rajput *et al.*, 2010) and 71.7 per cent seedling mortality in *Eucalyptus* (Balmelli *et al.*, 2013).

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