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Prevalence of mulberry root rot disease in Tamil Nadu

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Abstract
The maximum root rot incidence of 55.00 per cent followed by 24.33 per cent were recorded in popular mulberry varieties V1 and MR2 respectively in mulberry growing areas of Tamil Nadu. Among three soil types found in the surveyed area, red soil recorded root rot incidence of 2.33 to 55.00 per cent. Various irrigation methods practiced by the mulberry farmers, drip irrigation recorded the disease prevalence of 0.00 to 37.00 per cent and in channel irrigation it was from 14.66 to 55.00 per cent. Recommended spacing of 3'×3' recorded minimum root rot incidence (24.33 per cent) followed by 3'×2' spacing recorded the maximum (55.00 per cent). Age of plantations had a direct relation with occurrence of root rot in mulberry.

Keywords: Mulberry, root rot, variety, soil type, irrigation system, age of plantation

Introduction
Mulberry (*Morus alba* L.) is grown as mono crop to produce leaf for silkworm rearing. The total area under mulberry in India was 2, 19, 819 ha and in Tamil Nadu was 13,062 ha [2]. Due to repeated harvesting of leaf the soil nutrients gets depleted and makes the plant susceptible to soil-borne diseases [11]. Root rot is the most serious disease owing to its epidemic nature and its potentiality to kill the plants and poses a severe problem during mulberry cultivation in the sericulture practicing countries. After introducing high yielding varieties followed by intensive cultivation practices, mulberry became vulnerable to root rot disease [5]. The disease incidence of 10 to 14 per cent was recorded in hot spot areas of Karnataka [14].
The present study was conducted during 2015-16 with an aim to assess the prevalence of root rot of mulberry in Tamil Nadu.

Materials and Methods
Survey
Survey was conducted to record the occurrence of root rot in mulberry growing areas of six districts *viz.*, Coimbatore, Tirupur, Erode, Dharmapuri, Tirunelveli and Tuticorin during June 2015- May 2016.
The disease symptoms observed on foliage as wilting of leaves and on roots as rotting of roots. Three to four root samples were collected from each location from the plants showing typical root rot symptoms. Each sample was packed in a paper bag and labelled. The samples were further studied and used for isolation of respective root rot pathogen.

Table 1: Survey locations in mulberry growing areas

S. No.	District	Village
1	Coimbatore	Thondamuthur, Annur, Peththikuttai
2	Tirupur	Dharapuram, Sevur, Kudimangalam
3	Erode	Gobichettipalayam, Nallagoundapalayam, Aapakoodal, Ayyampalayam, Othakuthirai, Nambiyoor, Sathyamangalam, DhasppagoundanPuthur
4	Dharmapuri	Papperettipatti, Kaarimangalam
5	Tirunelveli	Surandai, Aalankulam
6	Tuticorin	Muthalur, Puliyankulam, Tharuvaikulam, Soorankudi

Assessment of root rot incidence

Root rot incidence was recorded in relation to parameters like variety, soil type, irrigation type, spacing and age of plantation based on the questionnaire prepared.

In a field, twenty sq. m. area was marked at five places randomly and then number of diseased and total number of plants counted and the per cent disease incidence was calculated by using the following formula

$$\text{Per cent disease incidence} = \frac{\text{Total number of plants infected}}{\text{Total number of plants observed}} \times 100$$

Results and Discussion

Survey for root rot incidence in mulberry

The mulberry growing areas were surveyed (Table 1) as explained in materials and methods and the data generated are presented in Table 2.

Table 2: Assessment of root rot incidence in mulberry growing areas of Tamil Nadu

S. No.	District	Village	Varieties grown	Soil type	Spacing (in feet)	Irrigation type	Age of plantation (in years)	Per cent disease incidence
1	Coimbatore	Thondamuthur	V1	Red	3'×2'	Channel	15	55.00
2		Annur	V1	Red	3'×2'	Channel	6	20.00
3		Peththikuttai	V1	Red	3'×3'	Drip	9	3.33
4	Tirupur	Kudimangalam	MR2	Black	3'×3'	Drip	16	6.67
5		Dharapuram	V1	Red	3'×3'	Drip	9.5	15.00
6		Sevur	V1	Red	3'×2'	Drip	6	23.66
7	Erode	Gobichettipalayam	V1	Red	3'×2'	Channel	15	50.00
8		Othakuthirai	V1	Red	3'×2'	Drip	2	37.00
9		Nambiyoor	V1	Red	3'×2'	Channel	3	20.00
10		Nallagoundapalayam	V1	Red	3'×3'	Drip	12	10.00
11		Aapakoodal	V1	Red	3'×2'	Channel	15	18.33
12		Ayyampalayam	V1	Red	3'×2'	Channel	6	54.66
13		Dasappagoundan Pudur	V1	Red	3'×2'	Channel	2	36.00
14		Sathyamangalam	MR2	Red	3'×3'	Drip	5	24.33
15	Dharmapuri	Papireddipatti	V1	Black	3'×3'	Drip	5 years	1.56
16		Karimangalam	V1	Red	3'×2'	Channel	3 years	25.00
17	Tirunelveli	Surandai	V1	Red	3'×2'	Channel	7 (months)	2.33
18		Aalankulam	V1	Red	3'×2'	Channel	4	14.66
19	Tuticorin	Muthalur	V1	Red	3'×3'	Drip	1.5	5.00
20		Puliyankulam	V1	Black	3'×3'	Drip	1	0.00
21		Tharuvaikulam	V1	Black	3'×3'	Drip	2	0.00
22		Soorankudi	MR2	Theri (Red Sandy dunal)	3'×3'	Drip	1	12.33

Assessment of root rot incidence

Among the fields surveyed, mulberry root rot was recorded in 20 fields (Table 2).

Incidence of root rot in different varieties of Mulberry

Two mulberry varieties V1 and MR2 were cultivated in the study areas. Popular V1 variety was grown in 19 fields, of which 17 fields recorded root rot incidence where as another variety MR2 was cultivated in 3 fields and root rot was recorded in all the 3 fields (Table 2).

The variety V1 recorded the maximum root rot incidence of 55.00 per cent when compared to MR2, which recorded 24.33 per cent (Table 2). Among the four mulberry cultivars analysed for the defence related biochemical parameters *viz*., peroxidase (PO), polyphenol oxidase (PPO) and phenylalanine amino lyase (PAL) MR2 recorded more activity when compared to V1[6]. The survey results obtained in the present study also revealed that maximum root rot incidence in V1 compared to MR2.

Soil type and root rot incidence

In 22 fields surveyed, three type of soil namely Red soil, Black soil, and Theri soil (Red sandy dunal) had been observed. Red soil was the predominant soil type in the study villages, covering 17 villages. Only four villages, Puliyankulam, Tharuvaikulam, Kudimangalam and Papireddipatti had black soil and one village, Soorankudi with Theri (Red sandy dunal) soil. Among three soil types, red soil covers 77.27 per cent of the surveyed area and recorded disease incidence ranging 2.33 to 55.00 per cent. Black soil covers 18.18 per cent of the surveyed area and the disease incidence was ranging 0.00 to 6.67 per cent. In Theri soil type 12.33 per cent incidence was observed (Table 2).

Red soil was deficient of humus, nitrogen, potash, phosphate, manganese and lime. Organic carbon content was low in red soil due to the deficiency of humus [3]. The lack of nutrients in red soil favoured the development of root rot disease [1].

In the hot dry season the moisture from the black soil evaporates, the soil shrinks and was seamed with broad and deep cracks, often 10 to 15 cm wide and upto a meter deep. This permits oxygenation of the soil to sufficient depths and the soil has extraordinary fertility [3]. The black soil was very retentive of soil moisture and has the high C:N ratio when compared to red soil, hence black soil is less amenable for the development of root rot disease [1].

Role of different irrigation methods in disease incidence

Irrigation source plays a major role in spread of soil borne diseases. In 22 fields surveyed 12 fields and 10 fields followed drip and channel irrigation respectively (Table 2).

Among the 2 irrigation method followed, root rot incidence of 2.33 to 55.00 per cent were observed in channel irrigation followed by drip irrigation (0.00 to 37.00 per cent) (Table 2).

The drip irrigation system delivers the required quantity of water in the root zone and hence, the root growth is restrained in the irrigated area (root zone) in the drip irrigation and the plants have compact root growth pattern. Due to this, there could not be any interaction between the neighbouring plants through roots, so the chance of movement of pathogen from one plant to another plant is less and minimizes the

occurrence of root diseases. The plants grown on the furrow-irrigated fields suffered greater water stress than those grown on the drip-irrigated fields [10]. Preventing moisture stress reduced root rot incidence and was achieved by adopting drip method of irrigation. Moreover, the sclerotia floated freely on soil surface in flood irrigation and became primary inoculum for root rot infection [8]. The results obtained in the present study also corroborated the earlier findings.

Disease incidence and mulberry spacing

Two types of spacing were adopted by the farmers in the study area, *viz*., 3'×3' and 3'×2'. The recommended 3'×3' spacing was adopted by 45.45 per cent of the farmers and the remaining 54.54 per cent of the farmers followed 3'×2' spacing in the study area (Table 2).

Maximum root rot incidence of 2.33 to 55.00 per cent was observed in 3'×2' spacing and the incidence was 0.00 to 24.33 per cent in 3'×3' spacing (Table 2). Closer the plant spacing, the more efficient the spread of the pathogen and lesser time was needed for infection [4].

Disease incidence due to age of plantation

Age of plantation in the surveyed area varied from 7 months to 16 years. Root rot disease incidence increased with an increase in age of plantation. Among 11-16 years of plantation the disease incidence ranging of 6.67 to 55.00 per cent. In 6-10 years of plantation the disease incidence ranged from 3.33 to 54.66 per cent. From 7 months to 5 years of plantation the disease ranging from 0.00 to 37.00 per cent (Table 2).

In Malaysia, up to 40 per cent mortality of *Acacia mangium* due to root-rot disease was recorded in 14-year-old plantations [9], and similar mortality was also noted in trees aged between 9- and 14-year old in West Bengal, India [12]. In the Philippines, mortality was between 10 and 25 per cent in 6- to 10-year-old *A. mangium* [13]. In Indonesia, in 3- to 5-year-old plantations, root-rot incidence was recorded between 3 and 28 per cent [7].

Conclusion

The mulberry cultivar MR2 is less vulnerable to root rot when compared to V1. Mulberry cultivated in black soil, recommended spacing of 3'×3' and drip method of irrigation recorded minimum root rot incidence. However, the increased root rot incidence was observed with increase in the age of mulberry plantation.

References

1. Almasudy AM, You MP, Barbetti MJ. Influence of fungicidal seed treatments and soil type on severity of root disease caused by *Rhizoctonia solani* AG-8 on wheat. Crop Protection. 2015; 75: 40-45.
2. Anonymous. Annual report 2014-15. Central Silk Board, Bangalore, Government of India, 2015; 93
3. Bhattacharyya T, Chandran P, Ray SK, Mandal C, Pal DK, Venugopalan MV *et al*. Characterization of benchmark spots of selected red and black soils in semi-arid tropics India-working report of identifying systems for carbon sequestration and increased productivity in semi-arid tropical environments (RNPS-25) (NATP, ICAR), 2003, 370.
4. Bisby GR. Stem-rot of sunflowers in Manitoba. Science Agriculture (Ottawa), 1921; 2:58-61.
5. Chowdary NB, Govindaiah. Leaf yield loss assessment due to *Macrophomina* root rot disease in mulberry gardens of South India. Archives of Phytopathology Plant Protection. 2009; 42:1055-1058.
6. Gangadhara S. Studies on micropropagation of mulberry and *in vitro* screening for resistance to root rot (*Macrophomina phaseolina*) Tassi. M.Sc. (Seri.) Thesis, Tamil Nadu Agricultural University, Coimbatore, 2005, 74.
7. Irianto RSB, Barry KM, Hidayah I, Ito S, Fiani A, Rimbawanto A *et al*. Incidence and spatial analysis of root rot of *Acacia mangium* in Indonesia. Journal of Tropical Forest Science. 2006; 18:87-90.
8. Khan SN. *Macrophomina phaseolin*a as causal agent for charcoal rot of sunflower. Mycopath. 2007; 5:111-118.
9. Lee SS. The current status of root diseases of *Acacia mangium* Willd. In: Ganoderma Diseases of Perennial Crops. Ed. by Flood J, Bridge PD, Holderness M, Oxon, UK: CAB International, 2000, 71-79.
10. Mahgoub NA, Ibrahim AM, Ali OM. Effect of different irrigation systems on root growth of maize and cowpea plants in sandy soil. Eurasian Journal of soil science. 2017; 6:374-379.
11. Mallikarjuna B, Magadum SB, Gunashekar V. A survey on incidence of root diseases of mulberry. Karnataka Journal of Agricultural Sciences. 2010; 23:655.
12. Mehrotra MD, Pandey PC, Chakrabarti K, Suresh S, Hazra, K. Root and heart rots in *Acacia mangium* plantations in India. Indian Forester. 1996; 122:155-160
13. Militante EP, Manalo MQ. Root rot disease of mangium (*Acacia mangium* Willd.) in the Philippines. In: 5th International Conference on Plant Protection in the Tropics, March 15-18, 1999, Kuala Lumpur, Malaysia. Ed. by Sivapragasam A, Ismail AA, Sidam AK, Cheah UB, Chung GF, Chia TH, 1999, 448-450.
14. Philip T, Govindaiah, Bajpai AK, Nagabhushanam G, Naidu NR. A preliminary survey on mulberry diseases in South India. Indian Journal of Sericulture. 1997; 34:137-139.