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New report of *Lasiodiplodia theobromae* causing *Jatropha* decline in Eastern Plateau and Hill region of India

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Lasiodiplodia theobromae (Pat.) Griffon & Maubl. causing Jatropha (*Jatropha curcas* L.) decline was reported for the first time from Eastern Plateau and Hill region of India. The symptoms of the disease initially observed are yellowing, drooping and shedding of leaves and later as necrotic lesions on stem. Vascular discolouration was also observed when the infected portion of stem was split open. The disease-causing pathogen was isolated and identified on the basis of its colony morphology, conidial and pycnidial characteristics.

Keywords: *Lasiodiplodia theobromae*; *Jatropha* decline; Eastern Plateau & Hill region of India

Physic nut (*Jatropha curcas* L.) is a non-edible oil plantation crop predominately cultivated worldwide for the production of biodiesel. The plant is a native of the American tropics, most likely Mexico and Central America. It is a bushy, small tree species of flowering plant in the genus *Jatropha* belonging to family Euphorbiaceae. In India, it is widely transplanted in thousands of hectare in a pastureland and uncultivated land or in roadside or rail trackside throughout the county. There is a growing interest in *J. curcas* as a biodiesel to help assuage the fuel/energy crisis and generate income in rural areas of developing countries. It is now becoming a poster child among some proponents of renewable energy and appropriate technology, especially as an oil-bearing, "drought resistant", non-grazing tree for marginal lands for small farmers and said now as "miracle tree" with a lifespan of more than 50 years. Several reports indicated that the Jatropha plants were highly resistant to pests and diseases (Chitra & Dhyani 2006). However, *Lasiodiplodia theobromae* (Pat.) Griffon & Maubl. (syn = *Botryodiplodia theobromae*), the anamorph of *Botryosphaeria rhodina* Berk. & Curt. Arx., is a well known plant pathogen which had a very wide host range and can infect more than 500 cultivated and non-cultivated plants (Narasimhudu & Reddy 1992; Urbez-Torres et al. 2008; Pereira et al. 2009; Celiker & Michailides 2012; Sulaiman et al. 2012).

In Eastern Plateau & Hill Region of India (Figure 1), severe *Jatropha* decline has been observed (in the month of March–April 2013, mean weather data-T^{Min}: 18.18 °C, T^{Max}: 34.08 °C, RH: 75.11 and rainfall: 3.25 mm) in the village of Nagri (lattitude-23°21.388′ N, longitude-85°14.661′, elevation-685 msl, annual rainfall-1200 mm and soil type is red lateritic with moram and gravels) which was transplanted in 2010 by the Institute of Forest Productivity, Ranchi, Jharkhand, India.

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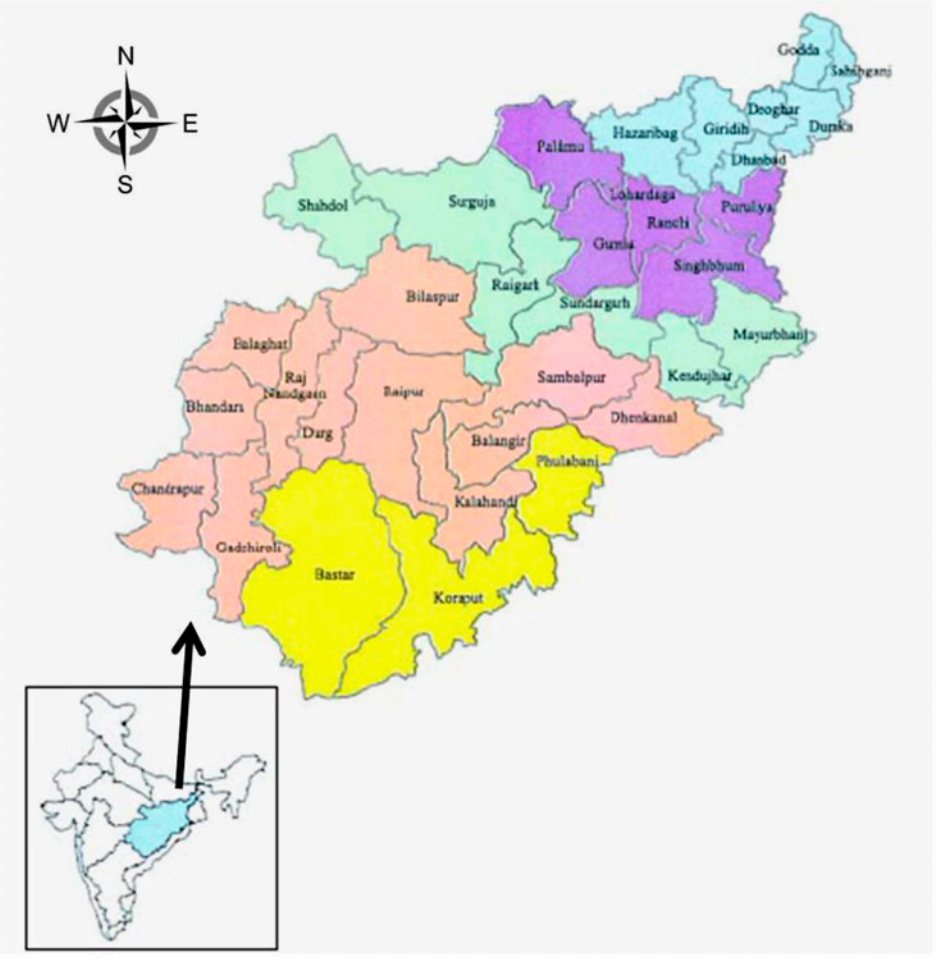

Figure 1. Map of Eastern Plateau and Hill region of India (Generated using ArcGIS Soft.).

The first symptoms were observed on leaves; initially leaves become yellowing, drooping and shedding of leaves. Later, disease symptoms spread on the stem and roots. The infected stem showed necrotic lesions on branches as scars which become brownish and sunken. When infected stem split open, discolouration of vascular bundle/tissue below the lesion was observed. Infected roots also exhibited discolouration and browning of vascular tissues (Figure 2 (a)–(f)). Sulaiman et al. (2012) reported that the disease caused 80% plantation losses when disease is severe.

Isolation was made in the Laboratory of Plant Pathology, ICAR Research Complex for Eastern Region, Research Centre, Ranchi, Jharkhand, India. The disease samples were collected from infected plantation field and the infected portions were surface washed with the help of $AgNO_3$ and then the infected tissues were cut into small pieces with sterile knife and kept on the moist filter paper chamber for induced mycelial growth of the fungal pathogen. After mycelial growth has begun, a small fragment of fungal hyphae was isolated and inoculated on potato dextrose agar (PDA) medium. The Petri dishes were incubated at 25 °C. The pure culture was purified with the help of

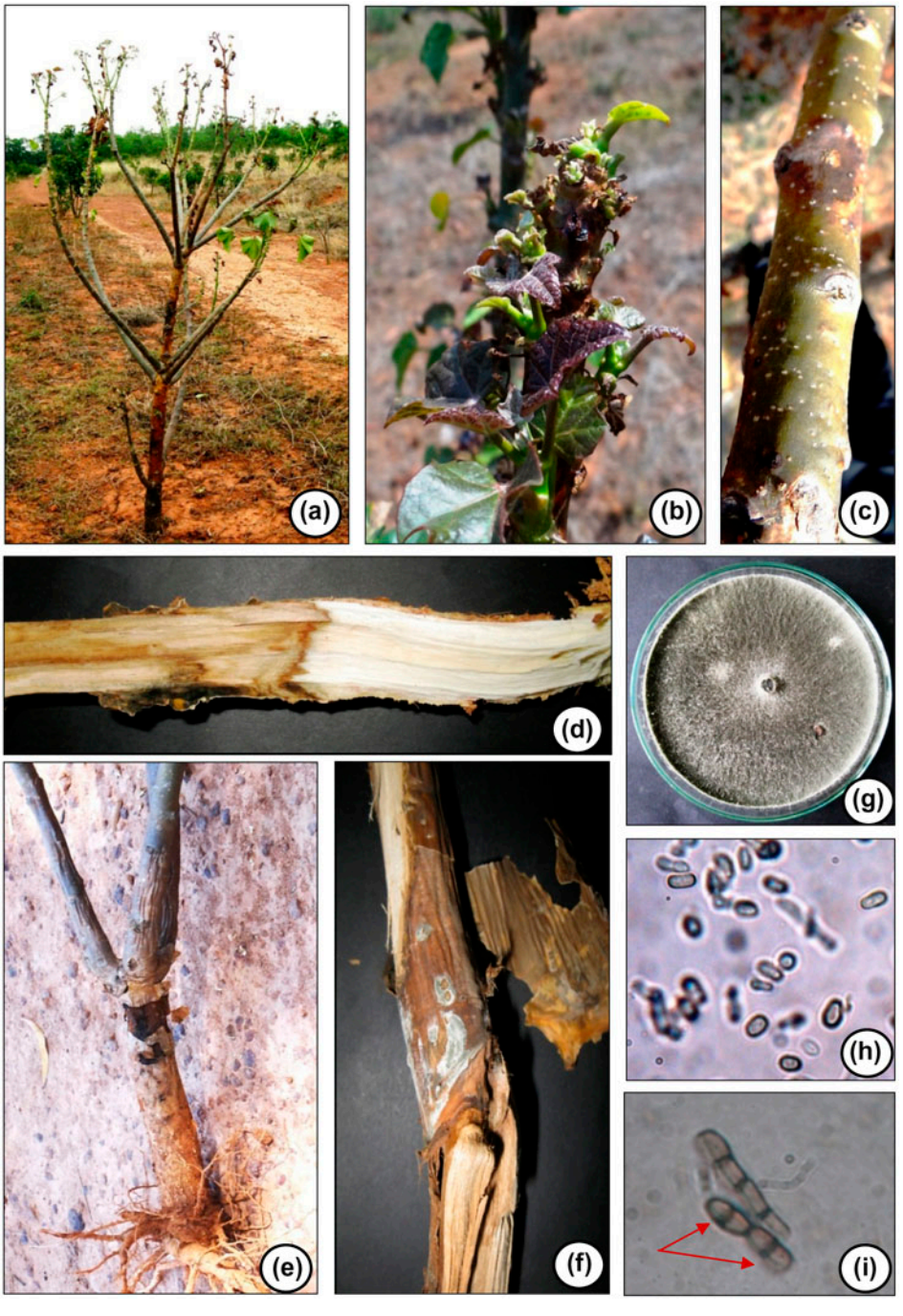

Figure 2. (a) Infected Jatropha plant (b) Symptoms on twig (c) Canker on stem (d) Vascular discolouration (e) Rotting of collar region (f) Fungal growth under bark (g) *L. theobromae* culture on PDA (h) Conidia (immature) (i) Mature Conidia.

hyphal-tip isolation techniques on PDA slants for further morphological studies. Semi-permanent slide mount was prepared by using lactophenol cotton blue and examined under a phase contrast microscope (type 020–519.503 LB 30T, Leica, Germany) equipped with a photomicrograph camera. Measurement of conidia was carried out using an ocular micrometre.

Fungal colonies on PDA agar are greyish sepia to greyish black, fluffy with abundant aerial mycelium; reverse fuscous black to black (Figure 1(g)). Colonies had copious, white, aerial mycelia that turned grey to black with age and formed black pycnidia in the later stage. Pycnidiospores were oval, greenish brown, with one septum in the middle, dimensions 20.9–27.5 × 11.0–15.4 µm (Celiker & Michailides 2012). Pycnidia from four-week-old pure cultures produced dark brown, thin-walled oval conidia with single septation and longitudinal striations. Conidiophores are hyaline, simple, sometimes septate, rarely branched cylindrical, arising from the inner layers of cells lining the pycnidial cavity. Conidiogenous cells are hyaline, simple and cylindrical to subobpyriform, holoblastic, annellidic. Conidia are initially unicellular, hyaline, granulose, subovoid to ellipsoide-oblong, thick-walled, base truncate; mature conidia one-septate, cinnamon to fawn, often longitudinally striate. The average size of the conidia was 22.70 × 12.02 µm (n = 25) with a length/width ratio of 1.57 (Figure 1(h)–(i)). The test of pathogenecity was done by inoculating the plant (at nursery stage) with reproductive structures from the margins of a seven-day-old colony of *L. theobromae* growing on PDA. Browning of the collar region, similar to those described, was detected 1 month after the inoculation and the fungus was reisolated from the artificially inoculated plants, thus satisfying Koch's Postulates.

Characteristics of the *Lasiodiplodia* species commonly include the presence of paraphyses within the conidiomata pycnidial and conidia that are initially hyaline and aseptate. At maturity, one median septum is formed, and the walls become dark brown with the formation of longitudinal striations due to the deposition of melanin granules on the inner surface of the wall (Machado & Pereira 2013). *Lasiodiplodia* spp. is a fungus of the phylum Ascomycota, family Botryosphaeriaceae. Fungi in this family are known to survive as endophytes and demonstrate symptoms when plants are under some stress (Slippers & Wingfield 2007). It causes rotting and dieback in most species where it infects. The disease has been characterised by the exudation of gum, wilting, dieback, vascular browning and death of the whole tree (Narasimhudu & Reddy 1992; Khanzada et al. 2004). *L. theobromae* was reported infecting *Jatropha* in Brazil (Pereira et al. 2009), Malesia (Sulaiman et al. 2012) and India (Latha et al. 2009). *L. theobromae* was also reported infecting grapevine in Italy (Burruano et al. 2008) and Mexico (Urbez-Torres et al. 2008), *Begonia* in Brazil (Fujinawa et al. 2012) and fig in Turkey (Celiker & Michailides 2012).

The fungus was identified as *L. theobromae* (Pat.) Griffon & Maubl. (syn = *Botryodiplodia theobromae*), the anamorph of *Botryosphaeria rhodina* Berk. & Curt. Arx., based on colony morphology and conidial characteristics as well as unique features of the pycnidiospores. Jatropha decline caused by *L. theobromae* is reported for the first time from Eastern Plateau & Hill Region of India.

References

Burruano S, Mondello V, Conigliaro G, Alfonzo A, Spagnolo A, Mugnai A. 2008. Grapevine decline in Italy caused by *Lasiodiplodia theobromae*. Phytopathol Mediterr. 47:132–136.

Celiker NM, Michailides TJ. 2012. First report of *Lasiodiplodia theobromae* causing canker and shoot blight of Fig. in Turkey. New Dis Rep. 25:12.

Chitra S, Dhyani SK. 2006. Insect pests of *Jatropha curcas* L. and potential for their management. Current Sci. 91:162–163.

Fujinawa M, Pontes NC, Carmo de Souza ES, Goes A, Vale H. 2012. First report of *Lasiodiplodia theobromae* causing stem rot disease of begonia (*Begonia* x elatior hort.) in Brazil. Australas Plant Dis Notes. 7:163–166.

Khanzada MA, Lodhi AM, Shahzad S. 2004. Pathogenicity of *Lasiodiplodia theobromae* and *Fusarium solani* on Mango. Pak J Bot. 36:181–189.

Latha P, Prakasam V, Kamalakannan A, Gopalakrishnan C, Raguchander T, Paramathma M, Samiyappan R. 2009. First report of *Lasiodiplodia theobromae* (Pat.) Griffon & Maubl causing root rot and collar rot disease of physic nut (*Jatropha curcas* L.) in India. Australas Plant Dis Notes. 4:19–20.

Machado RS, Pereira OL. 2013. Major diseases of the biofuel plant. Physic Nut (*Jatropha curcas*). http://dx.doi.org/10.5772/52336

Narasimhudu Y, Reddy PSN. 1992. A note on gummosis of mango. Indian Phytopathol. 45:261–262.

Pereira OL, Dutra DC, Dias LAS. 2009. *Lasiodiplodia theobromae* is the causal agent of a damaging root and collar rot disease on the biofuel plant *Jatropha curcas* in Brazil. Australas Plant Dis Notes. 4:120–123.

Slippers B, Wingfield MJ. 2007. Botryosphaeriaceae as endophytes and latent pathogens of woody plants: diversity, ecology and impact. Fungal Biol Rev. 21:90–106.

Sulaiman R, Thanarajoo SS, Kadir J, Vadamalai G. 2012. First report of *Lasiodiplodia theobromae* causing stem canker of *Jatropha curcas* in Malaysia. Plant Dis. 96:767.

Urbez-Torres JR, Leavitt GM, Guerrero JC, Guevara J, Gubler WD. 2008. Identification and pathogenicity of *Lasiodiplodia theobromae* and *Diplodia seriata*, the causal agents of bot canker disease of grapevines in Mexico. Plant Dis. 92:519–529.