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RESPONSE OF DIFFERENT MANGO CULTIVARS TO MANGO DECLINE PATHOGEN, *LASIODIPLODIA THEOBROMAE* PAT.

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ABSTRACT

Twenty varieties of mango *viz.*, Langra, Chaunsa, Sindhri, Neelum, Jagidar, Anwar Ratol, Saleh Bhai, Saroli, Almas, Zafran, Gulab Khasa, Anmol, Sawarnarica, Bagan Pali, Dusheri, Bombay, Mehran, Rampuri, Lal Badshah and Tuta Pari screened against *Lasiodiplodia theobromae.* Of these, only Bagan Pali, Saroli and Saleh Bhai showed resistance against *L. theobromae,* whereas, Langra, Sindhri and Almas were highly susceptible.

Keywords: Mango decline, *Lasiodiplodia theobromae*, host response, resistant varieties

INTRODUCTION

Among the fruit trees, mango (*Mangifera indica* L.) has greatest varietal richness; there are more than 1000 varieties of mango in the world (Medina and Garcia, 2003; Mukherjee, 1997). About 30 varieties are grown on commercial scale in India (Yadav and Rajan, 1993). Chadha (1995) reported 1000 mango varieties alone from India. Some 250 varieties of mango are said to be grown in Pakistan. Tere are 70 grafted varieties are grown in Sindh (Khan and Shaukat, 2006). The important mango varieties of Pakistan are Anwar Ratol, Baganapalli, Chaunsa, Dashehari, Gulab Khas, Langra, Saroli, Sindhri, Suvarnarekha and Zafran. Mango is cultivated in more than 85 countries of the world; of these, 63 countries produce more than 1000 million tons mangoes a year (Galan, 1997, 2008). The popularity of mango fruit can be examined by the fact that about 50% of all tropical fruits produced worldwide are mangoes. India with annual production of 15.25 million tones ranks first among world's mango producing countries followed by China (4.4 million tons), Kenya (2.78 million tons), Thailand (2.65 million tons), Indonesia (2.38 million tones) and Pakistan (1.95 million tones) (FAO Statistics, 2012). Mango is an important fruit crop in Pakistan comprising 1/4th of the entire national fruit industry (Anon, 2007). It is grown over an area of 174 thousand hectares in the country producing 1950 thousand tones (FAO Statistics, 2012).

Mango suffers from damages by a large number of insects, diseases and disorders. Association of a great variety of insect pest and plant pathogens has been attributed to the large cultivation area and fairly high number of varieties grown in different ecological regions and it is estimated that the production could be increased by 28% if the crop is protected against various diseases (Rawal, 1998).

Mango plantations in Pakistan especially in different areas of Sindh province were found to suffer from a decline disease caused by *Lasiodiplodia theobromae* Griff. & Maubl. (synonyms: *Botryodiplodia theobromae*, *Diplodia theobromae*) showing symptoms of drying of branches from the tip accompanied with a heavy exudation of yellowish-brown gum from stem and its branches and browning of vascular tissues. Under severe conditions, the disease results in death of the plant (Khanzada *et al*., 2004a, b). The casual fungus *L. theobromae* is a common soil-borne saprophyte or wound parasite, distributed throughout the tropics and subtropics with wide host range and attacks more than 280 species of plants in different parts of the world (Domsch *et al*., 1980; Sutton, 1980). It is also produces one or more similar type of symptoms in other crop plants (Li *et al.*, 1995; Riffle and Krupinsky, 1986; Cedeno and Palacios, 1992; Ko *et al*., 2004; Phipps and Porter, 1998).

In the present scenario i.e. monoculture of host and wide host range of pathogen, the chemical disease control can be difficult and costly; this has especially happened in fruit trees where disease control is so expensive (Ploetz, 2000; Schieber, 1972). Cultivation of resistant varieties is the best possible control strategy. In order to find out the resistant mango cultivars, the varietal response of commercial mango varieties to *L. theobromae* have been evaluated.

MATERIALS AND METHODS

Twenty mango varieties *viz.*, Langra, Chaunsa, Sindhri, Neelum, Jagidar, Anwar Ratol, Saleh Bhai, Saroli, Almas, Zafran, Gulab Khasa, Anmol, Sawarnarica, Bagan Pali, Dusheri, Bombay, Mehran, Rampuri, Lal Badshah and Tuta Pari were used for this purpose. The apparently healthy looking plants of 3 years age obtained from Sindh Horticultural Research Institute, Mirpurkhas, Sindh, Pakistan were used in this study.

Stems of all the varieties inoculated by making a cut using a sterilized knife or saw. A 1x2 cm inoculum block from 5 days old culture of the test fungus on PSA placed in the gap and the inoculated portion wrapped with Para film. A 1x2 cm PSA block without fungus placed in the control plants. Plants irrigated after inoculation and the wrapping material removed from the stems after 2 weeks of inoculation. Plants monitored for the development of disease symptoms and isolations made from roots, stem and branches of the test plants after two months of inoculation to determine the response of each variety. The experiments carried out in randomized complete block design with four replications. The infection (%) of causal fungus was recorded using the following formula:

$$\text{Colonization (\%)} = \frac{\text{Number of pieces colonized by a pathogen}}{\text{Total number of pieces}} \times 100$$

Statistical Analysis

Finally the data was analyzed by ANOVA using Statistix 8.1 software. Least significant differences (LSD) were calculated using significant level at $P = 0.05$.

RESULTS

Data on disease development recorded after 60 days of inoculation revealed that most of the mango varieties were susceptible to *L. theobromae* except Bagan Pali, Saroli and Saleh Bhai (Fig. 1). The inoculated pathogen failed to produce typical symptoms of mango decline like gum exudation and browning of vascular tissues in Began Pali and Saleh Bhai (Table 1). All other cultivars showed moderate to severe disease symptoms. Consequently, significantly least pathogen infection was recorded in cv. Saleh Bhai followed by Saroli and Bagan Pali, whereas maximum *L. theobromae* infection was observed in cv. Langra followed by Sindhri and remaining cultivars (Fig. 1). *L. theobromae* was highly virulent to mango varieties Langra, Sindhri and Almas, where it causes 90-100% plant mortality (Fig. 2). However, it failed to cause any impact on mango varieties Began Pali and Saleh Bhai in term of plant mortality. Other varieties *viz.*, Chaunsa, Neelum, Jagidar, Anwar Ratol, Gulab Khasa, Zafran, Anmol, Sawarnarica, Dusheri, Bombay, Mehran, Rampuri, Lal Badshah and Tuta Pari showed moderate susceptibility against the test pathogens (Fig. 2) and slight to medium dieback, gummosis and internal browning of vascular tissues observed (Table 1).

DISCUSSION

Use of resistant varieties is most fascinating way to combat devastating diseases of crop plants throughout the world. During the present studies, 20 mango varieties screened against *L. theobromae*. Most of the mango varieties failed to resist against the casual pathogen, among them cv. Langra, Sindhri and Almas appeared as highly susceptible. Only three varieties *viz*., Bagan Pali, Saroli and Saleh Bhai tolerated against the infection of *L. theobromae*. Similar investigation carried out by (Mahmood *et al*., 2007) in Punjab province of Pakistan, in which they screened nine mango varieties against *L. theobromae* and found that among these, Sindhri appeared as highly susceptible whereas Langra and Desi were comparatively less susceptible to the test pathogen. Our studies however revealed that Langra was among the highly susceptible varieties. Similarly, Saeed *et al.,* (2011) also evaluated eight mango varieties against *L. theobromae* and reported that Dusheri was comparatively tolerant than other varieties, whereas, Anwar Ratol was the highly susceptible followed by Langra, Fajri and Black Chounsa. During the present studies, Langra was the most susceptible variety followed by Anwar Ratol and Dusheri. This variation in the resistance and susceptibility may be due to the genetic variation in different isolates of *L. theobromae.* (Ramos *et al*., 1997) evaluated 122 mango cultivars against *Botryosphaeria ribis* causing tip dieback disease in Florida, and concluded that no significant differences in mean disease severity were present in different groups of mango cultivars and field resistance to tip dieback may be present in some mango cultivars. Presence of resistance in Began Pali, Saroli and Saleh Bhai varieties of mango can be utilized to transfer resistance to otherwise susceptible varieties in future.

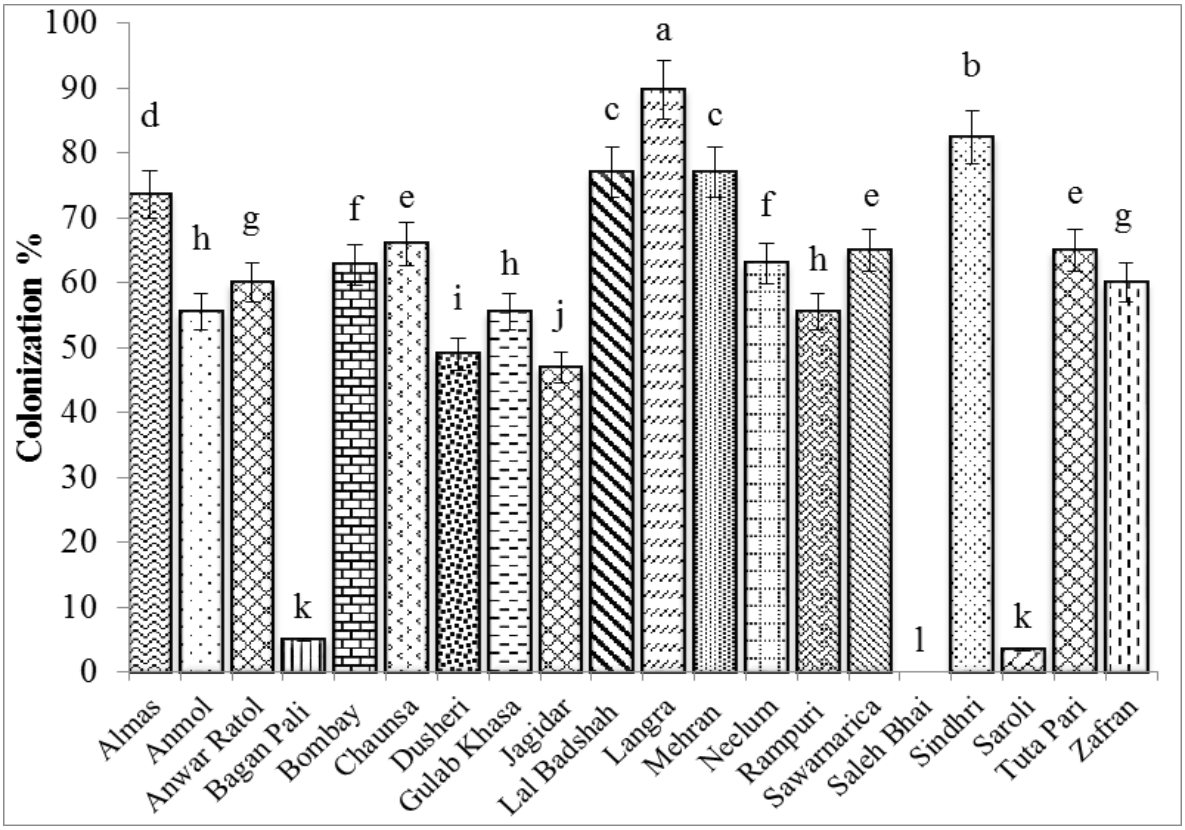

Fig. 1. Pathogen infection in mango plants inoculated with *Lasiodiplodia theobromae.*
LSD (P<0.05) = 1.5799; Different letters are significantly different with each other at P<0.05 level.

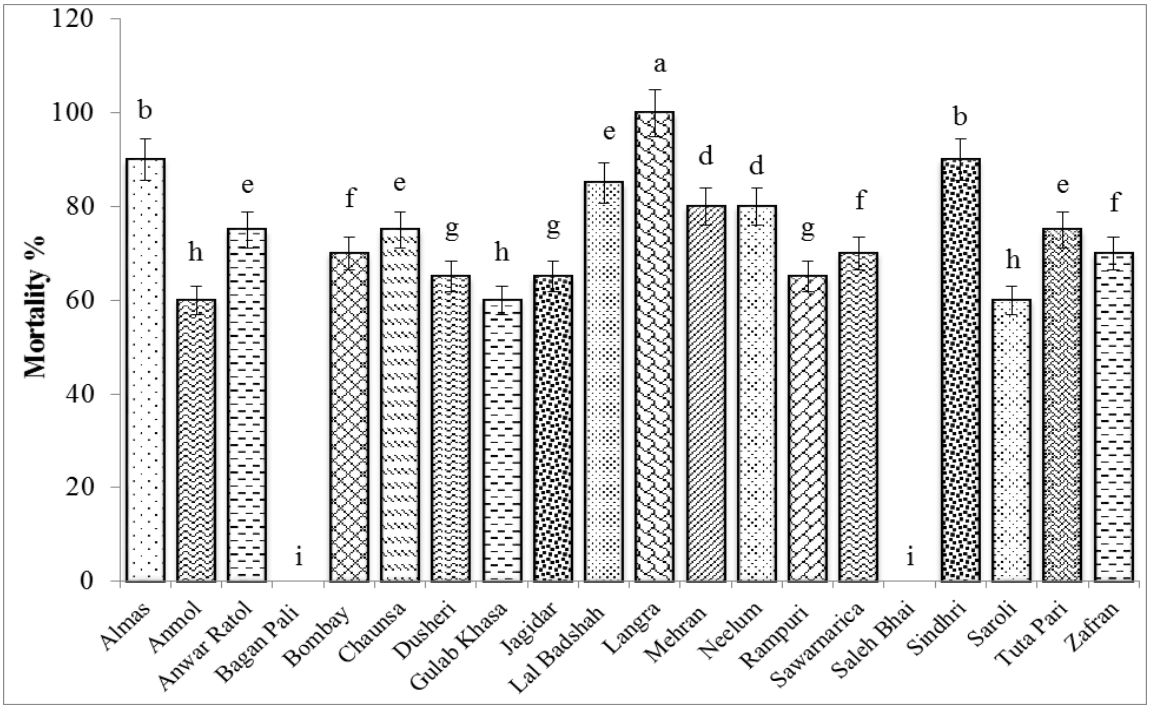

Fig. 2. Mortality of mango plants inoculated with *Lasiodiplodia theobromae.*
LSD (P<0.05) = 1.73; Different letters are significantly different with each other at P<0.05 level.

Table 1. Severity of symptoms on mango plants inoculated with *Lasiodiplodia theobromae.*

Mango varieties	**Symptoms produced on mango plants***		
	Drying of tips*	**Gum exudation***	**Internal browning***
Almas	3	2	3
Anmol	2	1	2
Anwar Ratol	3	3	2
Bagan Pali	1	0	0
Bombay	2	2	2
Chaunsa	3	2	2
Dusheri	2	3	3
Gulab Khasa	2	1	2
Jagidar	3	2	1
Lal Badshah	3	2	2
Langra	3	3	3
Mehran	3	2	2
Neelum	3	2	2
Rampuri	2	2	1
Sawarnarica	3	3	2
Saleh Bhai	1	0	0
Sindhri	3	2	3
Saroli	2	2	2
Tuta Pari	3	2	3
Zafran	3	1	2

*0= No symptoms, 1= Very light, 2= Moderate, 3= Severe symptoms.

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