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Symptomatology and management of crown rot disease of arecanut palm (*Areca catechu* L.)

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Abstract

Bud and crown rot diseases of arecanut palm (*Areca catechu* Linn.) are fatal diseases caused by *Phytophthora meadii* McRae. The pathogen could be isolated from the lesioned tissues of the bud, leaf sheath, developing inflorescence and internal tissues of the tender stem. Experiments were carried out using challenge inoculated one year old arecanut seedlings raised in polythene bags. Out of the three systemic fungicides, phosphorous acid (0.3%) was found superior to tridemorph and hexaconazole. Among the contact fungicides, propineb was found effective in checking the growth of *P.meadii* on arecanut seedlings. In a trial carried out at four different locations with phosphorous acid and tridemorph each at 0.3% conc. applied as soil drenching or as combination of soil drenching and spraying gave total control of the disease in adult palms when treated in the initial/middle stages of the disease.

Keywords: bud /crown rot, hexaconazole, phosphorous acid, *Phytophthora meadii,* propineb, tridemorph

Introduction

Bud and crown rots are fatal diseases of areca palm caused by *Phytophthora meadii* McRae (Saraswathy, 1994). The fungus also causes fruit rot which is prevalent during Southwest monsoon months (May-August). Bud and crown rots also start during southwest monsoon period. But the infection continues even after the monsoon period (October-December). These diseases may occur independently or can be manifestation of severe fruit rot. Bud and crown rots of arecanut palm were reported earlier (Coleman, 1910) and the pathogen was reported as *P.arecae* Peth. Later, Sastry and Hegde (1985) and Saraswathy (1994) reported *P.meadii* as the pathogen causing fruit, bud and crown rot diseases of arecanut palm. Sastry and Hegde (1985) reported mortality of palms due to bud rot to a tune of 50 palms/ acre. However, bud/crown rot has not appeared in an alarming proportion to consider them as major disease(s) till early 1990's when the incidence of this disease was recorded as 15 per cent from an arecanut garden at Vittal, Dakshina Kannada district, Karnataka (Saraswathy, 1994).A recent field observation revealed that up to 13.3 per cent palms are affected by crown rot with a mortality of 8 per cent (Unpublished).Though crown rot was reported in 1910, not much work has been carried out on the management of this disease except the recommendation of 1% Bordeaux mixture spraying/ drenching of the crown. So the present study was carried out to evaluate the efficacy of systemic and newer contact/botanical fungicides other than Bordeaux mixture in controlling bud/crown rot disease(s).

Materials and Methods

Samples were collected from crown rot affected palms occurring in different locations of Dakshina Kannada district viz; Vittal, Seed farm Kidu, farmers' plots at Belthangady, Mithur, Mullinja and Ujire and from Puthige in Kasaragod district of Kerala for isolation of the pathogen. Carrot agar medium was used for isolation and maintenance of stock cultures and the causal organism was identified as *P.meadii*. Based on the results of *in vitro* and *in vivo* studies carried out against *P.meadii* causing fruit rot of arecanut palms (Anon, 2000), three systemic fungicides hexaconazole, phosphorous acid and tridemorph were selected for the management trial of crown rot. In addition to these fungicides, two contact i.e. mancozeb and propineb and one botanical fungicide i.e. natural citronellal were also tested *in vivo* using one-year old arecanut seedlings raised in polybags. These

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fungicides were tested at 0.3 % conc. Areca seedlings, 20 per treatment were challenge inoculated with *P.meadii* on the spear leaf. The inoculated portion was padded with wet cotton wool to provide favourable condition for infection by the pathogen and care was taken to maintain the wetness of the cotton pad. The lesion developed on the spear leaf was measured after an incubation period of 10 days and then they were sprayed with each fungicide. The treated seedlings were monitored regularly and measurements of the lesion developed on the spear leaf were recorded at the end of 10^{th} day after treatment. The spraying trial was carried out from July-December for three years *viz*; 2004-2006. Data on pre and post treatment lesion size was compared to select the most effective fungicide. Seedlings without any spraying served as control.

Since a replicated field trial could not be laid out during the study period (2004-'06) because of the absence/irregular nature of incidence and intensity of the disease, an observational field trial spread out in four locations *viz*, CPCRI, Vittal and Kidu and farmers' plot at Belthangady and Ujire was carried out. The details of the observational trial are given in Table 1. The age of these palms varied between 10 to 25 years. The palms had early and middle stages of infection. The treatments were given as soil drenching and crown spraying at Kidu and Belthangdy and only soil drenching at CPCRI, Vittal and spraying at Ujire during October to November 2005-'06.

Table.1. Details of observational trial against crown rot of arecanut palm (2005-'06)

Treatments	Method of appln.	Location	Stage of disease	No of palms treated	Age range) (year)
Phosphorous	Soil	Belthangady	Early	24	15-20
acid (0.3%)	drenching	CPCRI, Vittal	Early	5	10-20
	Spraying	Ujire	Early & middle	40	17
Tridemorph (0.3%)	Soil drenching & spraying	CPCRI, Kidu	Early & middle	64	20- 25
	Soil drenching	CPCRI, Vittal	Early	20	10- 20

Results and Discussion

Detection of bud/crown rots: The first visible symptom of bud rot was yellowing of the spear leaf. As a result of infection, the spear leaf lost its natural green colour and turned yellow and slumped to a side in the advanced stages. The infected spear leaf could be drawn-out of the crown with a gentle pull (Fig.1). The affected seedlings emitted a disagreeable smell due to colonization by secondary organisms. The infection rapidly spread to the base of adjacent leaves leading to their yellowing and drooping and at the end the crown got cut off leaving a bare stem.

Fig. 1. Bud rot affected arecanut seedling

The initial visible symptom of crown rot was the unusual drooping of green leaves of the outer whorl during the southwest monsoon months, continued to occur throughout the winter months and extended up to February. These leaves became yellow and dried up (Fig.2).Water soaked lesions, typical of *Phytophthora* infection are seen on the inner side of the sheath of these leaves. The tissues of the tender stem and cabbage portion of the crown including the developing spadices also get infected in the advanced stages of the disease. The drooping leaves dry up and hang around the stem without shedding. The spear leaf remains green till the basal portion of the bud is fully rotten. In the advanced stages, the whole crown breaks off from the main trunk. Infection through the bunch bearing nodes led to rotting of rachii. Such bunches gradually dried up, and remained attached to the stem. *P.meadii* gained access to the host tissue through the leaf sheaths of the outer whorl of leaves or bunch bearing nodes resulting in crown rot or directly enter through the base of growing bud leading to bud rot. Coleman (1910) had described similar process of infection of these diseases. *P.meadii* could be isolated from the infected tissues of the leaf sheath, developing inflorescence, tissues of the bud and tender stem. All the isolates were infective both on the green arecanut and leaf. The taxonomic identity of the pathogen was confirmed with the standard isolate of *P.meadii* McRae which was identified by C.M.I, England (IMI No.352314) (Saraswathy, 1994).

Fig. 2. Initial symptoms of crown rot in adult palm

Fungicidal trial: The challenge inoculated seedlings developed water soaked lesions on the spear leaf within 24-48 h. The data on the lesion developed on the treated seedlings revealed that the spread of lesion was the least in seedlings sprayed with phosphorous acid (Fig.3) followed by tridemorph. These fungicides were also found effective against *P.meadii* causing fruit rot of arecanut palms, when applied as root feeding or soil drenching or spraying (Anon, 2000).

The results of field application of phosphorous acid or tridemorph against crown rot of adult palms in the institute farms at Vittal and Kidu and farmers' plots also confirmed the effectiveness of these fungicides in managing crown rot when applied as basal application with one of the above fungicides @ 5 l /palm (15 ml of the fungicide in 5 l of water) in the early stage of crown rot when drooping of the leaves of outermost whorl is noticed. In the case where the infection is spread to the inner whorl, both basal application and crown spraying are required (Saraswathy, 2006). The treated palms did not show further enhancement of disease symptoms. Tridemorph is recommended against *Ganoderma lucidum* (Leys) Karst causing basal stem rot of arecanut palm (Sampath Kumar and Nambiar,1996) and bud rot of coconut palm caused by *P.palmivora* (Butler) Butler (Rohini Iyer *et al*.,2003). They have recommended root feeding or stem injection of tridemorph or phosphorous acid. In the present study phosphorous acid was found superior to tridemorph and hexaconazole and this is the first report of using these fungicides for the management of bud/ crown rot disease of arecanut palm. Though these fungicides are effective as root feeding or stem injection, these methods of application are cumbersome because getting actively growing roots is difficult and making injuries to the basal portion of the palm may invite secondary invaders including insects. From the results of the present study, it is suggested that the incidence of bud/crown rots can be minimized or totally arrested if phosphorous acid or tridemorph @ 0.3% conc. is given as second or third round of spraying against fruit rot of arecanut in the disease endemic areas. In endemic areas, phytosanitation is also very important as the removal and destruction of diseased parts from arecanut plantation will reduce the inoculum of the pathogen.

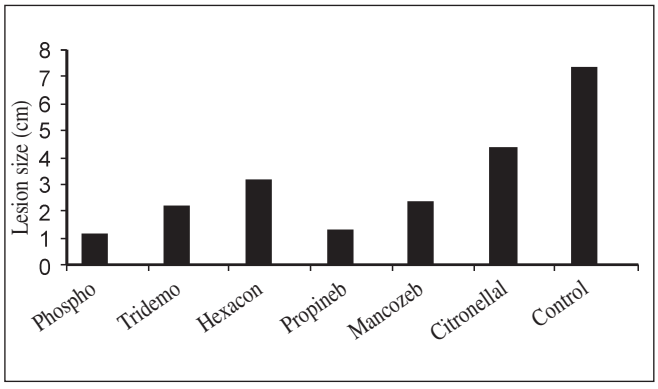

Fig.3 Effect of fungicides on *P.meadii* infection

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