

Original Research Article

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Management of Fruit Rot Disease of Arecanut Incited by *Phytophthora meadii*

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ABSTRACT

Arecanut is one of the major agriculturally important palm cultivated in humid tropics of India. *Phytophthora* “the plant destroyer” cause severe devastating diseases in arecanut palms. Fruit rot of arecanut is caused by the fungus *Phytophthora spp.* causes fresh infection during the monsoon and subsequent cooler months. The fungus survives as oospores, chlamydospores and mycelium in soil, on fallen nuts, on dried nuts and on inflorescence remaining in the crown. During 2014, a bulk farm trail was with Conventional Bordeaux mixture 1%, Stabilized Blue Bordeaux 1%, Metalaxyl Mz 0.2%, Copper Oxychloride 0.3%, Cymoxanil + Mancozeb @ 0.2% and potassium phosphonate products (Biofight 0.5% and Biopot 0.5%). The result indicated that the number of fallen nuts due to fruit rot incidence was 33.17% per palm. Application of conventional Bordeaux mixture at 1% has significantly reduced number of fallen nuts due to fruit rot of arecanut at 6 locations (0.91) and increased the nut yield (green nut 9230.44 kg/acre and dry nut 1200.32 kg/acre) followed by one percent of stabilized Bordeaux mixture and Metalaxyl MZ. Maximum disease incidence and affected fallen nuts was recorded in untreated check.

Keywords

Arecanut, Fruit rot, *Phytophthora*, Management, Bordeaux mixture.

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Introduction

The arecanut palm (*Areca catechu* L.) is one of the most important plantation crops in Karnataka. It is commonly known as betelnut or *supari* and used in various religious and social ceremonies. Although, India is the largest producer of arecanut its productivity is very low, 1214kg/ha. Besides, arecanut cultivation is beset with recurring problems due to reduced productivity, delayed commercial yield, soil fertility depletion, small holding size, price fluctuation and pests and diseases. Among the many reported diseases, fruit rot or Mahali (heavy devastation) or Koleroga caused by

Phytophthora meadii is a serious fatal disease causing huge loss to farmers. The disease may cause fruit drop of 50 to 100 per cent in individual palms if timely and proper control measures are not adopted. Fruit rot disease occurs in all the arecanut growing regions receiving heavy rainfall during southwest monsoon period (June- September). Though the disease is sporadic in nature, outbreaks of epidemic are also common during favourable climatic conditions especially in years of prolonged rainy season. Bultler (1906) first recorded the disease in the Karnataka. The disease was reported from the Dakshina

kannada and Uttara kannda districts of Karnataka as well as in small pockets of Malabar and cochin. The intensity of the disease is increasing year after year due to build up of inoculums in the endemic areas of Karnataka causing severe economic loss. Though the *P. meadii* is the major pathogen causing fruit rot, association of other *P. palmivora* and other species has been reported in rare occasions (Hegde and Chowdappa, 2015). Infection of *P. meadii* produces characteristic symptom like rotting and extensive shedding of the immature nuts which lie scattered near the base of the tree. Hence an attempt was made to use conventional contact fungicides like Bordeaux mixture, copper oxy chloride, kocide, along with judicious use of Metalaxyl MZ, curzate and bio-products like biofight and biopot for the effective management of the disease in arecanut cropping system.

Materials and Methods

The experiment in randomized block design was laid out in farmer's field in Varadamula, Hosavi, Tuppooru, Kouti, Wodeyala and Bobbi village of Shimoga district of Karnataka during 2014. The arecanut palms were treated alone and in combinations of fungicides viz., Conventional Bordeaux mixture 1%, Stabilized Blue Bordeaux 1%, Metalaxyl + Mancozeb (Metalaxyl Mz) 0.2%, Copper oxychloride, 0.3%, Cymoxanil + Mancozeb @ 0.2% and potassium phosphonate products (Biofight 0.5% and Biopot 0.5%) along with removal of fallen nuts, provision of drainage, cutting of excessive branches of inter crops like black pepper, cocoa, clove, nutmeg, cardamom, cinnamon and branches of forest trees around arecanut gardens for proper aeration during third week of may month gives the better management of fruit rot. And application of agricultural lime at 200 kg/acre to neutralize soil before on set of monsoon controls the

disease. The treatments were imposed twice in the season i.e., first week of June and second week of August. The arecanut palm without any fungicidal application was served as control. The observation were taken on infected fallen nuts (%), was recorded during onset of monsoon, peak monsoon and post monsoon and also green nut and dry nut yield were recorded and benefit cost ratio was calculated and collected data was analyzed statistically.

Results and Discussion

During the year 2014, bulk farm trial was conducted in six locations in moderate to heavy rainfall areas to control fruit rot of arecanut. Data on the incidence as measured by the percentage of infected fallen fruits are presented in table 1. The result indicated that the number of fallen nuts due to fruit rot incidence was ranged from 0.30 to 33.17/palm from all villages.

Application of conventional Bordeaux mixture at 1% has significantly reduced number of fallen nuts due to koleroga (fruit rot) of arecanut at 6 locations (0.91) followed by stabilized Bordeaux mixture at 1%. Further Metalaxyl MZ treatment was found effective. Maximum disease incidence or affected fallen nuts was recorded in untreated check.

In varadmula village minimum nut drop of 0.63% was recorded in 1% conventional Bordeaux mixture sprayed trees followed by stabilized Bordeaux mixture, copper oxychloride and cymoxanil + mancozeb (1.33, 2.10 and 2.30%) which were remains on par with each other. The next best treatment was Metalaxyl Mz which recorded less nut drop of 2.83%. Whereas the maximum nut drop was recorded untreated check (25.63%). However the potassium phosphonate products viz., Biofight and Biopot found less effective.

Table.1 Effect of alternate fungicides to Bordeaux mixture against fruit rot disease of Arecanut during kharif 2014

Treatments	Avg. no. of fallen nuts/palm (infected) (%)						Avg. Nut drop (%)	% decrease over control
	Varadamula	Hosavi	Tuppooru	Kouti	Wodeyala	Bobbi		
Conventional Bordeaux mixture @1%	0.63	1.47	0.43	1.23	0.30	1.40	0.91	96.37
Stabilized Bordeaux mixture 1%	1.33	1.97	1.43	2.33	0.30	1.90	1.54	93.85
Biofight @ 0.5%	5.63	5.77	8.93	7.23	6.57	4.90	6.51	74.04
Cymoxanil+mancozeb @ 0.2%	2.30	4.30	6.65	5.13	2.23	3.70	4.05	83.85
Suraksha @ 0.5%	4.50	8.40	7.05	6.40	5.13	6.93	6.40	74.48
Biopot @ 0.5%	6.60	9.30	7.70	7.13	6.07	7.17	7.33	70.77
Copper oxychloride @0.25%	2.10	3.10	4.55	4.53	2.13	2.07	3.08	87.72
Metalaxyl MZ @0.2%	2.83	2.97	4.33	1.83	2.10	3.50	2.93	88.32
Untreated check	25.63	33.17	24.00	22.00	20.33	25.33	25.08	-
S.Em±	0.33	0.18	0.25	0.12	0.20	0.17		
CD@ 5%	1.26	0.76	0.84	0.89	0.79	0.67		

Table.2 Effect of fungicides on yield parameter in fruit rot affected palms (green nut and dry nut yield kg/ac)

Treatments	Green and Dry nut yield (Kg/ac)	% increase over control
	Avg. yield of 6 locations	
Conventional Bordeaux mixture @1%	9230.44* (1200.32)**	145.32
Stabilized Bordeaux mixture 1%	8662.99 (1126.53)	130.24
Biofight @ 0.5%	6697.70 (870.96)	78.01
Cymoxanil+Mancozeb @ 0.2%	7390.56 (961.06)	96.42
Suraksha @ 0.5%	6655.21 (865.44)	76.88
Biopot @ 0.5%	6440.12 (837.47)	71.16
Copper oxychloride @0.25%	7698.20 (1001.07)	104.60
Metalaxyl Mz @0.2%	7840.89 (1019.62)	108.39
Untreated check	3762.60 (489.28)	
S.Em ±	0.31	
CD @ 5%	1.18	

Similarly, in Hosavi, Tuppooru, Kouti, Wodeyala and Bobbi villages also minimum nut drop was recorded in trees which received 1% conventional Bordeaux mixture (1.47, 0.43, 1.23, 0.30 and 1.40%) respectively, followed by stabilized Bordeaux mixture,

copper oxychloride and cymoxanil + mancozeb.

Fruit rot of arecanut being season bound, it is the previous seasons inoculum in the form of latent infection within the dried bunches and canopy which serves as initial inoculums. The secondary spread is by means of sporangia which are produced abundantly on the infected fruits. The minimum incidence of fruit rot in Bordeaux mixture and Metalaxyl MZ treated plots may be due to reduced number of secondary inoculums due to anti-sporulant activity of this fungicide (Anandraj and Sarswathy, 1986), there by restricting the rapid secondary spread of the disease. For such mode of action the time of application of fungicide is critical. The spraying has to be done soon after the primary inoculums resume its activity and just before secondary spread gathers momentum. Similar findings was obtained by Hegde and Anahosur (1998), the integrated management of foot rot of black pepper where in application of neem cake + *Trichoderma harzianum* + Metalaxyl Mz + garlic and mustard seed extract + mulching of the wet soil with transparent polythene sheets during the hot summer was the most effective treatment and resulted in maximum survival of vines. The present findings are in conformity with the work of Ramesh *et al.*, 2014 and Narayanaswamy *et al.*, 2015. Jeeva *et al.*, (2015) also showed that Copper and metalaxyl fungicides are very effective in controlling leaf blight of taro caused by *P. colocasiae*.

Correspondingly, the data presented in the table 2 revealed that application of conventional Bordeaux mixture at 1% has significantly increased the nut yield (green and dry) at 6 locations over control of 9230.44 and 1200.32 kg/ac respectively. Further, stabilized Bordeaux mixture 8662.99 and 1126.53 kg/ac), Metalaxyl Mz (7840.89 and 1019.62kg/ac), copper oxychloride

(7698.20 and 1001.07 kg/ac) and cymoxanil + mancozeb (7390.56 and 961.06 kg/ac) recorded maximum nut yield, whereas, less nut yield was recorded in untreated check (3762.60 and 489.28 kg/ac) respectively. The results are conformity with the findings of Lokesh *et al.*, (2014) reported that arecanut bunches treated with systemic fungicide Metalaxyl MZ 72 WP @ 2 g/l as spray for twice was effective in reduction of the disease and increase in the yield.

The results of the present finding clearly showed that the disease could be managed by application of either conventional or stabilized Bordeaux mixture (1%) as foliar spray along with removal of fallen nuts, provision of drainage, cutting of excessive branches of inter crops like black pepper, cocoa, clove, nutmeg, cardamom, cinnamon and branches of forest trees around arecanut gardens for proper aeration during third week of may month gives the better management of fruit rot. And application of agricultural lime at 200 kg/acre to neutralize soil before on set of monsoon controls the disease. Over the years various chemicals were screened for the management of the *Phytophthora* diseases in arecanut. Fungicidal spray could control the disease only to a limited extent as the as the heavy rains resulted in washing off of the fungicides from plant surface. An integrated disease management involving proper cultural practices, application of biocontrol agents, fungicidal sprays and host plant resistance need to be employed for effective management. It is easier said than practice the effective control measures for *Phytophthora* disease in the perennial trees like arecanut grown in high rainfall areas.

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