YIELD LOSS DUE TO FRUIT ROT (*Mahali*) DISEASE OF ARECANUT IN KARNATAKA

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Arecanut is an important commercial crop cultivated in India with an annual production of 0.48 million tonnes from an area of 0.38 million hectares. Karnataka, Kerala, Assam, Maharashtra, West Bengal and Tamil Nadu are the major producers. Arecanut is affected by many pests, diseases and nutritional disorders. Among the diseases, the fruit rot disease (commonly called as *"Koleroga"* or *"Mahali"*), bud rot and crown rot are the most devastating diseases in terms of yield loss and cost involved. These diseases are caused by the fungus *Phytophthora meadii*. Fruit rot disease occurs during south west monsoon period (June – September). The disease can be identified by sudden heavy shedding of immature nuts, which lie scattered near the base of the tree. On closer observation of the nuts, dark coloured water soaked lesions are found near the perianth end. Rain plays an important role in the initiation and spread of the disease. Heavy rainfall with constant high humid conditions, wind, low temperature and intermittent bright sunshine favour the disease development. The disease causes maximum yield loss when the rainfall is heavy. The disease affected nuts lose their quality and hence have a low market value. Bud rot and crown rot diseases caused by the same fungus occur either as a further manifestation of the fruit rot infection or independently as fresh infection, during the monsoon and subsequent cooler months of October-November.

A quick field survey was conducted to estimate the yield loss due to *mahali* in 5 major arecanut growing districts of Karnataka, viz, Dakshina Kannada, Udupi, Chikmagalur, Shimoga and Uttara Kannada. These districts receive very high rainfall during monsoon season. In this article we have given the percentage incidence and the estimated yield loss of arecanut due to *mahali* during the year 2007-08. The control measures for the *mahali* disease as well as the management technique to control further manifestation of the disease are given at the end.

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The survey was conducted during the last week of September in the year 2007 in Dakshina Kannada, Udupi, Chikmagalur, Shimoga and Uttara Kannada districts of Karnataka to assess the yield loss in arecanut due to *mahali*. To cover large number of gardens with limited time and resources, purposive sampling method has been used in the selected taluks of each district. To take observations, the gardens were selected systematically in each taluk. From each selected garden, 20 palms were selected at random and observations taken on total number of bunches present, number of bunches affected due to *mahali* and the percentage loss of nuts expected per bunch. Taluk wise percentage incidence of *mahali* and the average yield loss were worked out by taking average of the selected gardens in each taluk. The survey was conducted in all the taluks of Dakshina Kannada and Udupi districts. In other three districts, the survey was conducted in major arecanut growing taluks. The district average was obtained by taking weighted average of the taluks average with area under arecanut in each taluk as weights. The district wise yield loss was estimated by using the previous year's production and the estimated percentage yield loss in each district.

The results of the field survey conducted in the five districts of Karnataka to estimate the incidence of *mahali* disease and the yield loss are discussed below.

Dakshina Kannada: Dakshina Kannada is one of the major arecanut growing districts in Karnataka. The estimated production of arecanut in this district is 48540 tonnes from an area of 27210 hectares. The field survey was conducted in all the five taluks in Dakshina Kannada district. Taluk wise summary of the field observations on number of gardens surveyed, percentage yield loss and percentage number of palms affected by *mahali* are given in Table 1. The estimated number of palms affected by *mahali* varied from 78.6% in Belthangady taluk to 67% in Puttur taluk. The estimated percentage yield loss was maximum in Belthangady (42.73%) followed by Sullia (42.54%), Puttur (40.12%), Mangalore (35.65%) and Bantwal (35.61%). The loss of arecanut in Dakshina Kannada due to *mahali* was estimated as 40% and the total yield loss 19416 tonnes *chali* equivalent (Table 2).

Udupi: Udupi is another major arecanut growing district in Karnataka and the estimated production is 8950 tonnes from an area of 5020 hectares. The intensity of *mahali* incidence in Udupi district was comparatively very high during the year 2007. The field survey was conducted in all the three taluks in Udupi district. Taluk wise summary of the field

observations on number of gardens surveyed, percentage loss of nuts and percentage number of palms affected by *mahali* are given in Table 1. The analysis of the field survey data indicated that 88.5% of palms in Karkala taluk, 77.5% of palms in Udupi taluk and 51% of palms in Kundapur taluk were affected by *mahali* disease. The estimated percentage yield loss was maximum in Karkala taluk (68%) followed by Udupi (62%) and Kundapur (31.5%). The loss of arecanut in Udupi district due to *mahali* was estimated as 49% and the total yield loss 4386 tonnes *chali* equivalent.

Chikmagalur: Chikmagalur is a major arecanut growing area in Karnataka and the estimated production is 19030 tonnes from an area of 16620 hectares. The field survey was conducted in two major arecanut growing taluks viz., Sringeri and Koppa. Taluk wise summary of the field observations on number of gardens surveyed, percentage loss of nuts and percentage number of palms affected by *mahali* are given in Table 1. The results of the field survey indicated that 55.56% palms in Koppa taluk and 49% of palms in Sringeri taluk were affected by *mahali*. The estimated percentage yield loss in Koppa taluk was 35% and in Sringeri taluk 31%. The loss of arecanut in Chikmagalur district due to *mahali* was estimated as 33% and the total yield loss 6272 tonnes *chali* equivalent.

Shimoga: Shimoga is one of the major arecanut growing districts in Karnataka. The estimated production of arecanut in this district is 43870 tonnes from an area of 29150 hectares. The field survey was conducted in three major arecanut growing taluks in Shimoga viz, Shimoga, Thirthahalli and Sagar. Taluk wise summary of the field observations on number of gardens surveyed, percentage loss of nuts and percentage number of palms affected by *mahali* are given in Table 1. The analysis of the field survey data indicated that 50% of palms in Shimoga taluk, 46% of palms in Sagar taluk and 45% of palms in Thirthahalli taluk were affected by *mahali* disease. The results indicated that there was 32% yield loss in both Shimoga and Sagar taluks and 26% yield loss in Thirthahalli taluk. The loss of arecanut in Shimoga district due to *mahali* was estimated as 29% and the total yield loss 12617 tonnes *chali* equivalent.

Uttara Kannada: Uttara Kannada is another major arecanut growing district in Karnataka and the estimated production is 16700 tonnes from an area of 12290 hectares. The field survey was conducted in three major arecanut growing taluks viz, Sirsi,

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Yellapur and Siddapur. Taluk wise summary of the field observations on number of gardens surveyed, percentage loss of nuts and percentage number of palms affected by *mahali* are given in Table 1. The analysis of the field survey data indicated that 66% of palms in Sirsi taluk, 65% of palms in Yellapur taluk and 46% of palms in Siddapur taluk were affected by *mahali* disease. The estimated percentage yield loss was maximum in Sirsi taluk (50%) followed by Yellapur (44%) and Siddapur (32%). The loss of arecanut in Uttara Kannada district due to *mahali* was estimated as 43.6% and the total yield loss 7276 tonnes *chali* equivalent.

The high incidence of *mahali* during 2007 is due to the continuous showers experienced during the monsoon. The farmers could not get enough time gap to undertake proper spraying operations to control *mahali*. This resulted in a heavy loss of produce to the farmers (Fig. 1 & 2). The weather data at CPCRI Regional Station, Vittal shows that in the year 2007, the number of rainy days and the total rainfall during the three months period from July to September are much higher and the average sunshine hours is much lower compared to the previous three years data (Fig 3).

The incidence of bud rot and crown rot diseases are comparatively high in gardens with high incidence of fruit rot disease. Symptoms of bud rot appear as yellowing of spindle leaf and rotting of the growing bud and surrounding tissues (Fig 4). Such plants emit a foul smell and the spindle can be easily pulled out. Finally the crown remains without the spindle for some period of time before the tree dries totally. Crown rot symptoms initiate from the outermost leaf sheath, the outer most leaves become yellow and droop. The infection gradually spreads towards the growing bud. In the advanced stages, all the leaves fall off with only the spindle remaining in the tree (Fig 5). In both the diseases, if the infections at the early stages are not treated, the palms die.

MANAGEMENT MEASURES TO BE ADOPTED

1. *Mahali* can be controlled by spraying 1% Bordeaux mixture to the bunches at least two times at an interval of 45 days. The first spray should be given immediately after the first few showers and if the monsoon prolongs, a third spray should be compulsorily given. It is very important to make a proper 1% Bordeaux mixture (1 kg Lime + 1 kg Copper sulphate in 100 liters water) and spray it freshly. It is to be noted that addition of excess lime will reduce the efficacy of the mixture, while

excess copper sulphate will be phytotoxic to the nuts.

2. Phytosanitary measures like collection of fallen nuts, removal of infected bunches and other plant parts from the garden and destroying them, preferably outside the garden, will give better control of the disease. Proper drainage in the gardens especially those which are in low lying and water logged conditions will reduce the disease incidence.

3. Covering bunches with polythene bags of size 85 X 75 cm and 200 gauge thickness, before the onset of monsoon gives complete control of *mahali* disease. If timely and proper control measures are not adopted, the disease causes heavy loss in yield and sometimes a total loss of the crop.

4. In areas where *mahali* infection is high, there is possibility of higher infection of palms to cause bud and crown rot. Therefore preventive measures have to be taken up for controlling these diseases also. Bud rot/crown rot diseases can be effectively controlled by removing the infected tissues and treating the wound with 10% Bordeaux paste. To prevent the spread of infection spray 1% Bordeaux mixture to the crown of the affected and surrounding trees.

5. The recent recommendations on the management of the bud rot and crown rot disease is the drenching of root zone of the palms with phosphorous acid (akomin) or tridemorph (calixin) at 0.3% concentration (3 ml/litre of water). Minimum of 5 litre fungicidal solution/palm (15 ml fungicide in 5 litre water) is required for drenching. In advanced stages of the disease 250 ml of phosphorous acid (akomin) or tridemorph (calixin) at 0.3% concentration can be poured inside the crown.

It is necessary to make the farmers aware of the phytosanitory measures to be taken and proper preparation/spraying of Bordeaux mixture for control of the disease so that inoculum in the garden is reduced. This will ensure control of the disease.

Table 1. Taluk wise incidence of *mahali* disease and yield loss in 5 districts of Karnataka

District	Taluk	n	Palms affected (%)		Yield loss (%)	
			Mean	SE	Mean	SE
Dakshina Kannada	Bantwal	24	76.46	4.92	35.61	4.01
	Sullia	28	73.75	2.52	42.54	2.91
	Belthangady	32	78.59	2.70	42.73	3.30
	Puttur	25	67.00	3.03	40.12	2.46
	Mangalore	12	72.08	5.92	35.65	6.14
Udupi	Udupi	14	77.50	8.06	61.76	9.05
	Karkala	10	88.50	3.05	68.00	7.04
	Kundapur	21	50.95	6.79	31.45	5.68
Chikmagalur	Sringeri	10	49.00	8.12	31.05	7.22
	Koppa	9	55.56	7.83	35.08	8.16
Shimoga	Thirthahalli	19	45.26	6.77	26.07	5.47
	Shimoga	10	50.00	7.97	31.80	6.22
	Sagar	7	46.43	11.16	31.71	10.90
Uttara Kannada	Yellapur	11	64.55	5.07	44.06	5.70
	Sirsi	12	66.25	3.53	49.91	3.46
	Siddapur	7	57.14	7.06	31.94	6.14

n : Number of gardens surveyed; SE : Standard Error

Table. 2 Estimated loss due to *koleroga* in Districts

District	Area*(Ha)	Production*(MT)	Estimated loss (%)	Estimated loss (MT)
Dakshina Kannada	27210	48540	40.00	19416
Udupi	5020	8950	49.00	4386
Chikmagalur	16620	19030	32.96	6272
Shimoga	29150	43870	28.76	12617
Uttara Kannada	12290	16700	43.57	7276

*** Source: Directorate of Economics and Statistics**

Fig. 1 : *Koleroga* affected bunches

Fig. 2 : Severely *koleroga* affected areca garden

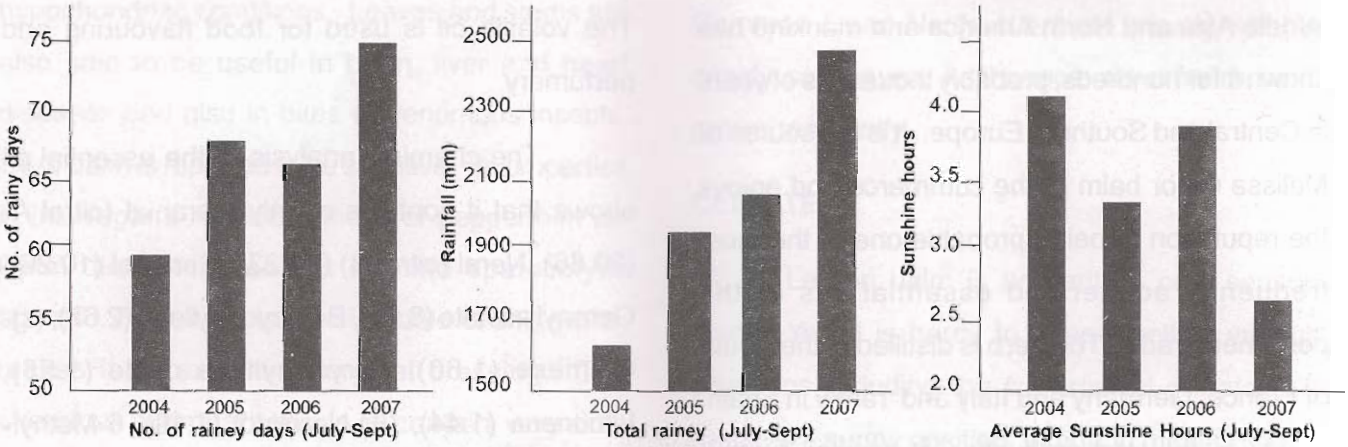

Fig. 3 : Rainfall and sunshine hours recorded at Vittal

Fig. 4 : Bud rot affected arecanut seedling

Fig. 5 : Crown rot affected arecanut palm

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