Chemical Control of Leaf Spot of Date Palm (*Phoenix dactylifera*) in Sultanate of Oman

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Date palm (*Phoenix dactylifera*) is an important fruit and cash crop in Sultanate of Oman, occupying nearly 60% of the total cultivated area. However, leaf spots caused by *Mycosphaerella tassiana*, *Alternaria* spp., and *Drechsleri* sp. have become a threat to date palm's cultivation in recent years. In this study, a field experiment was conducted to find out a suitable chemical spray program to control the disease. A prophylactic spray schedule with mancozeb (Dithane M45), copper oxychloride (Champion), and mancozeb+copper (Trimltox) effectively controlled the disease when applied at a time when the disease severity index (DSI) was low, ranging from 0 to 1.68. Meanwhile, the disease did not decrease, but instead increased gradually, when the fungicide combination was applied when DSI was high, ranging from 1.78 to 5.37. It was concluded that fungicides should be applied at the early stage or before disease initiation in order to control the disease effectively.

Keywords : control, date palm, fungicide.

Date palm (*Phoenix dactylifera*, Family: Arecaceae; sub-family: Poaceae) is the most important cash and fruit crop grown in Sultanate of Oman. The date fruits are nutritionally a good source of sugar, potassium, iron, and vitamins. In addition, the fruits play a prominent role in the economic, social and cultural life of the Omani people. The dates, which are mostly eaten fresh and dry, are also processed into a lot of by-products. The fruits are exported to several countries as a good source of export revenue for Oman.

The areas planted to date palm trees are nearly 60% of the total cultivation area in the Sultanate (Ben, 1998). There are various economically important diseases infecting the date palm trees in all date palm growing countries (Anonymous, 1992, 1993; Carpenter and Elmer, 1978; Fawcette and Klotz, 1932; Saadi, 1992). Among these diseases, leaf spot caused by *Mycosphaerella tassiana*, *Alternaria* spp., and *Drechslera* sp. are the main causes of yield reduction of the plant in recent years throughout the Sultanate. Generally,

the lower 6-8 whorls of the leaves are more severely infected than the upper young leaves, causing premature leaf blight and sickly appearance of the whole plant. However, the importance of the disease is often underestimated because its direct effect on yield loss is not readily noticed.

In general, leaf spot is more severe in relatively old date palms of over 6 years. Symptoms on the leaflets that appear as longitudinal gray spots with well-defined margins in various sizes ranging from 1 mm to 30 mm are mostly caused by *Mycosphaerella tassiana*. Meanwhile, leaf spots without definite margins of various shapes and sizes are mainly caused by *Alternaria* and *Drechslera*. The reduction in the photosynthetic area of leaves consequently results in the reduction in fruit yield. Farmers spray chemicals two or three times a year to control various diseases in the country, but have not been successful in satisfactorily controlling these diseases. Therefore, this study was conducted to develop a suitable spray program to control leaf spot of date palm.

Materials and Methods

Ten-year old trees of the date palm variety 'Khalas Dhahra' were used in this study. The palm trees were cultivated at the Date Palm Research Station in Wadi Quriyat, Interior Region of Oman. All palms showed high disease incidences of leaf spot at the start of the experiment. The 4th whorl leaves from the bottom of the tree were selected and tagged for the experiment. Three trees were used for each treatment representing three replicates. The different contact and systemic fungicides used in this study are listed in Table 1. The fungicides were sprayed once a month starting from September 1998 to May 1999. The disease severity index (DSI) ranged from 1.78 to 5.37 at the initiation of the spray.

Starting June 1999, another set of leaves, the 6th whorl from the bottom, was selected and tagged for observation. Less than 1.68 DSI was observed at the start of the spray, which continued until August 2000. Five leaflets equidistant from each other were selected from each tagged leaf and the DSI was calculated using the following formula (James, 1971a, b).

Disease Severity Index (DSI)

$$\frac{\text{Mean area of plant tissue affected}}{\text{Mean total area of the leaflet}} \times 100$$

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Table 1. Fungicide dosage used

Fungicide	Dosage
Mancozeb (Dithane M45)	3.0 g/liter
Mancozeb + copper (Trimiltox)	3.0 g/liter
Carbendazim (Bavistin)	1.5 g/liter
Copper oxychloride (Champion)	3.0 g/liter

Results and Discussion

When the spray was initiated in September 1998, the DSI on the 4th whorl ranged from 1.78 to 5.37%. Although the fungicides were sprayed every month until May 1999, the disease did not decrease, but instead increased gradually in all treatments (Table 2). This implies that the fungicides used were not effective in controlling the disease when the DSI was above 1.5% at the initial time of application.

However, the spray was continued and new disease that developed on the 6th whorl leaves was recorded from June 1999 to August 2000. The DSI on the 6th leaves ranged from 0 to 1.68% at the time of the first spray. In all fungicide treatments, the DSI decreased gradually. However, the DSI did not vary significantly among all chemicals used in this study, although the difference between the treatment and the control was highly significant (Table 3). However, treatments with mancozeb, mancozeb + copper, and copper oxychloride showed relatively higher control efficiency than carbendazim (Table 3 and 4). Mejeni et al. (1989) and Mahmoud and Mohammed (1997) also recommended spraying with copper oxychloride and Trimiltox to control leaf spot diseases. From the above results, it can be concluded that spraying any one of these fungicides, except carbendazim, before the initiation of the disease can reduce the incidence of leaf spot. Spraying of these fungicides as a

Table 2. Disease severity index of leaf spot on the 4th whorl leaf of date palm from September 1998 to May 1999

Fungicide used	Time of spray								
	1998				1999				
	Sep.	Oct.	Nov.	Dec.	Jan.	Feb.	Mar.	Apr.	May
Mancozeb (Dithane M45)	5.37	2.91	7.72	39.94	38.26	43.35	30.65	58.96	35.85
Mancozeb + copper (Trimiltox)	2.43	3.09	16.35	41.16	45.41	23.07	31.74	16.13	22.97
Carbendazim (Bavistin)	1.78	2.56	16.74	35.80	31.74	50.89	30.27	25.75	20.37
Copper oxychloride (Champion)	2.45	1.30	9.88	26.35	31.31	50.26	7.55	38.02	26.10
Control	3.36	4.64	13.84	40.09	46.91	49.70	36.43	54.06	41.84

Table 3. Disease severity index of leaf spot on the 6th whorl leaf of date palm from June to December 1999

Fungicide used	Time of spray						
	June	July	Aug.	Sep.	Oct.	Nov.	Dec.
Mancozeb (Dithane M45)	0.00	0.00	0.00	0.35	0.22	0.38	0.36
Mancozeb + copper (Trimiltox)	0.62	0.33	0.56	0.18	1.56	2.08	1.29
Carbendazim (Bavistin)	1.68	1.07	0.63	0.52	2.73	4.49	8.01
Copper oxychloride (Champion)	0.00	0.00	0.00	0.00	0.00	0.79	0.28
Control	0.88	0.65	0.80	2.41	2.33	3.17	11.92
LSD (0.05)	1.45	—	—	0.97	—	—	6.96

Table 4. Disease severity index of leaf spot on the 6th whorl leaf of date palm from January to August 2000

Fungicide used	Time of spray							
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.
Mancozeb (Dithane M45)	0.57	0.00	0.00	0.00	0.00	0.04	0.00	0.13
Mancozeb + copper (Trimiltox)	2.21	0.21	0.27	0.53	0.97	0.65	0.57	0.40
Carbendazim (Bavistin)	4.48	2.26	3.78	2.88	4.57	3.50	3.02	0.86
Copper oxychloride (Champion)	0.16	0.00	0.08	0.00	0.00	2.67	0.08	0.21
Control	3.99	3.47	3.58	15.88	18.61	18.24	22.50	21.51
LSD (0.05)	—	2.44	2.85	1.87	5.52	5.04	3.47	1.28

prophylactic measure on a regular basis can, therefore, reduce leaf spot incidence and increase fruit yields.

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