EFFECT OF POWDERY MILDEW ON MANGO CHLOROPHYLL CONTENT AND DISEASE CONTROL

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Abstract

Powdery mildew caused by *Oidium mangiferae* is a serious disease of Mango. Survey of the disease was conducted during seasons 2011 and 2012 in Sharkeya, Behera, Ismailía and Giza as well as Noubareya district. The highest disease severity (%) was observed in Ismailía being (46.6%) and the lowest in Giza (23.6%). Five different fungicides namely Punch, Bayleton, Kema-Z, Colis, Billis and one biocide (AQ 10) were used as spraying treatments to control the disease on four Mango cultivars (Langara, Zebda, Alphonso and Fagri Kelan) grown at Noubareya district. Punch gave the highest efficiency in controlling the disease being (78.9 and 79.4% in 2011 and 2012, respectively) whereas AQ 10 gave the lowest efficiency (57.o % and 55.3%). Using the fungicides tested and the biocide maintained the chlorophyll content at comparative level with the healthy tissue. The untreated infected control showed reduced in chlorophyll content. The yield increased by using fungicides and biocides ranging from 307.4% to 35.5% depending on the treatment and cultivar. The increase in income occurred as a result of reducing disease severity which led to maintaining chlorophyll content and photosynthesis.

INTRODUCTION

Mango *(Mangifera indica L.)* is universally one of the most popular edible fruit crops. In Egypt, the areas cultivated reached 222838 feddans (169068 feddan as fruiting trees) with an approximate production of 598084 metric tons (Anonymous, 2011). Powdery mildew is one of the most serious diseases of mango affecting almost all the cultivars. Powdery mildew is caused by the fungus *Oidium mangiferae*, which may develop as sporadic infections causing severe crop loss before being epiphytotic leading to flower and panicle infection and subsequent failure of fruit set (Nofal *et al*, 2006 & Haggag, 2010). Many researchers reported that chlorophyll content and leaf hair density were negatively correlated with susceptibility to powdery mildew. Furthermore, Infection on leaves results in destruction of chloroplast and in turn reduces photosynthesis, photophosphorylation and CO_2 assimilation. The chlorophyll content of plants infected by powdery mildew was considerably lower than in healthy plants (Shukanov *et al.* 1980; Xu Bing Liang *et al.* 2005; Dinesh 2009).

The efficacy of many fungicides have been evaluated for disease control such as Bavistin (carbendazim), Sulfex (wettable sulfur), Bayleton (triademefon), Roko (thiophanate-methyl), Topas (penconazole), Contaf (hexaconazole), Rubigan (fenarimol), Punch (flusilazole), and Karathane (dinocap) (Chavan *et al* 2009; Sharma *et al* 2012). Also, *Ampelomyces quisqualis* (AQ10) as a biocontrol agent against powdery mildew was tested on different crop and trees,and it gave good results in reducing disease severity (Kiss *et al*., 2004; Romero *et al* 2007)

The objective of this paper was to evaluate some treatments in controlling the disease and their effect on the chlorophyll content and yield.

MATERIALS AND METHODS

Disease survey:

Survey was conducted during spring seasons of 2011 and 2012 in Sharkeya, Behera, Ismailía, Giza governorates and Noubareya districts. Samples were chosen at random and examined. Results were recorded as disease severity according to Thind *et al* (2005) using a 0-5 scale, according to the following classes: 0 = No symptoms; 1 = 1-20 %; 2 = 21-40 %; 3 = 41-60%; 4 = 61-80% and 5=81-100% infected leaf area.

Percentage of disease severity was calculated according to following equation:

$D.S.\ \% = \Sigma (n \times c) / N.C \times 100$

Whereas: D.S. = Disease severity %

n = Number of infected leaves per category

c = Category number

N = Total examined leaves

C= Maximum of category number of infection.

Chlorophyll determination:

The chlorophyll content was determined using portable chlorophyll meter (SPAD-502, Minolta, Japan), as SPAD unit; these units were transformed to mg m^{-2} as described by Monje and Bugbee (1992) as follows:

$$\text{Chlorophyll content (mg } m^{-2}) = 80.05+10.4(\text{SPAD } 502).$$

Where: SPAD 502= chlorophyll meter reading (CMR).

Percentage of reduction of chlorophyll content in infected leaves was calculated as following equation:

% reduction of chlorophyll content = chlorophyll content in healthy leaves - chlorophyll content in infected leaves / chlorophyll content in healthy leaves× 100

Chemical and biological control under field conditions:

Mango cultivars Langara, Zebda, Alphonso and Fagri Kelan, grown at Noubareya districts, was sprayed with five different fungicides namely: Punch, Bayleton, Kema-Z, Colis, Billis and the biocides AQ 10 at the recommended doses

(Table, 1). Three sprays; before flowering, during flowering and after fruit set were applied for two consecutive fruiting seasons (2011and 2012). Eight year-old Mango trees in Randomized Block Design were arranged for each treatment replicated three times (one tree per replication). Incidence and development of powdery mildew was recorded on four marked panicles and leaves in four sides of each mango tree. Disease severity was recorded using disease scale as previously mentioned.

Efficiency of fungicides in controlling the disease was calculated according to the following formula: % Efficiency = Disease severity% in the control - Disease severity % in the treatment /Disease severity % in the control x 100

Table 1. The fungicides and biocide tested.

Trade name	Active ingredient	Dose/ 100 L water
Punch 40% EC	flusilazole and carbendazim	6 ml
Bayleton 25 % EC	Triadimefo	50 ml
Kema-Z 50 % WP	Carbendazim	50 gm
Colis 30% EC	Kresoxim-methyl and Boscalid	50 ml
Billis 38% WG	Boscalid and 12.8% Pyraclostrobin	30 gm
AQ 10 58% WGD	*Ampelomyces quisqualis*	3 gm

Economic study:

Three trees of each cultivar were chosen randomly, average number of fruits/ tree was recorded in order to calculate the amount of fruit production in each treatment. Increase (%) was calculated according to the following formula:

% increase of average number of fruits/ trees = average number of fruits in the treatment - average number of fruits in the control/ average number of fruits in the control ×100. The value of the crop increase was estimated versus the cost of the applied treatment and the net balance was presented. However, Profit = crop price by Egyptian pound in the treatment - crop price by Egyptian pound in the control.

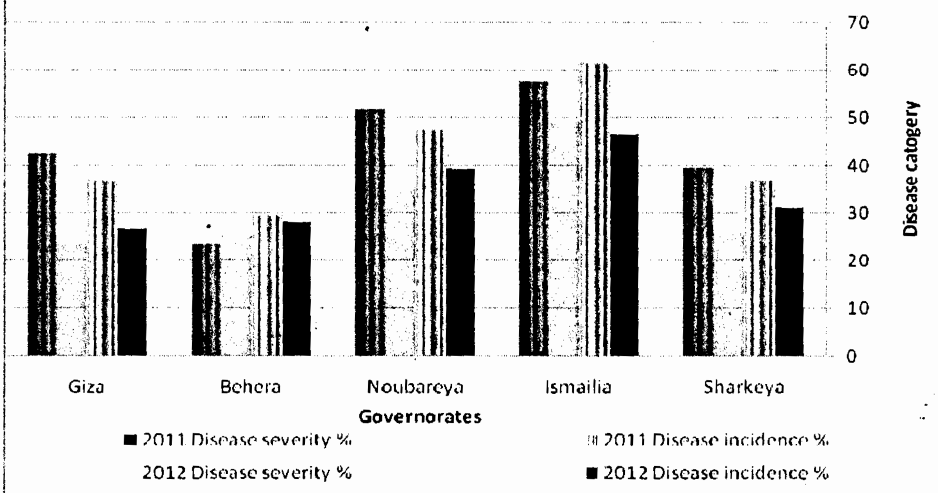
Statistical analyses : The data were statistically analyzed as complete randomized block design. Anova was performed on combined data for the two seasons and LSD was computed.

RESULTS

Field survey

Data in (Fig.1) showed that the highest percentages of disease severity and incidence of powdery mildew were reported during seasons 2011 in Ismailía (46.6 % and 61.5) followed by Noubareya, Sharkeya, Behera and Giza (39.3% and 47.5%), (31.3% and 37.0%), (28.2% and 29.6%) and (26.7 % and 37.0), respectively. Meanwhile, during season 2012 the highest percentage of disease severity and incídence observed in Ismailía (49.1% and57.6%) followed by Noubareya, Sharkeya, Behera and Giza (35.4% and 51.6%), (25.9% and39.5%), (25.3%and 32.6%) and (23.6 % and42.5%), respectively.

Fig.(1): Disease severity and incidince of powdery mildew on Mango in four Egyptian governorates and Noubarey district during the seasons 2011and 2012



Chlorophyll contents:

Results presented in Table (2) indicate that there is an inverse relationship between the leaves content of the chlorophyll and the powdery mildew disease. Healthy leaves contain greater amount of chlorophyll than infected leaves in all varieties that have been studied. The rate of reduction in chlorophyll content of the infected leaves ranged between 25.6 and 38.3% .

Table 2. Leaf content of chlorophyll (mg /m^{-2}) of four Mango cultivars grown under natural infection of powdery mildew disease in Noubareya region conditions in 2011 and 2012 seasons.

cultivars	Chlorophyll (mg m^{-2})					
	2011			2012		
	Healthy Leaf	Infected Leaf	Reduction %	Healthy Leaf	Infected Leaf	Reduction %
Alphonso	582.66	412.16	29.3	602.08	427.06	29.1
Fagri Kelan	685.28	422.90	38.3	693.94	458.26	33.9
Langara	595.84	396.56	33.4	619.06	438.16	29.22
Zebda	666.90	496.40	25.6	698.69	499.36	28.5

Chemical and biological control under field conditions:

Data in table (3) show that Punch gave the highest efficiency in reducing disease severity in Alphonso cultivar during season 2011and 2012 under natural infection (78.9 and 79.4%), followed by Bellis, (76.3, 76.6) Collis, (73.7, 74.8) Bayleton, (66.7, 70.1) and Kema-Z (65.7, 66.4) respectively, whereas AQ 10 was the least effective (55.3, 56.7). Similar trend could be observed with Fagri Kelan cultivars.

Table 3. Efficiency of five fungicides and one biocide against powdery mildew on two mango cultivars in Noubareya during the 2011and 2012 seasons.

Fungicide	cv. Alphonso				cv. Fagri Kelan			
	2011 season		2012 season		2011 seasons		2012 season	
	% D.S	% Eff.	% D.S	% Eff.	% D.S	% Eff.	% D.S	% Eff.
Collis	15.0	73.7	13.5	74.8	12.5	74.2	11.0	75.6
Bellis	13.5	76.3	12.5	76.6	11.5	76.3	10.0	77.8
Punch	12.0	78.9	11.0	79.4	9.5	80.4	8.5	81.1
Bayleton	17.5	69.3	16.0	70.1	15.0	69.1	13.5	70.0
Kema-Z	19.5	65.7	18.0	66.4	17.0	64.9	15.0	66.7
AQ 10	25.5	55.3	23.5	56.1	21.5	55.7	19.5	56.7
Control	57.0		53.5		48.5		45.0	
L.S.D $_{0.05}$	Fungicides(F): 1.71 Seasons (S): 0.91 F*S: N.S				Fungicides(F): 1.91 Seasons (S): 1.02 F*S: N.S			

% D.S = % Disease severity % Eff. = % Efficiency

Data presented in Table (4) show that Bellis gave the highest efficiency to reduce disease severity in field under natural infection during season 2011and 2012 on Langara cultivar being (84.7 and 87.3%) followed by Punch, (83.1, 83.6) Collis, (77.9, 76.4) Bayleton. (72.9, 74.5), and Kema-Z (67.8, 69.1) but AQ 10 was lowest one (57.6, 58.2) On Zebda cultivar, Punch gave the highest efficiency to reduce disease severity in field under natural infection were (80.3 and 80.1%) followed by Bellis, (78.9, 79.4) Collis, (76.3, 76.5) Bayleton, (71.1, 70.6) and Kema-Z (67.1, 66.2) but AQ 10 was lowest one (57.9, 55.9).

Table 4. Evaluation of the efficiency of five fungicides and one biocide on powdery mildew severity (%) on Langara and Zebda Mango cultivars in Noubareya during 2011/2012 seasons.

Fungicides	cv. Langara				cv. Zebda			
	2011 season		2012 season		2011 season		2012 season	
	% D.S	% Eff.	% D.S	% Eff.	% D.S	% Eff.	% D.S	% Eff.
Collis	6.5	77.9	6.5	76.4	9.0	76.3	8.0	76.5
Bellis	4.5	84.7	3.5	87.3	8.0	78.9	7.0	79.4
Punch	5.0	83.1	4.5	83.6	7.5	80.3	6.5	80.1
Bayleton	8.0	72.9	7.0	74.5	11.0	71.1	10.0	70.6
Kema-Z	9.5	67.8	8.5	69.1	12.5	67.1	11.5	66.2
AQ 10	12.5	57.6	11.5	58.2	16.5	57.9	15	55.9
Control	29.5		27.5		38.0		34.0	
L.S.D $_{0.05}$	Fungicides(F): 1.46 Seasons (S): 0.78 F*S: N.S				Fungicides(F): 1.65 Seasons (S): 0.88 F*S: N.S			

% D.S = % Disease severity % Eff. = % Efficiency

Effect of treatments on chlorophyll content.

Using fungicides tested and biocide reduced the magnitude of decrease in chlorophyll content due to infection. Punch recorded the highest chlorophyll content compared to the control (Table 5). Chlorophyll was decreased from 585.84 to 396.56 mg/ m^2 in untreated control compared with using Punch in season 2011, and from 609.06 to 438.16 mg /m^2 season 2012. Meanwhile, chlorophyll decreased from 542.5 to 396.56 mg /m^2 in untreated control compared with using Bellis in season 2011, and from 554.64 to 438.16 mg/ m^2 season 2012 on Langara variety. Whereas, on Zebda cultivar, chlorophyll content decreased from 656.90 to 5496.40 mg/ m^2 in untreated control compared with using Punch in season 2011, and from 668.69 to 469.36 mg/ m^2 in 2012, Also Chlorophyll content was decreased from 617.73 to 496.40 mg /m^2 in untreated control compared with using Bellis in season 2011and from 640.96 to 469.36 mg/ m^2 season 2012.On the other hand, the biocide AQ10 gave the lowest stability in Chlorophyll content in both seasons.

Table 5. Effect of five fungicides and one biocide on leaf content of chlorophyll ($mg\ m^{-2}$) Langara and Zebda cultivars grown under natural infection of powdery mildew disease in Noubareya region conditions in 2011 and 2012 seasons.

	Chlorophyll ($mg\ m^{-2}$)					
Fungicide	cv. Langara			cv. zebda		
	Season		Mean	Season		Mean
	2011	2012		2011	2012	
Collis	529.33	534.53	531.93	594.50	605.60	600.05
Bellis	542.50	554.64	548.57	617.73	640.96	629.34
Punch	585.84	609.06	597.45	656.90	668.69	662.80
Bayleton	514.77	524.48	519.62	584.80	588.26	586.53
Kema-Z	495.36	507.49	501.42	563.30	579.94	571.62
AQ 10	468.66	476.98	472.82	521.01	546.32	533.66
Control	396.56	438.16	417.36	496.40	469.36	482.88
Mean	504.71	520.76		576.38	585.45	
LSD at (P<0.05):						
Fungicides(F):	= 10.70			= 44.83		
Seasons (S):	= 5.72			= NS		
F*S:	= 15.13			= NS		

Results presented in Table (6) show that the control of powdery mildew led to a fixity in chlorophyll content in leaves during the two seasons of the study on Alphonso and Fagri klan cultivars compared to untreated control which decreased amount of chlorophyll, resulting from development of infection. Chlorophyll was decreased from 572.66 to 491.35 mg m^2 in untreated control compared with using Punch in season 2011, and from 592.08 to 503.23 mg m^2 season 2012 in Alphonso cultivar. Also, chlorophyll content in Fagri Klan cultivar during the 2011 season decreased from 675.28 to 567.17 mg m^{-2} and during the season of 2012 from 683.94 to 586.38 mg m^{-2}. for the same mentioned fungicides.

In contrast, the least decreases were recorded with AQ10 in Alphonso cultivar during 2011 (from 454.1 to 412.16 mg m^{-2}) and 2012 (from 465.39 to 427.0 mg m^{-2}) in Fagri Klan cultivar during the 2011 season (from 510.16 to 422.9 mg m^{-2}) and 2012 (from526.21 to 458.26 mg m^{-2})

The highest decreases in chlorophyll content were recorded in untreated control compared with Punch application during 2011 season from 675.28 to 567.17 mg m^{-2} in Fagri Klan cultivar.

Table 6. Effect of five fungicides and one biocide on chlorophyll content (mg/ m^{-2}) in Alphonso and Fagri klan cultivars grown under natural infection of powdery mildew in Noubareya region in 2011 and 2012 seasons.

Fungicide	Chlorophyll (mg m^{-2})					
	cv. Alphonso			cv. Fagri Kelan		
	Season		Mean	Season		Mean
	2011	2012		2011	2012	
Collis	508.88	518.58	513.73	612.18	635.06	623.62
Bellis	528.29	540.77	534.53	643.73	664.18	653.96
Punch	572.66	592.08	582.37	675.28	683.94	679.61
Bayleton	488.08	499.17	493.62	567.46	592.42	579.94
Kema-Z	475.25	479.06	477.16	538.00	544.58	541.29
AQ 10	454.10	465.89	460.00	510.61	526.21	518.41
Control	412.16	427.06	419.61	422.90	458.26	440.58
Mean	491.35	503.23		567.17	586.38	
LSD at (P<0.05):						
Fungicides(F):	= 16.28			= 7.59		
Seasons (S):	= 8.7			= 4.06		
F*S:	= NS			= 10.37		

Economic study:

Applying three spraying of five fungicides and one biocide against the disease increased average number of fruits/ tree compared to the untreated control on cv. Alphonso (Table, 7&8). The highest percentage of increases during 2011 season in the average number of fruits/ tree were observed with Punch (307.4%), Bellis (288.3%) and Collis (244.4 %) and these fungicides increment the profit 332, 310 and 267 Egyptian pounds, respectively compared with the controls. Whereas, the least percentages were observed with AQ10 (156.6 % & 119.7 %). and the profits were (164 &211) Egyptian pounds during 2011and 2012 season. As for Fagri Kelan, similar positive results in increased average number of fruits/ tree and profits were observed.

Table 7. Effect of five fungicides and one biocide on fruit yields in Alphonso mango cultivars in Noubareya districts, 2011 and 2012 seasons.

Fungicides	2011season					2012 season				
	YK*	Y*	I*	P	Profit	YK*	Y*	I*	P	Profit
Collis	37.5	93.0	244.4	375	267	47.1	117.7	167.5	471	295
Bellis	41.8	102.7	288.3	418	310	51.2	128.0	190.9	512	336
Punch	44.0	110.0	307.4	440	332	54.5	136.3	209.7	545	369
Bayleton	33.1	82.7	286.3	331	223	47.1	111.7	153.8	471	295
Kema-Z	30.6	76.7	183.8	306	198	42.1	105.3	139.3	421	245
AQ 10	27.2	69.3	156.6	272	164	38.7	96.7	119.7	387	211
Control	10.8	27.0		108		17.6	44.0		176	
L.S.D 0.05	Fungicides(F): 4.70 Seasons (S): 2.51 F*S: N.S									

Y* = Yield average number of fruits/ tree
P= Price of yield, Egyptian pound
I* = % Increases of average number of fruits/ tree.
Profit / Egyptian pound
Price of 1Kg cv. Alphonso 2011/2012 = 10 Egyptian pound
YK* = Yield by Average weight Kg/tree.

Table 8. Effect of five fungicides and one biocide on fruit yields in Fagri Kelan mango cultivars in Noubareya districts, 2011 and 2012 seasons.

Fungicides	2011season					2012 season				
	YK*	Y*	I*	P	Profit	YK*	Y*	I*	P	Profit
Collis	23.4	70.3	90	210.6	99.9	26.9	80.7	79.3	242.1	108
Bellis	25.2	75.7	104.5	226.8	116.1	28.3	85.0	88.8	254.7	120.6
Punch	27.1	81.3	119.7	243.9	133.2	31.5	94.7	110.4	283.5	149.4
Bayleton	21.7	65.3	76.5	195.3	84.6	25.3	76.0	68.8	227.7	93.6
Kema-Z	20.3	61.0	65.6	182.7	72.0	24.2	72.7	61.5	217.8	83.7
AQ 10	17.6	53.0	43.2	158.4	47.7	20.3	61.0	35.5	182.7	48.6
Control	12.3	37.0		110.7		14.9	45.0		134.1	
L.S.D 0.05	Fungicides(F): 4.55 Seasons (S): 2.43 F*S: N.S									

Y* = Yield average number of fruits/ tree
P= Price of yield, Egyptian pound
I* = % Increases of average number of fruits/ tree.
Profit / Egyptian pound
Price of 1Kg cv. Fagri kelan 2011/2012 = 9 Egyptian pound
YK* = Yield by Average weight Kg/tree.

Data in table (9) show that spraying five fungicides and one biocide three times against the disease increased average number of fruits/tree compared to the untreated control on cv. Langara. The highest increases were observed for Punch (169.5%), Bellis (148.4) and Collis (133.9%). Also, using these fungicides increased the profits 346.4, 304 and 274.4 Egyptian pounds respectively compared with the control during 2011 season, whereas the least was observed with AQ10 83.2% and the profit was 170.4 Egyptian pounds, positive increases in both criteria were also recorded in the second season tested (2012) for the same treatments somewhat similar to those of the first season (2011).

Table 9. Effect of five fungicides and one biocide on fruit yields in Langara Mango cultivars in Noubareya districts, 2011 and 2012 seasons.

Fungicides	2011season					2012 season				
	YK*	Y*	I*	P	Profit	YK*	Y*	I*	P	Profit
Collis	59.8	107.67	133.9	478.4	274.4	76.0	137.0	110.8	608	319.2
Bellis	63.5	114.33	148.4	508	304	80.0	144.3	122	640	351.2
Punch	68.8	124.00	169.5	550.4	346.4	84.9	153.0	153.3	679.2	390.4
Bayleton	54.9	99.00	115.2	439.2	235.2	69.8	125.7	93.3	558.4	269.6
Kema-Z	50.5	91.00	97.8	404	200	65.5	118.0	81.5	524	235.2
AQ 10	46.8	84.33	83.2	374.4	170.4	59.6	107.3	65.1	476.8	188
Control	25.5	46.00		204		36.1	65.0		288.8	
L.S.D $_{0.05}$	Fungicides(F): 4.98 Seasons (S): 2.66 F*S: N.S									

I* = % Increases of average number of fruits/ tree.

P= Price of yield, Egyptian pound

Profit / Egyptian pound

Price of 1Kg cv. Langara 2011/2012 = 8 Egyptian pound

YK* = Yield by Average weight Kg/tree.

Data in Table (\10) show that on cultivar Zebda, the highest percentages of increases the average number of fruits/tree observed when used Punch (111.6 %), Bellis (95.3%) and Collis (79.7)% .Moreover ,these fungicides increased the profits (219), (187) and (156) Egyptian pounds respectively compared with the control during 2011season. Whereas, the least percentage of increment in average number of fruits/ tree (52.7%) was observed when AQ10 was used and the profit was 104 Egyptian pounds during 2011 season. somewhat similar results were obtained with the mentioned treatments in the second season (2012) on both criteria tested.

Table 10. Effect of five fungicides and one biocide on fruit yields in Zebda Mango cultivars in Noubareya districts, 2011 and 2012 seasons.

Fungicides	2011season					2012 season				
	YK*	Y*	I*	P	Profit	YK*	Y*	I*	P	Profit
Collis	29.7	77.3	79.7	267.3	118.8	41.9	109.3	88.4	377.1	176.4
Bellis	32.3	84.0	95.3	290.7	142.2	43.1	112.3	93.6	387.9	187.2
Punch	34.9	91.0	111.6	314.1	165.6	46.5	121.0	108.6	418.5	217.8
Bayleton	28.5	74.3	72.7	253.8	105.3	37.6	98.0	68.9	338.4	137.7
Kema-Z	26.9	70.0	62.7	242.1	93.6	35.6	92.7	59.8	320.4	119.7
AQ 10	25.2	65.7	52.7	226.8	78.3	31.1	81.0	39.6	279.9	79.2
Control	16.5	43.0		148.5		22.3	58.0		200.7	
L.S.D $_{0.05}$	Fungicides(F): 5.42 Seasons (S): 2.90 F*S: 7.66									

Y* = Yield average number of fruits/ tree.

I* = % Increases of average number of fruits/ tree.

P= Price of yield, Egyptian pound

Profit / Egyptian pound

Price of 1Kg cv. Zebda 2011/2012 = 9 Egyptian pound

YK* = Yield by Average weight Kg/tree.

DISCUSSION

Powdery mildew caused by *Oidium mangiferae* is one of the most serious Mango diseases, Disease survey was carried out during 2011and 2012 seasons, in the main Mango production areas in Ismailía, Sharkeya, Noubareya, Giza and Behera largest areas, however, are being reported in Ismailía, Behera and Noubareya (Anonymous, 2011). Data revealed that the severity of the disease varied from one location to another, and from season to season as well as varieties. These variable reactions may be due to various factors as environmental conditions and density of the pathogen inocula (Jayalakshmi, 2010). Data in the present study suggested that applying some fungicides and the biocide tested reduced the severity of the disease which was accompanied by less damage to chloroplasts and chlorophyll content. The fungicide Punch was more effective in this result, allowing better photosynthesis rate, photophosphorylation and CO2 assimilation (Shukanov *et al.*, 1980, Xu Bing Liang *et al.*, 2005 and Dinesh, 2009).

Also, data in the present study revealed that the fungicides in concern reduced the disease significantly if spraying is applied before flowering, during flowering and after fruit set. Punch, however, gave the highest efficiency in reducing disease severity in the field under natural infection on Alphonso, Fagri Kelan, Langara and Zebda cultivars in two seasons (2011 and 2012). Likewise, the other systemic fungicides Bellis, Collis, Bayleton , and Kema-Z gave a good control in reducing the disease, As for the mode of action on the pathogen, the triazole fungicides Punch and Bayleton played a role in sterol production needed for membrane structure and function by inhibiting C14 demethylase. (Brent, 1995 and Bretthauer, 2005) Also, Kema-Z and Punch are known to disrupt "Beta-tubulin assembly during cell division." Fungicides in this group disrupt mitosis by binding to the tubulin subunits. Moreover, the fungicides. Colis and Billis belonging to carboximides group which are known to inhibit the function of a molecule within mitochondria, termed complex II, necessary to secure energy (via FADH2). During respiration, negatively charged electrons are moved across mitochondrial membranes, dragging with them protons which also accumulate behind the membrane. The protons filter back through the membrane, in an effort to reestablish equilibrium, and turn cellular turbines which generate the energy needed to sustain life. As the function of complex II molecules is inhibited, the cell's ability to transport electrons across the mitochondrial membrane is inhibited as well, also inhibiting proton movement. Our results agree with the findings of Brent (1995), Bretthauer (2005), Chavan *et al.,* (2009) and Sharma *et al.,* (2012).

Ampelomyces quisqualis in AQ10 as biocontrol agent against powdery mildews disease gave a moderate efficacy to reduce disease severity, *Ampelomyces quisqualis* Ces. is a fungal hyperparasites on Erysiphaceaae and other fungi. *A. quisqualis* is a potential biological control agent for powdery mildew diseases on vegetable crops, apple, Grape, and mango (Kiss *et al.*, 2004 and Romero *et al.*, 2007). Present results revealed that the mango yield increased when fungicides or biocide where applied as spraying treatment compared to the untreated control on all cultivars tested. Percentages of increase in average number of fruits/ tree ranged from 307.4% to 35.5 %. Increasing the number of fruits produced with fungicides and biocides spraying treatments may due to retention flowering trees health, the large percentage of them turn to fruits as well the fruit does fall in the early stages. These results are not agreeable with the findings of Galli J *et al.*, (2008) which mentioned that the presence or absence of powdery mildew symptoms had no effect on fruit yield but they agree with those found by Nofal *et al.*, (2006) and Haggag, (2010). Reducing disease incidence and severity would result in maintaining healthy chloroplasts. Consequently, photosynthesis tends to be normal. Such conditions would result in sufficient photosynthates that reflect as an increase in yield.

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تأثير مرض البياض الدقيقي في المانجو علي محتوي الكلوروفيل و مكافحتة في مصر

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يعتبر مرض البياض الدقيقي علي أشجار المانجو في مصر والمتسبب عن الفطر أوديم مانجيفيرا من الامراض الهامة اقتصاديا والتي تؤدي الي خسائر كبيرة في المحصول علي المستوي القومي . لذلك تم اجراء حصر لانتشار المرض وشدتة في خمس محافظات هي الجيزة والبحيرة والاسماعيلية والشرقية ومنطقة النوبارية خلال عامي (٢٠١١ و ٢٠١٢) . وقد سجلت أعلى نسبة لشدة المرض في الإسماعيلية ٤٦.٦٪ وأقل شدة اصابة في الجيزة ٢٣.٦٪ و تم تقييم فعالية خمسة مبيدات كيماوية وهي البيليز ، الكوليز ، البانش ، كيمازد والبايليتون والمبيد الحيوي AQ 10 ضد المرض حيث أعطى مبيد البانش أعلى كفاءة لتقليل شدة المرض في الحقل تحت ظروف العدوى الطبيعية وكانت ٧٨.٩ و ٧٩.٤٪ على التوالي في عام ٢٠١١ و ٢٠١٢ عند رشة علي اصناف الزبدة ، اللانجارا، الفونسو والفجر كلان المنزرعة في منطقة النوبارية.بينما أعطى مبيد AQ 10 أقل كفاءة في مقاومة المرض بالمقارنة بالمعاملات الاخري حيث كانت ٥٧.٠ و٥٥.٣٪. وقد ادي استخدام هذة المبيدات الي ثبات محتوي الكلوروفيل في اوراق الاشجار المعاملة مقارنتا بمحتوي الكلوروفيل في اوراق الاشجار الغير معاملة والتي حدث بها انخفاض وكان معدل النقص في محتوى الكلوروفيل في اوراق الاشجار الغير معاملة يتراوح من ٢٥.٦٪ الي ٣٨.٣٪ خلال عامي (٢٠١١ و ٢٠١٢) . وقد تم تسجيل متوسط عدد الثمار لكل ثلاثة اشجار من أجل حساب كمية الإنتاج . وأظهرت النتائج أن كمية المحصول في المانجو تزداد عند مكافحة المرض بالمبيدات الكيميائية المختبرة وكذلك بالمبيد الحيوي. ولقد حقق برنامج المكافحة لمرض البياض الدقيقي ربحا عاجلا عند تطبيقة. وعلي سبيل المثال بلغت الزيادة في الدخل (٢٥٨- ٥٢٤) ، (٢٨٤- ٥٩١) جنيها مصريا في السنة الاولي والثانية للتجريب علي التوالي في حالة الصنف لانجارا.