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EFFECT OF SOME AGRICULTURAL PRACTICES AS ALTERNATIVES FOR METHYL BROMIDE AGAINST THE SUDDEN WILT OF MELON, GALIA TYPE

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ABSTRACT

Sudden wilt of melon (*Cucumis melo* L.), also known as melon collapse or vine decline induced by *Monosporascus cannonballus* is a worldwide problem, mainly in arid and semi-arid regions. Virgin land or soil disinfestation by fumigation with methyl bromide before planting is a common and very effective treatment for disease control. But because methyl bromide is expected to be banned from use within the next 5 years; therefore alternative methods for disease management are urgently needed. In this study, the efficiency of agricultural practices as alternatives like water regime and fruit load per plant each alone or in combination with methyl bromide, was examined against *M. cannonballus* in melon plants, as well as vegetative growth characteristics and fruit yield and its quality. Ideal cultivar (Galia type) was used during the two successive late summer seasons of 2002 and 2003 at Nubaria area, Alex.-Desert Road. Significant reduction in wilt incidence was achieved in all plots treated with methyl bromide even in the low rate (30 gm/m^2). But extremely reduction in wilt incidence was obtained with doubling the rate of methyl bromide (60 gm/m^2). Significant reduction in wilt incidence was noticed with increasing irrigation regime. Mortality of 53.1% was observed in plants with an average of 3 fruits per plant, but with fruit thinned to one or two per plant, the wilt incidence was 36.1 and 43.2%, respectively. Consequently, vegetative growth characteristics, yield and fruit quality were affected by agricultural practices as alternatives for methyl bromide against melon wilt incidence. The highest values of plant dry weight, root dry weight, number of main stems per plant, plant vine length, average leaf area, relative growth rate and net assimilation rate were significantly increased with increasing both of water regime and methyl bromide rate, but these parameters were decreased by increasing number of fruits per plans. Fruit weight, total and marketable yields were increased by increased irrigation water regime and methyl bromide rate. Increasing number of fruits per plant resulted in high both of total and marketable yield, but decreased fruit weight. TSS content was increased by increasing both methyl bromide rate and number of fruits per plant, but it was decreased by increasing water regime. The highest value of water use efficiency was obtained with decreasing water regime. Effect of interaction among all treatments in this study, i.e., water regime, methyl bromide and fruit load/plant, were discussed The lowest values of wilt incidence were recorded in the treated plots with high rate of methyl bromide (60 gm/m^2), irrigated with high water regime (15 m^3/fed/day) and leaving one fruit per plant. Consequently these plots resulted in high values of vegetative growth parameters, and fruit weight. TSS, total and marketable yields were increased in plants with three fruits per plant. Finally, the dependence on single method for the control this should be avoided, since pesticides can be banned. There appeared to be promising to use alternative methods for the management of *Monosporascus* wilt of melon, especially when used in combination. For example, water regime, which is not effective alone in controlling a thermotolerant pathogen like *Monosporascus*, still has the potential to be a component in a disease management program, either by modifying the technology or by combining it with suitable pesticides at the reduced dosage. Similarly, fruit load per plant also can contribute to management programs. Any agricultural practices that improve the plant's ability to overcome the disease can be an important component in the integrated approach. To date, research on biological control of this disease has not been studied; therefore, this alternative should also be considered in future research.

INTRODUCTION

During the last fifteen years a root rot and vine decline symptoms of unknown etiology was observed in numerous commercial melon fields in Egypt. The disorder has been plagued melon business particularly sever in the warmer climatic production regions and periods.

The cause of this disorder was not identified until recent. In late summer of 2001, Melon Team Work in Agricultural Technology Utilization and Transfer Project (ATUT, 2001) observed and described the symptoms of this disorder. Disease symptoms first appeared on plants at early stage of fruit maturity. Diseased vines exhibited stunting, yellowing and at late stage, complete collapse of the leaf canopy exposing the fruit to intense solar radiation and reduce the sugar contents. The roots showed discoloration, discrete lesions on all root systems, and loss of secondary and tertiary feed roots. Numerous perithecia were observed on the secondary and tertiary roots. Each ascus contained one large and spherical ascosporic. Root samples were sent to the laboratory to USA by the project. The fungus was isolated on potato dextrose agar and identified as a *Monosporascus* sp. A pure culture was confirmed as *Monosporascus Cannonballus*.

The fungus also has been associated with a similar disorder in hot, semiarid melon growing areas of India (Martyn and Miller, 1996), Southern Spain (Garcia-Jimenez *et al.*, 1994), Southwestern regions of the United States (Mertely *et al.*, 1991 and 1993), Saudia Arabia (Karlaatti *et al.*, 1997), Central America (Bruton and Miller, 1997), Taiwan (Tsay and Tung, 1997) and Tunisia (Martyn *et al.*, 1994). Common names of this disorder include collapse (Garcia-Jimenez *et al.*, 1994; Reuveni *et al.*, 1983 and Ucko *et al.*, 1992), vine decline (Bruton and Miller, 1997), root rot (Kim *et al.*, 1995) and sudden wilt (Cohen *et al.*, 1996; Edelstein *et al.*, 1999; Eyal and Cohen, 1986 and Pivonia *et al.*, 1998). Because melon (*Cucumis melo* L.) is an important commercial crop in Egypt for local market and exportation and approximately 56.000 feddan were devoted to melon crop in 2002 (Agricultural Economic Bulletin. Ministry of Agriculture. Cairo, Egypt) and virgin land or disinfestations by fumigation with methyl bromide before planting is a common treatment for disease management But methyl bromide is expected to be banned from use within the next 5 years (Ristaino and Thomas, 1997)

Also, the response of melon plants to *Monosporascus* wilt incidence may be attributed to the size and structure of root system. Crosby and Wolf (1998) suggested that the melon cutivar Deltex (Ananas type) is tolerant than cv Caravelle (Western shipper) due to Deltexs's has more vigorous root system and they added that the size and structure of the root system can be manipulated by irrigation regime A study conducted by Reuveni *et al.* (1983) showed that daily irrigation closer to the fruit harvesting delayed wilting compared with irrigation given every 3 days Cohen *et al* (2002) reported that there is a need to further study this issue in order to optimize the irrigation regime and combine it with other management practices to obtain disease reduction with acceptable yield.

The effect of fruit load on disease severity was tested by Pivonia *et al* (1997) in a trail conducted in a field with a history of sudden wilt. They reported that plants with an average of 2 5 fruits per plant was observed 61 days after planting compared with plants with fruits thinned to one or zero per plant. These plants exhibited wilt incidences of 75 and 12%, respectively, and *Monosporascus* sp. was the fungus most frequently isolated from the roots of the wilted plants in this experiment.

So, the objective of the present study was to identify alternative measure for disease suppression that are urgently needed to save melon crop.

MATERIALS AND METHODS

Two field experiments were carried out during late summer of 2002 and 2003 in Nubaria area. Desert Alex -Road

Soil of the experimental site was sandy in texture, having a pH of 8.3 and irrigation depends on ground water The physical and chemical analysis of the experimental soil (using the methods reported by Black, 1965) and irrigation water (according to the methods reported by Chapman and Pratt, 1961) are shown in Table (1) All experiments were conducted in a field with history of sudden wilt caused by *Monosporascus cannonballus* (ATUT 2001) This field was grown with melon one year (in 2001) before carrying out this study, and it was used again in the same plots in present our study in 2002 and 2003

Seeds of melon cv Ideal (Galia type) were sown in speedlings trays using mixture of peat moss and vermiculite (1 2 by volume) under controlled and protected conditions on 5th and 6th of July in the 2002 and 2003 seasons, respectively Transplanting was carried out 3 weeks later Each experiment included 27 treatments which were the combinations of three irrigation regimes, three rates of methyl bromide and three levels of fruit load per plant The three irrigation regimes were 5 m^3 daily/fed (low level, less frequent water application), 10 m^3 daily/fed (traditional daily irrigation) and 15 m^3 daily/fed (higher level more frequent water application). Drip irrigation system with 4 liters/ hour/ dripper was used under operating pressure of 2.5 bar

Methyl bromide was applied via drip irrigation tubes which were placed on beds prior to covering the beds with black plastic mulch. Methyl bromide was applied through the irrigation tubes at the desired rate (0, 30 or 60 gm/m^2) employing the hot gas method (Klein, 1996).

The effect of fruit load on disease severity was tested by comparison made among plants with three levels of fruit load: a) thinning to one fruit, b) two fruits and c) no thinning with average of three fruits per plant. To have one fruit per plant, all female flowers and the baby setting fruits were removed as soon as the first fruit setting was done (5 days later after fruit set). For the treatment two fruits per plant, the first two fruits were left on the plant (5 days later after fruit set) and any female flower or baby fruit was removed after the setting of those two fruits. These operations were done throughout the plant life from flowering stage until harvesting date.

The experimental design was a split-split plot with four replicates. Where the three irrigation regimes formed the main plots, the rates of methyl bromide served as subplots, and the three levels of fruit load were distributed at the sub-sub plots. The sub-sub plot area was $105m^2$ consisting of 4 beds 1.75 m apart and 15 m long. The distance between plants was 50 cm.

During the soil preparation, 15 m^3/fed of cooked chicken manure and commercial fertilizers, namely ammonium sulfate (21% N), calcium superphosphate (15.5% P_2O_5) and potassium sulfate (48% K_2O) with rates of 150, 300 and 100 kg/feddan, respectively, were added to all sub-sub plots. Black plastic mulch with thickness of 50 mm was used in all sub-sub plots. All agricultural practices like fertigation program and white fly control were took place as recommended for commercial melon production.
Data were recorded on the following characters:

A. Disease incidence (%):

Data on wilt incidence was recorded after 45, 55, and 65 days from transplanting. A plant was considered dead when the whole plant exhibited irreversible wilt symptoms. Involvement of *Monosporascus* in wilting was confirmed by evaluation of perithecial development on wilted plant root samples after 3 weeks of incubation in paper bags at room temperature and rot samples were sent to USA and analysis was done in the laboratory using the method described by Aegerter *et al.* (2000). The number of wilted plants and the total number of plants per plot were used to calculate the incidence of wilt (percent) Data for disease incidence were transformed using arcsin function prior to analysis. When the F values were significant at >0.05, differences among the treatments were determined by Fisher's protected least significant difference (LSD) test.

Table (1): Physical and chemical characteristics of the site experimental soil and the irrigation water used.

Soil

Season	Clay %	Silt %	Fine sand %	Coarse sand %	Texture	pH	EC dS/m	$CaCo_3$ %	Total N %	P_2O_5 ppm	K_2O ppm	CaO ppm	Na meq/L
2002	7 14	3 14	15 11	74 59	sandy	8.4	1 12	2 21	0.016	28.5	48.5	45.7	4.21
2003	7 85	4 22	12 34	75 95	sandy	8.3	1.31	1.90	0.022	32.6	51 3	51.2	3.9

Irrigation Water

Season	pH	EC dS/m	K_2O ppm	CaO ppm	MgO ppm	Na meq/L	Co_3 3meq/L	Hco_3 meq/L	SO_4 ppm	Cl meq/l
2002	8 4	1 82	6 32	43 91	22 31	15.52	0.71	3 11	125	10 28
2003	8 3	1 69	5 93	41 82	23 75	14.91	0.82	2.95	119	12 17

B. Vegetative Growth:

Ten alive plants from each experimental unit were taken for vegetative growth measurements 45 and 60 days after transplanting in the two seasons of the study and the following data were recorded:

1- Plant dry weight.
2- Root dry weight.
3- Number of main stems/plant.
4- Plant vine length.
5- Leaf area/plant using the dry weight method as suggested by Roads and Blood Worth (1964).
6- Relative growth rate (RGR) as determined by the formula of Richards, (1969).

$$RGR = \frac{\ln W_1 - \ln W_0}{T_1 - T_0} \text{ mg/g/dry}$$

Where: W_0 and W_1 are the plant weight at T_0 and T_1, respectively, i.e., at 45 and 60 days, respectively in this study.

7- Net assimilation rate (NAR) was determined by the following equation of Mc Collum, 1978.

$$NAR = \frac{W_2 - W_1}{L_2 - L_1} \times \frac{\text{Log } L_2 - \text{Log } L_1}{T_2 - T_1} \text{ mg/cm}^2\text{/dry}$$

Where: W_1 and W_2 are plant dry weight at T_1 and T_2, respectively and Likewise, L_1 and L_2 are leaf area at T_1 and T_2.

C. Yield and its components:

At harvesting time, 60 days after transplanting, fruits of each plot/each harvest were harvested at half and full-slip maturity stage, then counted, weighed and the data of average fruit weight, yield/m^2, total yield and marketable yield per feddan were calculated.

D. Fruit Quality:

Five fruits of each plot from each harvest were randomly taken and the total soluble solid percentage (TSS %) were determined using a hand refractometer.

E. Efficiency of water utilization (E.W.U):

E.W.U. expressed as consumptive use in m^3/fed. for one kilogram of melon fruits was used to evaluate the efficiencies of water regimes for maximum utilization of water supplies. It was calculated according to the equation of Beg and Turner (1976) as follows:

$$\text{Water use efficiency} = \frac{\text{Water quantity (m}^3\text{/fed)}}{\text{Yield (kg/fed)}} = \text{m}^3\text{/ kg}$$

The amount of applied water through the entire season (70 days) in each of water regime used was 350, 700 and 1050 m^3/fed for 5, 10 and 15 m^3/ fed/day, respectively considering that a feddan equals 4000 m^2.

The obtained data were subjected to the analysis of variance as proposed by Snedecor and Cochran, (1980).

RESULTS AND DISCUSSION

A. Sudden wilt incidence (%):

1. Effect of irrigation water regimes:

Data in Table (2) show that doubling the amount of irrigation water led to significant reduction in wilt incidence and improved wilt suppression in both growing seasons. As average of both seasons wilt incidence was 63.2, 38.3 and 30.8% in plots irrigated with 5, 10 and 15 m^3/fed/day, respectively. In other words, only the third of plants were infected if they irrigated with15 m^3/fed./day compared with the plants that irrigated with 5 m^3/fed./day, almost about two-third of these plants were infected.

These results prove that irrigation water regime may play an important role against *Monosporascus* wilt of melon plants. Little information is available on effect of water regime on melon wilt, but these results were in accordance with those reported by Reuveni *et al.* (1983), who reported that daily irrigation for melon plants closer to fruit harvest delayed wilting compared with irrigation given every 3 days. They explained their results by that daily irrigation saturates the soil and the diseased plant has enough water to resist wilting compared with the drier soil in the less frequent irrigation. Crosby and Wolf (1998) suggested that the size and structure of the root system can be manipulated by the irrigation regime and this may lead to reduction in *Monosporascus* wilt incidence on melon plants. Likewise, Cohen *et al.* (2002) reported that melons are drip-irrigated daily for maximum yield and this irrigation regime results in a relatively small root system that fails to provide sufficient water to diseased plants under high transpiration rates, thus contributing to enhanced wilt. But their advice in their study was that there is a need to further study this issue in order to optimize the irrigation regime and combine it with other management practices to obtain disease reduction with acceptable yield. Recently, Pivonia *et al.* (2002) studied water balance in melon plants under field conditions in naturally infested soil with *Monosporascus Cunnonballus*. They found that plant water uptake started to decrease shortly before plant wilting and death. They reported that xylem hydraulic conductance of excised infected roots, measured at the onset of wilting was five to seven times lower than that of healthy plants. An extensive rise in tylose formation was observed in xylem vessels and most vessels were plugged and plant collapse and death usually occurred under these conditions during the fruit maturation period.

2. Effect of methyl bromide:

Sever wilt was developed in both seasons in untreated plots (Table 2). Increasing methyl bromide concentration was effective against wilt symptoms. Doubling methyl bromide rate caused significant reduction in wilt incidence. In this study, almost 80% of melon plants can be saved by fumigation with methyl bromide at rate of 60 g/m^2, whereas only 34% of these plants can be saved if the rate was 30 g/m^2. 80% of the plants have been lost in untreated plots.

Similar results were obtained by Reuveni *et al.* (1983), Martyn and Miller (1996). Gamliel *et al.* (1996), Edelstein *et al.* (1999) and recently by

Cohen *et al.* (2002), who reported that methyl bromide at 50 gm/m^2 effectively controlled *M. Cunnonballus* in melon plants compared with the rate 15 gm/m^2. Ristaino and Thomas (1997) reported that although methyl bromide usage will be prohibited in the developed countries, the use of this fumigant at reduced dosages would be allowed for the next 5 years in the developing countries.

Table (2): Effect of water regime, methyl bromide rate and fruit load on *Monosporascus* wilt incidence (%) on melon plants.

Treatments	*Monosporascus* wilt incidence (%)		
	2002	2003	Mean
Water regime (m^3/fed./day)			
5	62.3	64.2	63.2
10	37.2	39.5	38.3
15	29.8	31.9	30.8
L.S.D. at (0.05)	6.1	6.4	6.5
Methyl bromide rate (g/m^2)			
0	78.6	81.0	79.8
30	33.1	35.1	34.1
60	17.7	19.5	18.6
L.S.D. at (0.05)	6.8	6.9	6.8
Fruit load (no. of fruits/plant)			
1	35.2	37.1	36.1
2	42.3	44.2	43.2
3	51.9	54.3	53.1
L.S.D. at (0.05)	5.1	5.2	5.3

Table (3): Effect of interaction between water regime and methyl bromide rate on Monosporascus wilt incidence (%) on melon plants.

Irrigation water regime (m^3/fed./day)	Methyl bromide rate (g/m^2)	Wilt incidence (%)		
		2002	2003	Mean
	0	85.3	87.4	86.3
5	30	59.5	61.6	60.7
	60	41.9	43.7	42.8
	0	78.9	81.5	80.2
10	30	25.6	28.5	26.8
	60	7.3	9.0	8.1
	0	71.6	74.1	72.8
15	30	13.8	15.9	14.8
	60	4.1	5.8	4.9
L.S.D. at (0.05)		5.3	5.4	5.4

3. Effect of fruit load:

Plants with fruit thinned to two or one per plant, exhibited wilt incidences of 43.2 and 36.1, respectively (Table 2). On the other hand, mortality of 53.1% was observed in the plants grown with the average of three fruits per plant (non-thinning). The first symptoms of sudden wilt in this experiment were usually associated with fruit maturity. Similar results, showing delayed symptoms following fruit removal, were reported in trails conducted in Texas by Wolf (1994 and 1995). Also, these results are coincided with those reported by Pivonia *et al.* (1997), who mentioned that melon plants with one or zero fruit per plant exhibited *Monosporascus* wilt incidence of 75 and 12%, respectively compared with plants have an average of 2.5 fruits per plant. Recently, Pivonia *et al.* (2002) confirmed similar results, they reported that fruit removed from infected melon plants prevented wilting and the largest reduction in wilt incidence was observed after complete fruit removal compared with one or four to five fruits. They added also that presence of fruit on *M. Cannonballus* infected plants apparently subjected the plants to progressive water stress till they die. Fruit removal reduced leaf stomatal conductance and increased root growth, thus enabling the plants to survive. The constraint to water uptake and translocation are imposed by the pathogen through root destruction tylose formation and root function.

4. Effect of interaction between water regime and methyl bromide:

Doubling both water regime and methyl bromide rate significantly reduced wilt symptoms (Table 3). High wilt incidence (72.8%) was noticed in untreated plants with methyl bromide even if these plants were irrigated with high water regime. The lowest values of wilt incidence were obtained in plants irrigated with the high water regime (15 m^3/fed./day) and fumigated with the high rate of methyl bromide (60 gm/m^2). There were significant differences between plants fumigated with the same rate of methyl bromide (60 gm/m^2) and irrigated with different amounts of irrigation water. Also, there were significant differences between plants irrigated with the same quantity of irrigation water and treated with different rates of methyl bromide. These results confirmed that following up for good agricultural practices like water regime and methyl bromide rate can play an important role in wilt incidence reduction on melon plants. These results are in agreement with those reported by Martyn and Miller (1996), who found that *Monospororascus* wilt was most severe under stress conditions e.g. drought and heat.

5. Effect of interaction between water regime and fruit load:

Plants have one fruit showed the lowest percent of infection even they irrigated with less frequent traditional water application, i.e. 5 m^3/fed./day and increasing water regime in these plants increased the percent of alive plants (Table 4). Three fruits per plant resulted in wilt symptoms of 73.5, 48.3 and 37.4 of plants irrigated with 5, 10 and 15 m^3/fed./day, respectively. These results proved that water management is an important issue in melon wilting reduction. Similar results were obtained by Miller (1990), who demonstrated that when young cantaloupe fruits were removed from the vines, vine symptoms were delayed as much as 14 days compared to vines from which the fruit had not been removed. Wolf (1995) also reported that muskmelon genotypes with a concentrated fruit set appeared more susceptible to vine decline. Martyn and Miller (1996) reported that vine decline disease caused by *Monosporascus* is most severe under conditions that tend to stress the plant, e.g., heat, drought and fruit load. In recent years, Pivonia *et al.* (2002(reported that *Monosporascus* infected plants showed reversible wilt symptoms and when fruits were removed, they regained leaf turgor and remained alive. Fruit removal caused an immediate and sharp drop in leaf stomatal conductance in both healthy and infected plants. Fruit removal reduced leaf stomata conductance and increased root growth, thus enabling the plants to survive. The constraint to water uptake and translocation imposed by the pathogen through root destruction tylose formation and root function.

Table (4): Effect of interaction between water regime and fruit load on Monosporascus wilt incidence (%) on melon plants.

Irrigation water regime (m^3/fed/ day)	Fruit load (no. of fruits/plant)	Wilt incidence (%) 2002	2003	Mean
	1	53.5	54.9	54.2
5	2	61.2	63.0	62.1
	3	72.4	74.7	73.5
	1	28.8	30.7	29.7
10	2	36.0	38.1	37.0
	3	46.9	49.7	48.3
	1	23.4	25.8	24.6
15	2	29.6	31.6	30.6
	3	36.5	38.4	37.4
L.S.D. at (0.05)		5.2	5.3	5.2

Table (5): Effect of interaction between methyl bromide and fruit load on Monosporascus wilt incidence (%) on melon plants.

Methyl bromide rate (g/m^2)	Fruit load (no. of fruits/plant)	Wilt incidence (%) 2002	2003	Mean
	1	69.6	71.6	70.6
0	2	78.7	81.5	80.1
	3	87.4	89.9	88.6
	1	23.8	25.8	24.8
30	2	31.4	33.0	32.2
	3	44.1	46.7	45.4
	1	12.2	14.0	13.1
60	2	16.8	18.2	17.5
	3	24.2	26.3	25.2
L.S.D. at (0.05)		5.2	5.3	5.2

6. Effect of the interaction between methyl bromide and fruit load:

The highest values of infected plants were obtained in untreated plants and those having three fruits per plant, compared with those having one fruit per plant and fumigated with methyl bromide at rate of 60 gm/m^2, which showed the lowest values of wilt incidence (Table 5). Data in Table (5) also, revealed that there was an evidence that fruit removal is an effective treatment for melon wilt even the plants are fumigated with the recommended rate of methyl bromide.

7. Effect of the interaction among water regime, methyl bromide and fruit load:

Data presented in Table (6) showed that the lowest values of wilt incidence were obtained in plants which received the highest water regime (15 m^3/fed/day), fumigated with the highest rate of methyl bromide (60 gm/m^2) and their fruits thinned to one fruit per plant. Likewise, up to 90% of untreated plants (zero methyl bromide) under the lowest water regime (5 m^3/fed/day) with fruit load of three fruits/plant were wilted, died and lost. Doubling both of water regime and methyl bromide rate and fruit removal to one or two fruits per plant decreased wilt incidence.

Table (6): Effect of interaction between water regime, methyl bromide and fruit load on Monosporascus wilt incidence (%) on melon plants.

Irrigation water regime (m^3/fed/ day)	Methyl bromide rate (g/m^2)	Fruit load (no. fruits/plant)	Wilt incidence (%)		
			2002	2003	Mean
5	0	1	79.1	80.3	79.5
		2	84.3	86.7	85.5
		3	92.6	95.3	93.9
	30	1	50.3	51.5	50.9
		2	58.7	60.2	59.4
		3	70.9	73.1	72.0
	60	1	31.3	33.1	32.2
		2	40.8	42.2	41.5
		3	53.7	55.9	54.8
10	0	1	68.2	70.7	69.4
		2	79.7	82.1	80.9
		3	88.8	91.8	90.3
	30	1	15.4	17.3	16.3
		2	22.6	25.1	23.8
		3	38.9	41.8	40.3
	60	1	2.8	4.2	3.5
		2	5.9	7.3	6.6
		3	13.2	15.7	14.4
15	0	1	61.7	63.8	62.7
		2	72.3	75.7	74.0
		3	80.9	82.8	81.8
	30	1	5.8	8.8	7.3
		2	12.9	13.9	13.4
		3	22.7	25.2	23.9
	60	1	2.7	4.8	3.7
		2	3.8	5.2	4.5
		3	5.9	7.4	6.6
L.S.D. at (0.05)			5.5	5.8	5.6

B. Vegetative Growth:

The highest values of plant dry weight, root dry weight, number of main stems per plant, plant vine length, average leaf area, relative growth rate and net assimilation rat were significantly recorded on plants irrigated with the higher rate of irrigation water (15 m^3/day/fed), grown in soil fumigated pre-planting with 60 gm/m^2 or having the lower number of fruits (Table 7). As a general conclusion there was a relationship and negative correlation (Tables 2 and 7) between *Monosporascus* wilt incidence (%) and vegetative growth characteristics of melon plants. It can be concluded that agricultural practice systems including leaving only one to two fruits/plant, irrigation with higher water regime or the application of high rate of methyl, bromide which stimulated the vegetative growth decreased the incidence of wilt in melon fields even if these fields are naturally infested with *Monosporascus* wilt.

The above mentioned results were in a agreement with those reported by Mertely *et al.* (1991 and 1993), Martyn and Miller (1996), Crosby and Wolf, (1998) and Edelstein *et al.* (1999), they concluded that the highest values of vegetative growth parameters can be achieved by the right agricultural practices which decreased the incidence of *Monosporascus* wilt which significantly reduced the values of vegetative growth parameters of melon plants like dry weight, shoot length, leaf area, number of branches per plant and plant vigour.

The same trend was true according to the effect of the interactions between each two factors or among water regime, methyl bromide and fruit load per plant on melon vegetative growth parameters (Tables 8, 9, 10 and 11). In other words, the most effective treatment in stimulating the vegetative growth was irrigation 15 m^3/fed/day, fumigation with methyl bromide at 60 g/m^2 and leaving one or two fruits on plants.

C. Fruit quality, yield and its components:

Data presented in Table (12) show that average fruit weight was increased with increasing both of irrigation water regime, and methyl bromide rate and decreasing the number of fruits per plant. In other words, average fruit weight could be doubled by doubling both of irrigation water regime and methyl bromide even if these fruit are produced by plants grown in naturally infested soil with *Monosporascus* wilt (Table 13). This is an evidence that management of agricultural practices like water regime, fruit load and methyl bromide can play a role to have high weight of melon fruits produced under conditions of *Monosporascus* wilt.

The same trend was noticed in total and marketable yields where higher fruit weight led to higher both total and marketable yield. Both total and marketable yields were increased by increasing levels of irrigation or methyl bromide. On the contrast, fruit weight was decreased with increasing fruit number per plant but both total and marketable yields were increased fruit with increasing number of fruits per plant. These results were true in the two seasons of this study. The interactions between each two factors or among three tested factors (Table 13, 14, 15 and 16) indicated the favorable influence of increasing irrigation and methyl bromide levels or decreasing the number of fruits per plant.

Table (7): Main effect of water regime, methyl bromide rate and fruit load on vegetative growth characteristics of melon plants grown in naturally infested soil with *Monosporascus* wilt.

Treatments	Plant dry weight (gm)			Root dry weight (gm)			Number of main stems /plant			Plant vine length (cm)			Leaf area (cm^2)			Relative growth rate (mg/g/ 2weeks)			Net assimilation rate (mg/cm^2/day)		
	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
Water regime (m^3/fed /day):																								
5	85.2	83.2	84.2	11.8	11.3	11.5	2.1	2.0	2.1	90.1	88.4	89.2	434.3	425.0	429.6	0.571	0.560	0.565	1.194	1.176	1.185
10	93.6	91.9	92.7	20.0	19.6	19.8	2.5	2.5	2.5	114.8	112.6	113.7	581.6	571.9	576.7	0.641	0.633	0.637	1.434	1.405	1.419
15	102.8	100.5	101.6	23.9	23.6	23.7	3.6	3.6	3.6	135.0	133.1	134.0	693.5	682.0	687.7	0.801	0.791	0.796	1.648	1.637	1.642
L.S.D. at (0.05)	**5.1**	**5.0**	**5.1**	**2.6**	**2.5**	**2.6**	**0.7**	**0.6**	**0.7**	**10.8**	**9.7**	**10.3**	**49.4**	**47.4**	**48.2**	**0.059**	**0.048**	**0.054**	**0.107**	**0.101**	**0.104**
Methyl bromide rate (g/m2)																					
0	87.8	86.0	86.9	16.3	15.8	16.0	2.6	2.6	2.6	105.9	103.8	104.8	515.3	506.6	510.9	0.642	0.631	0.636	1.348	1.332	1.340
30	93.1	91.0	92.0	18.0	17.7	17.8	2.7	2.7	2.7	113.0	111.3	112.1	564.9	553.4	559.1	0.664	0.656	0.660	1.426	1.413	1.419
60	100.7	98.7	99.7	21.5	21.0	21.3	3.9	3.9	3.9	121.0	119.0	120.0	629.3	619.0	624.1	0.707	0.698	0.702	1.502	1.474	1.488
L.S.D. at (0.05)	**5.0**	**5.0**	**5.0**	**1.7**	**1.6**	**1.7**	**0.7**	**0.7**	**0.7**	**7.1**	**7.0**	**7.1**	**51.8**	**50.3**	**51.2**	**0.058**	**0.052**	**0.055**	**0.110**	**0.108**	**0.109**
Fruit load (no. of fruits/ plant):																					
1	103.7	102.6	102.6	22.1	21.7	21.9	3.0	3.0	3.0	122.0	121.0	121.5	627.9	617.0	622.4	0.762	0.751	0.756	1.559	1.543	1.551
2	94.4	93.6	93.6	18.5	18.1	18.3	2.8	2.7	2.8	112.9	111.5	112.2	568.0	556.9	562.4	0.619	0.611	0.615	1.389	1.374	1.381
3	83.5	81.3	82.4	15.2	14.8	15.0	2.5	2.5	2.5	104.4	102.8	103.6	514.1	505.1	509.6	0.633	0.624	0.628	1.334	1.323	1.328
LS.D. at (0.05)	**5.2**	**5.1**	**5.2**	**1.8**	**1.7**	**1.8**	**0.5**	**0.5**	**0.5**	**7.5**	**7.3**	**7.4**	**48.2**	**47.3**	**47.7**	**0.048**	**0.045**	**0.046**	**0.118**	**0.112**	**0.115**

Table (8): Effect of interaction between water regime and methyl bromide rate on vegetative growth characteristics of melon plants grown in naturally infested soil with *Monosporascus wilt.*

Irrigation water regime (m^3/fed./day)	Methyl bromide rate (g/m^2)	Plant dry weight (gm)			Root dry weight (gm)			Number of main stems /plant			Plant vine length (cm)			Leaf area (cm^2)			Relative growth rate (mg/g/ 2weeks)			Net assimilation rate (mg/cm^2/day)		
		2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
5	0	78.8	76.4	77.6	9.1	8.5	8.8	1.9	1.9	1.9	82.0	79.9	81.0	410.3	407.7	409.0	0.547	0.537	0.542	1.116	1.095	1.105
	30	87.5	85.7	86.6	11.2	10.9	10.1	2.1	2.1	2.1	90.1	88.3	89.2	430.1	417.1	423.6	0.584	0.572	0.578	1.195	1.176	1.185
	60	89.3	87.7	88.5	15.1	14.7	14.9	2.3	2.2	2.3	98.4	97.0	97.7	462.7	450.3	456.5	0.584	0.575	0.580	1.271	1.258	1.264
10	0	88.5	87.1	87.8	18.4	17.9	18.1	2.4	2.4	2.4	106.2	104.3	105.2	514.6	503.9	509.2	0.635	0.626	0.630	1.361	1.347	1.354
	30	92.2	90.3	91.2	19.4	19.0	19.2	2.5	2.4	2.5	115.5	113.2	114.3	567.0	566.0	567.0	0.613	0.605	0.609	1.433	1.421	1.427
	60	100.1	98.5	99.3	22.3	21.9	22.1	2.6	2.8	2.7	122.7	120.5	121.6	654.4	645.1	649.7	0.677	0.670	0.673	1.509	1.449	1.479
15	0	96.2	94.5	95.3	21.4	21.0	21.2	3.6	3.5	3.6	129.6	127.4	128.5	621.0	608.2	614.6	0.744	0.731	0.737	1.567	1.554	1.560
	30	99.6	97.0	98.3	23.4	23.2	23.3	3.6	3.6	3.6	133.5	132.5	133.0	688.7	676.4	682.5	0.797	0.791	0.794	1.652	1.643	1.647
	60	112.7	110.1	111.4	27.1	26.6	26.8	3.8	3.7	3.2	142.1	139.6	140.8	771.0	761.6	766.3	0.863	0.852	0.857	1.727	1.715	1.721
L.S.D. at (0.05)		3.1	3.0	3.1	1.5	1.4	1.5	0.7	0.7	0.7	7.0	6.7	6.9	51.1	49.2	50.2	0.052	0.051	0.052	0.060	0.058	0.059

Table (9): Effect of interaction between water regime and fruit load on vegetative growth characteristics of melon plants grown in naturally infested soil with *Monosporascus wilt.*

Irrigation water regime (m^3/fed./day)	Fruit load (no. fruit/plant)	Plant dry weight (gm)			Root dry weight (gm)			Number of main stems /plant			Plant vine length (cm)			Leaf area (cm^2)			Relative growth rate (mg/g/ 2weeks)			Net assimilation rate (mg/cm^2/day)		
		2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
	1	93.3	91.1	92.2	15.1	14.5	14.8	2.3	2.2	2.3	100.3	98.1	99.2	461.9	451.5	456.7	0.638	0.626	0.632	1.308	1.285	1.296
5	2	86.9	85.4	86.1	11.2	10.9	11.1	2.1	2.0	2.1	90.0	88.7	89.3	439.7	427.6	433.6	0.549	0.541	0.545	1.179	1.160	1.169
	3	75.3	73.3	74.3	9.0	8.7	8.8	2.0	1.9	2.0	80.1	78.5	79.3	401.5	395.9	398.7	0.526	0.515	0.520	1.095	1.084	1.089
	1	103.8	102.3	103.0	23.7	23.4	23.5	2.9	2.9	2.8	123.4	121.1	122.2	643.0	633.0	638.0	0.742	0.734	0.738	1.579	1.567	1.573
10	2	92.4	90.8	91.6	20.0	19.4	19.7	2.6	2.6	2.6	115.2	113.1	114.1	563.8	554.4	559.1	0.579	0.572	0.575	1.398	1.383	1.390
	3	84.6	82.8	83.7	16.4	16.0	16.2	2.4	2.4	2.4	105.8	104.0	104.9	538.2	528.4	533.3	0.603	0.596	0.599	1.326	1.317	1.321
	1	113.9	111.2	112.5	27.5	27.1	27.3	3.8	3.7	3.8	142.3	140.9	141.6	777.5	766.7	772.1	0.904	0.615	0.759	1.789	1.778	1.783
15	2	103.9	102.4	103.1	24.3	24.1	24.2	3.7	3.6	3.7	135.5	132.7	134.1	700.5	688.4	694.4	0.728	0.720	0.724	1.590	1.578	1.584
	3	90.7	88.0	89.3	20.1	19.6	19.8	3.6	3.4	3.5	127.4	126.0	126.7	602.8	591.0	596.9	0.771	0.762	0.766	1.567	1.555	1.561
L.S.D. at (0.05)		5.3	5.1	5.1	2.1	2.0	2.1	0.6	0.6	0.6	5.2	5.0	5.1	52.1	51.3	51.6	0.056	0.051	0.053	0.086	0.081	0.084

Table (10): Effect of interaction between methyl bromide and fruit load on vegetative growth characteristics of melon plants grown in naturally infested soil with *Monosporascus wilt.*

Methyl bromide rate (g/m²)	Fruit load (no. fruits/plant)	Plant dry weight (gm)			Root dry weight (gm)			Number of main stems /plant			Plant vine length (cm)			Leaf area (cm²)			Relative growth rate (mg/g/ 2weeks)			Net assimilation rate (mg/cm²/day)		
		2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
	1	95.2	93.6	94.4	19.3	18.7	19.0	2.7	2.7	2.7	115.1	113.1	114.1	564.2	554.1	559.1	0.733	0.719	0.726	1.471	1.452	1.461
0	2	87.9	85.9	86.9	16.1	15.6	15.8	2.6	2.5	2.6	106.0	103.8	104.9	517.8	506.6	512.2	0.604	0.597	0.600	1.316	1.297	1.306
	3	80.4	78.4	79.4	13.5	13.1	13.3	2.6	2.5	2.6	96.8	94.8	95.8	463.9	459.0	461.4	0.588	0.579	0.583	1.257	1.247	1.252
	1	103.2	100.6	101.9	22.0	21.7	21.8	3.0	2.9	3.0	121.4	119.8	120.6	615.4	605.7	610.5	0.742	0.733	0.737	1.559	1.543	1.551
30	2	91.9	93.4	92.6	17.8	17.6	17.7	2.7	2.7	2.7	113.8	111.6	112.7	565.3	554.4	559.8	0.611	0.603	0.607	1.386	1.373	1.379
	3	81.4	79.1	80.2	14.3	13.9	14.1	2.6	2.5	2.5	103.9	102.6	103.2	507.5	500.2	503.8	0.640	0.632	0.636	1.335	1.323	1.329
	1	112.6	110.5	111.5	25.1	24.6	24.8	3.3	3.2	3.3	129.6	127.1	128.3	702.8	691.3	697.0	0.809	0.800	0.804	1.647	1.635	1.641
60	2	100.7	99.3	100.0	21.6	21.3	21.4	3.0	2.9	2.9	120.9	118.9	119.9	620.9	609.6	615.2	0.641	0.633	0.637	1.464	1.451	1.457
	3	88.8	86.5	87.6	17.8	17.3	17.5	2.8	2.7	2.7	112.6	111.1	111.8	564.4	556.1	560.2	0.672	0.662	0.667	1.396	1.385	1.390
L.S.D. at (0.05)		5.6	5.4	5.5	3.1	3.0	3.1	0.3	0.3	0.3	7.1	7.0	7.1	30.1	30.0	30.0	0.051	0.050	0.050	0.055	0.051	0.053

Table (11): Effect of interaction between water regime and fruit load on vegetative growth characteristics of melon plants grown in naturally infested soil with *Monosporascus wilt.*

Irrigation water regime (m^3/fed./day)	Methyl bromide rate (gm/m^2)	Fruit load (no. fruits/plant)	Plant dry weight (gm)			Root dry weight (gm)			Number of main stems /plant			Plant vine length (cm)			Leaf area (cm^2/plant)			Relative growth rate (mg/g/ 2 weeks)			Net assimilation rate (mg/cm^2/day)		
			2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
		1	86.4	83.2	84.8	12.5	11.3	11.9	2.1	2.1	2.1	92.3	89.1	90.7	430.7	420.2	425.4	0.589	0.577	0.583	1.207	1.181	1.194
	0	2	79.5	78.1	78.8	8.1	7.7	7.9	1.9	1.8	1.9	81.4	80.3	80.8	418.8	410.3	414.5	0.543	0.536	0.539	1.102	1.075	1.088
		3	70.6	67.9	69.2	6.7	6.5	6.6	1.9	1.9	1.9	72.3	70.5	71.4	381.5	392.6	387.0	0.510	0.499	0.504	1.040	1.031	1.035
		1	93.9	91.5	92.7	15.7	15.4	15.6	2.3	2.2	2.3	99.9	98.1	99.0	456.8	450.7	453.7	0.631	0.625	0.625	1.318	1.292	1.305
5	30	2	88.7	86.9	87.8	9.8	9.5	9.6	2.1	2.1	2.1	90.2	88.4	89.3	432.2	419.3	425.7	0.573	0.562	0.567	1.172	1.153	1.162
		3	80.1	78.8	79.4	8.2	7.9	8.1	2.0	2.0	2.0	80.3	78.5	79.4	401.3	381.5	391.4	0.548	0.536	0.542	1.096	1.083	1.089
		1	99.8	98.7	99.2	17.3	17.0	17.2	2.5	2.4	2.5	108.8	107.0	107.9	498.3	483.6	490.9	0.696	0.682	0.689	1.401	1.383	1.392
	60	2	92.7	91.3	92.0	15.8	15.5	15.7	2.3	2.2	2.3	98.5	97.4	97.9	468.2	453.7	460.6	0.531	0.527	0.529	1.263	1.253	1.258
		3	75.4.	73.2	74.3	12.2	11.7	12.0	2.1	2.0	2.1	87.9	86.6	87.2	421.7	413.8	417.7	0.522	0.510	0.516	1.149	1.138	1.143
		1	95.6	95.1	95.3	21.4	21.2	21.3	2.7	2.6	2.7	115.7	113.8	114.7	560.3	551.9	556.1	0.763	0.751	0.757	1.496	1.480	1.488
	0	2	88.8	86.1	87.4	18.7	17.9	18.3	2.4	2.3	2.4	106.8	105.2	106.0	501.9	489.3	495.6	0.601	0.592	0.596	1.337	1.320	1.328
		3	81.3	80.1	80.7	15.3	14.8	15.1	2.3	2.3	2.3	96.3	94.3	95.3	481.7	470.6	476.1	0.543	0.537	0.540	1.250	1.241	1.245
		1	102.1	100.2	101.1	23.2	22.8	23.0	2.9	2.8	2.9	124.3	122.2	123.2	619.2	608.3	613.7	0.701	0.692	0.696	1.583	1.570	1.576
10	30	2	91.7	90.5	91.1	19.5	19.2	19.4	2.5	2.4	2.5	115.8	113.4	114.6	567.3	560.2	563.7	0.537	0.531	0.534	1.398	1.386	1.392
		3	82.8	80.3	81.5	15.6	15.1	15.4	2.2	2.1	2.2	106.4	104.0	105.2	541.7	531.8	536.7	0.601	0.592	0.596	1.320	1.309	1.314
		1	113.9	111.7	112.8	26.7	26.2	26.5	3.3	3.1	3.2	130.2	127.3	128.7	749.7	738.8	744.2	0.764	0.759	0.761	1.660	1.653	1.656
	60	2	96.9	95.8	96.3	21.8	21.3	21.6	2.9	2.8	2.9	123.1	120.7	121.9	622.3	613.9	618.1	0.601	0.593	0.597	1.459	1.443	1.451
		3	89.7	88.	88.8	18.5	18.2	18.4	2.7	2.6	2.7	114.8	113.7	114.2	591.3	582.8	587.0	0.666	0.659	0.662	1.410	1.401	1.405
		1	103.7	102.6	103.1	24.2	23.7	24.0	3.5	3.5	3.5	137.2	136.4	136.8	701.8	690.3	696.0	0.849	0.831	0.840	1.710	1.696	1.703
	0	2	95.5	93.7	94.6	21.6	21.2	21.4	3.6	3.5	3.6	129.9	126.1	128.0	632.7	620.4	626.5	0.670	0.663	0.666	1.510	1.496	1.503
		3	89.4	87.3	88.3	18.6	18.2	18.4	3.7	3.5	3.6	121.8	119.7	120.7	528.7	513.9	521.3	0.713	0.701	0.707	1.483	1.470	1.476
		1	113.8	110.1	111.9	27.1	26.9	27.0	3.8	3.7	3.8	140.1	139.2	139.6	770.3	758.2	764.2	0.896	0.888	0.892	1.776	1.769	1.772
15	30	2	103.6	102.8	103.2	24.2	24.1	24.2	3.7	3.7	3.7	135.5	133.2	134.3	696.5	683.7	690.1	0.723	0.718	0.720	1.590	1.581	1.585
		3	81.5	78.3	79.9	19.1	18.7	18.9	3.5	3.4	3.5	125.1	125.3	125.2	599.4	587.4	593.4	0.773	0.769	0.771	1.590	1.579	1.584
		1	124.3	121.1	122.7	31.3	30.8	31.1	4.1	4.1	4.1	149.8	147.1	148.4	860.4	851.7	856.0	0.969	0.959	0.964	1.881	1.869	1.875
	60	2	112.6	110.8	111.7	27.3	27.1	27.1	3.8	3.7	3.8	141.2	138.8	140.0	772.3	761.3	766.8	0.793	0.781	0.787	1.670	1.659	1.664
		3	101.4	98.5	99.9	22.8	22.1	22.5	3.6	3.5	3.6	135.3	133.1	134.2	680.4	671.8	676.1	0.829	0.818	0.823	1.630	1.618	1.624
L.S.D. at (0.05)			6.4	6.3	6.3	2.9	2.8	2.8	0.6	0.5	0.5	6.3	6.1	6.2	52.3	51.8	52.0	0.051	0.050	0.051	0.090	0.087	0.088

Table 12. Effect of irrigation water regime, methyl bromide and fruit load on yield, yield components and fruit quality of melon plants grown in naturally infested soil with *Monosporascus wilt.*

Treatments	Fruit weight (kg)			Yield (kg/m^2)			Total yield (Ton/fed.)			Marketable yield (Ton/fed.)			TSS (%)		
	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
Irrigation water regime (m^3/fed./day)															
5	0.842	0.813	0.827	2.127	2.034	2.080	8.511	8.144	8.327	3.950	3.659	3.804	10.1	10	10.1
10	1.061	1.025	1.043	2.510	2.426	2.468	10.042	9.704	9.873	4.966	4.612	4.789	9.6	9.6	9.6
15	1.301	1.246	1.273	2.905	2.823	2.864	12.295	11.720	12.007	5.903	5.570	5.736	9.2	9.2	9.2
L.S.D. at (0.05):	**0.083**	**0.087**	**0.091**	**0.170**	**0.160**	**0.165**	**0.495**	**0.480**	**0.473**	**0.192**	**0.185**	**0.170**	**0.5**	**0.5**	**0.5**
Methyl bromide rate (g/m^2)															
0	0.926	0.892	0.909	2.209	2.137	2.173	8.837	8.552	8.694	2.570	2.306	2.438	8.7	8.6	8.7
30	1.062	1.026	1.044	2.507	2.410	2.458	10.032	9.645	6.559	3.215	2.917	3.066	9.1	9.1	9.1
60	1.217	1.166	1.191	2.826	2.736	2.781	11.306	10.947	11.126	9.036	8.640	8.838	11.1	11.1	11.1
L.S.D. at (0.05):	**0.089**	**0.093**	**0.097**	**0.185**	**0.170**	**0.163**	**0.450**	**0.440**	**0.445**	**0.180**	**0.170**	**0.160**	**0.5**	**0.5**	**0.5**
Fruit load (no. of fruits/pant)															
1	1.228	1.183	1.205	1.737	1.665	1.701	7.017	6.662	6.839	3.921	3.676	3.798	9.2	9.1	9.2
2	1.064	1.020	1.042	2.561	2.477	2.519	10.247	9.908	10.077	5.286	4.951	5.118	9.6	9.6	9.6
3	0.913	0.882	0.897	3.244	3.143	3.193	12.978	12.573	12.775	5.613	5.237	5.425	10.3	10.2	10.3
L.S.D. at (0.05):	**0.093**	**0.097**	**0.099**	**0.160**	**0.153**	**0.163**	**0.492**	**0.479**	**0.497**	**0.173**	**0.171**	**0.181**	**0.5**	**0.5**	**0.5**

It is noticeable from data in Table (12) that the marketable yield was increased with the increasing of water regimes. The same trend was similar with methyl bromide rates. Only 28% was recorded as marketable yield in untreated plants, whereas the marketable yield in the treated plants with rates of 30 and 60 gm/m^2 was 47 and 80% from the total produced yield, respectively, i.e., the high rates of methyl bromide still play a role in melon marketable yield. This is very important point in this study because *Monosporascus* symptoms first appeared on plants at early stage of fruit maturity, commonly within 10 days of harvest and the diseased vines exhibited stunting, yellowing and at late stage complete collapse of the leaf canopy exposing the fruits to intense solar radiation and reduce sugar contents.

Regarding the effect on total soluble solids contents (TSS) of melon fruits, data presented in Table (12) show clearly that TSS% was decreased by increasing water regime or by decreasing the number of fruits per plant. The plants which had higher number of fruits (3 fruits/plant) had the higher TSS than that of plants having two or one fruit/plant. TSS contents in the highest methyl bromide treated plots was higher than that in the untreated plots or treated with lower rate. With respect to the effect of interaction of all combinations of water regime, methyl bromide and fruit load, data in Tables (13, 14, 15 and 16) indicate that management of agricultural practices in melon fields is very important to get good yield with best fruit quality even if these fields are infested with *Monosporascus* wilt.

D. Efficiency of water utilization (EWU):

Efficiency of water utilization, expressed as consumptive use per season in m^3/fed. for one kilogram of melon fruits, is used to evaluate the efficiencies of irrigation practices for maximum utilization of water supplies. Results in Table (17) indicate that the highest efficiency of water utilization was noticed as a result of growing melon plants under low water regime. EWU was 0.042, 0.070 and 0.087 m^3/kg for 5, 10 and 15 m^3/fed./day, respectively. A similar conclusion was also noticed by Tanner and Lemon (1962), who reported that evapotranspiration was increased, while water use efficiency was decreased, by wet rather than dry treatments. Fattahallah (1992) working on tomato in sandy soil reported that the least amount of irrigation i.e., 1.67 liters/m^2, gave the highest record of water use efficiency, while the lowest records were noticed when plants were irrigated with 5.01 or 6.68 liters/m^2. Also, these results confirm the results obtained by Theodore and Sammis (1980), Singh and Sood (1994), Franke *et al.*, (1994), Shehata and Bakeer (1995) and Khalok and Kumaraswamy (1996), who reported that the highest values of EWU were obtained under the lowest water quantity.

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Table (13): Effect of interaction between irrigation water regime and methyl bromide rate on yield, yield components and fruit quality of melon plants grown in naturally infested soil with *Monosporascus wilt*.

Irrigation water regime (m^3/fed./day)	Methyl bromide rate (g/m^2)	Fruit weight (kg)			Yield (kg/m^2)			Total yield (ton/fed.)			Marketable yield (ton/fed.)			TSS (%)		
		2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
5	0	0.697	0.668	0.682	1.752	1.655	1.703	7.008	6.622	6.815	1.824	1.558	1.691	9.1	8.8	8.9
	30	0.841	0.812	0.826	2.253	2.167	2.212	9.014	8.682	8.848	2.405	2.229	2.317	9.3	9.2	9.2
	60	0.990	0.960	0.975	2.378	2.282	2.329	9.513	9.128	9.320	7.622	7.192	7.407	12.0	12.0	12.0
10	0	0.936	0.901	0.918	2.314	2.247	2.281	9.258	8.990	9.124	2.585	2.370	2.478	8.6	8.6	8.6
	30	1.050	1.014	1.032	2.490	2.383	2.436	9.961	9.532	9.746	3.108	2.716	2.912	9.2	9.2	9.2
	60	1.198	1.160	1.179	2.727	2.648	2.687	10.908	10.592	10.750	9.206	8.814	7.603	11.0	11.1	11.1
15	0	1.145	1.107	1.126	2.561	2.511	2.536	10.246	10.044	10.145	3.302	2.990	3.146	8.6	8.6	8.6
	30	1.295	1.254	1.274	2.780	2.680	2.730	11.121	10.721	10.921	4.132	3.808	3.970	8.8	8.8	8.8
	60	1.463	1.379	1.421	3.374	3.280	3.327	13.497	13.121	13.309	10.277	9.914	10.096	10.4	10.4	10.4
L.S.D. at (0.05)		**0.088**	**0.082**	**0.085**	**0.159**	**0.152**	**0.155**	**0.472**	**0.461**	**0.467**	**0.180**	**0.174**	**0.180**	**0.5**	**0.5**	**0.5**

Table (14): Effect of interaction between irrigation water regime and fruit load on yield, yield components and fruit quality of melon plants grown in naturally infested soil with *Monosporascus wilt.*

Irrigation water regime (m^3/fed./day)	Fruit load (no. fruits/plant)	Fruit weight (kg)			Yield (kg/m^2)			Total yield (ton/fed.)			Marketable yield (ton/fed.)			TSS (%)		
		2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
5	1	0.965	0.939	0.952	1.497	1.426	1.461	5.988	5.705	5.846	3.169	2.961	3.065	9.5	9.4	9.4
	2	0.854	0.830	0.842	2.039	1.929	1.984	8.157	7.718	7.937	4.264	3.913	4.089	10.1	10.1	10.4
	3	0.708	0.677	0.692	2.847	2.752	2.799	11.390	10.009	10.699	4.418	4.103	4.260	10.7	10.4	10.5
10	1	1.240	1.199	1.219	1.722	1.648	1.685	6.890	6.593	6.741	3.865	3.629	3.747	9.0	9.0	9.0
	2	1.038	0.999	1.018	2.623	2.557	2.590	10.492	10.228	10.360	5.176	4.864	5.020	9.7	9.6	9.6
	3	0.906	0.877	0.891	3.186	3.073	3.129	12.745	12.293	12.519	5.858	5.408	5.633	10.2	10.2	10.2
15	1	1.478	1.417	1.447	1.993	1.922	1.957	7.973	7.689	7.831	4.728	4.437	4.582	8.7	8.7	8.7
	2	1.300	1.230	1.265	3.023	2.944	2.984	12.092	11.777	11.934	6.420	6.076	6.248	9.2	9.1	9.1
	3	1.126	1.093	1.109	3.700	3.605	3.652	14.800	14.420	14.610	6.564	6.200	6.382	9.9	9.9	9.9
L.S.D. at (0.05)		0.089	0.078	0.091	0.152	0.143	0.151	0.510	0.501	0.501	0.175	0.171	0.178	0.5	0.5	0.5

Table (15): Effect of interaction between methyl bromide rate and fruit load on yield, yield components and fruit quality of melon plants grown in naturally infested soil with *Monosporascus wilt*.

Methyl bromide rate (g/m^2)	Fruit load (no. fruits/plant)	Fruit weight (kg)			Yield (kg/m^2)			Yield (ton/fed.)			Marketable yield (ton/fed.)			TSS (%)		
		2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
	1	1.073	1.025	1.049	1.577	1.451	1.514	6.098	5.806	5.952	1.982	1.806	1.894	8.2	8.2	8.2
0	2	0.924	0.892	0.908	2.144	2.081	2.112	8.577	8.326	8.451	2.893	2.577	2.735	9.0	8.6	8.8
	3	0.781	0.758	0.769	2.959	2.881	2.920	11.837	11.524	11.608	2.836	2.536	2.686	9.4	9.1	9.2
	1	1.228	1.188	1.208	1.764	1.894	1.829	7.056	6.772	6.914	2.795	2.584	2.590	8.4	8.7	8.5
30	2	1.004	1.030	1.017	2.669	2.570	2.619	10.676	10.281	10.478	3.478	3.174	3.326	9.2	9.2	9.2
	3	0.865	0.862	0.863	3.091	2.970	3.030	12.365	11.882	12.123	3.349	2.994	3.177	9.4	9.6	9.5
	1	1.383	1.336	1.359	1.924	1.852	1.888	7.697	7.409	7.553	6.985	6.637	6.811	10.6	10.6	10.6
60	2	1.210	1.137	1.173	2.872	2.779	2.825	11.488	11.116	11.302	9.465	9.102	9.283	11.1	11.1	11.1
	3	1.058	1.026	1.042	3.683	3.579	3.631	14.733	14.316	14.525	10.656	10.181	10.418	11.8	11.8	11.8
L.S.D. at (0.05)		**0.095**	**0.097**	**0.98**	**0.158**	**0.162**	**0.163**	**0.490**	**0.530**	**0.513**	**0.1081**	**0.182**	**0.179**	**0.5**	**0.5**	**0.5**

grown in naturally infested soil with *Monosporascus wilt*.

Water regime (m^3/fed./day)	Methyl bromide rate(g/m^2)	Fruit load (no. fruits/plant)	Fruit weight (kg)			Yield (kg/m^2)			Yield (ton/fed.)			Marketable yield (ton/fed.)			TSS (%)		
			2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
		1	0.815	0.773	0.794	1.346	1.211	1.278	5.384	4.844	5.114	1.592	1.348	1.470	8.5	8.5	8.5
	0	2	0.709	0.682	0.695	1.245	1.173	1.209	4.980	4.692	4.836	2.028	1.780	1.904	9.1	9.1	9.1
		3	0.567	0.549	0.558	2.665	2.583	2.624	10.660	10.332	10.496	1.852	1.458	1.700	9.6	9.0	9.3
		1	0.979	0.963	0.971	1.518	1.476	1.497	6.072	5.904	5.988	2.100	1.952	2.026	8.8	8.7	8.7
5	30	2	0.870	0.841	0.855	2.392	2.254	2.323	9.568	9.016	9.292	2.696	2.416	2.556	9.3	9.2	9.2
		3	0.675	0.632	0.653	2.851	2.782	2.816	11.404	11.128	11.266	2.420	2.319	2.369	9.9	9.8	9.8
		1	1.103	1.063	1.083	1.627	1.592	1.609	6.508	6.368	6.438	5.816	5.584	5.700	11.3	11.2	11.2
	60	2	0.985	0.968	0.976	2.481	2.362	2.421	9.924	9.448	9.686	8.068	7.548	7.808	12.1	12.2	12.1
		3	0.882	0.851	0.866	3.027	2.892	2.959	12.108	11.568	11.838	8.984	8.444	8.714	12.8	12.6	12.7
		1	1.116	1.067	1.091	1.515	1.473	1.494	6.060	5.892	5.976	2.016	1.876	1.946	8.2	8.2	8.2
	0	2	0.905	0.874	0.889	2.463	2.396	2.429	9.852	9.584	9.718	2.824	2.604	2.714	8.5	8.5	8.5
		3	0.787	0.763	0.775	2.966	2.874	2.920	11.864	11.496	11.680	2.916	2.632	2.774	9.2	9.2	9.2
		1	1.224	1.179	1.201	1.782	1.696	1.739	7.128	6.784	6.956	2.765	2.500	2.632	8.5	8.5	8.5
10	30	2	1.013	0.981	0.997	2.652	2.586	2.619	10.608	10.344	10.176	3.320	2.976	3.148	9.4	9.4	9.4
		3	0.915	0.883	0.899	3.037	2.867	2.952	12.148	11.468	11.808	3.240	2.672	2.956	9.9	9.7	9.8
		1	1.382	1.353	1.367	1.871	1.776	1.823	7.484	7.104	7.294	6.816	6.512	6.664	10.4	10.5	10.5
	60	2	1.196	1.142	1.169	2.754	2.689	2.721	11.016	10.756	10.886	9.384	9.012	4.975	11.1	11.1	11.1
		3	1.017	0.986	1.001	3.556	3.479	3.517	14.224	13.916	14.070	11.420	10.920	11.170	11.7	11.7	11.7
		1	1.290	1.236	1.263	1.713	1.671	1.692	6.852	6.684	6.768	2.340	2.196	2.268	8.1	8.1	8.1
	0	2	1.159	1.122	1.140	2.725	2.676	2.700	10.900	10.704	10.802	3.828	3.348	3.588	8.3	8.3	8.3
		3	0.986	0.963	0.974	3.247	3.186	3.216	12.988	12.744	12.866	3.740	3.428	3.584	9.5	9.3	9.4
		1	1.481	1.422	1.451	1.992	1.907	1.949	7.968	7.628	7.798	3.520	3.300	3.410	8.1	8.1	8.1
15	30	2	1.291	1.268	1.279	2.963	2.871	2.917	11.852	11.484	11.668	4.488	4.132	4.310	9.0	9.0	9.0
		3	1.113	1.073	1.093	3.386	3.263	3.324	13.544	13.052	13.298	4.388	3.992	4.190	9.4	9.4	9.4
		1	1.664	1.593	1.628	2.275	2.189	2.232	9.100	8.756	8.928	8.324	7.816	8.070	10.1	10.1	10.1
	60	2	1.451	1.302	1.376	3.381	3.286	3.333	13.524	13.144	13.334	10.944	10.748	10.846	10.3	10.2	10.3
		3	1.276	1.243	1.259	4.467	4.366	4.416	17.868	17.464	17.666	11.564	11.180	11.372	11.0	11.1	11.1
LS.D. at (0.05)			**0.091**	**0.096**	**0.098**	**0.160**	**0.158**	**0.164**	**0.486**	**0.472**	**0.182**	**0.178**	**0.187**	**0.183**	**0.5**	**0.5**	**0.5**

Table (17): Efficiency of water utilization as influenced by irrigation regimes of melon plants grown in naturally infested soil with *Monosporascus* wilt.

Irrigation regime (m^3/fed./day	Amount of applied water in the whole season (m^3/fed) *			Yield (ton/fed.)			E.W.U. ** m3/kg		
	2002	2003	Mean	2002	2003	Mean	2002	2003	Mean
5	350	350	350	8.511	8.144	8.327	0.041	0.042	0.042
10	700	700	350	10.042	9.704	9.873	0.069	0.072	0.070
15	1050	1050	350	12.295	11.720	12.007	0.085	0.089	0.087

* Amount of applied water through the hole season (70 days) of irrigation regime was 350, 700 and 1050 m^3/fed. for 5, 10 and 15 m^3/fed./day considering that a feddan equals 4000 m^2.

** Efficiency of water utilization (EWU) = consumptive use [m^3/fed./yield (kg/fed.)].

REFERENCES

Aegerter, B.J., Gordon, T.R., and Davis, R.M. (2000): Occurrence and pathogenicity of fungi associated with melon root rot and vine decline in California. Plant Dis. 84: 224- 229.

Agricultural Economic Bulletin, (2002): Annual report, Ministry of Agriculture. Cairo, Egypt.

Agricultural Technology Utilization and Transfer Project (ATUT). (2001): Soil fumigation and solarization for melon. Melon Technical Report. Publication No. 203 Dec. 2001, USAID Project No. 263- 0240

Beg, J.E. and Turner, N.C. (1976): Crop water deficits. Advances in Agron. 2, pp. 189.

Black, C.A. (1965): Crop yield in relation to water supply and soil fertility. In Plant Enviroment and Efficient Water Use. Amer. Soc. Agro. and Soil Sci. Am. Madison, Wis. (1966).

Brutton, B.D., and Miller, M.E. (1997): Occurrence of vine decline diseases of muskmelon in Guaemala. Plant Dis., 81: 694-696.

Chapman, H.D. and Pratt, P.F. (1961):" Melthods of Analysis for soil plant and water ". Division of Agricultural Science, Univ. of California, Barkely.

Cohen, R., Edelstein, M., Pivona, S., Gamliel, A., Burger, Y. and Katan. J. (2000): Toward integrated management of *Monosporascus* wilt of melons in Israel. Plant Dis., 86: 203-207

Cohen, R., Elkind, Y., Burger, Y., Offenbach, R., and Nerson, H. (1996): Variation in the response of melon genotypes to sudden wilt. Euphtica 87: 91- 95.

Crosby, K., and Wolf, D. (1998): Effects of *Monosporascus cannonballus* on root traits of susceptible and tolerant melon (*Cucumis melo* L.) cultivars plant Dis 82: 319- 322.

Edelstein, M., Cohen, R., Burger, Y., Shriber, S., Pivonia, S., and Shtienberg, D (1999): Integrated management of sudden wilt in melons, caused by *Monosporascus cannonballus*, using grafting and reduced rates of methyl bromide. Plant Dis. 83 1142-1145

Eyal. H.. and Cohen Y (1986) Sudden wilt in muskmelon: A continuing challenge. (Abstr.) Phtoparasitica 14: 251

Fattahalla, M.A. (1992) Response of tomato to various irrigation regimes in relation to farm–yard manure fertilization. 2. Yield and fruit quality Menofiya J. Agric. Res.,17: 1327-1351

Franke, A.E.; Martini; L.C.P., Konig, O.; Pozzebon, E. and Liberalesso, R.A. (1994): Effect of irrigation quantity on yield and quality of tubers in potato (*Solanum tuberosum* L.). Revisit Ceres. 41 (236) 366-378. (Field Crop Abstr 49: 1906)

Gamliel, A. Grinstein. A., and Katan, J. (1996): Combining solarization and fumigants as a feasible alternatives to methyl bromide. Pages 17-18 in: Proc. Annu. Int. Res. Conf. Methyl Bromide Alternatives Emission Reduction, 3rd. Orlando FL.

Garcia-Jimenez, J., Velazquez, M.T., Jorda, C., and Alfaro-Garcia, A. (1994): Acremonium species as the causal agent of muskmelon collapse in Spain. Plant Dis. 78: 416-419

Karlatti, R.S., Abdeen, F.M., and Al-Fehaid, M.S. (1997): First report of *Monosporascus cannonballus* on melons in Saudi Arabia. Plant Dis.. 81: 1215-1216.

Khalok, A. and Kumaraswamy, A.S. (1996): Water, use efficiency and nutrient uptake in potato. J.Agric. Sci., 30: 39-42 (Field Crop Abstr. 49: 6508).

Kim. D.H., Rasmuseen, S.L., and Stanghellini, M.E (1995): *Monosporascus cannonballus* root rot of muskmelon: Root infection and symptom development in relation to soil temperature. (Abstr.) phytopathology 85: 1195.

Klein, L. (1996): Methyl bromide as soil funmigant. Pages 191-235 in: The Methyle Bromide Issue C.H. Be. N Price, and B. chakrabarti, eds. John wiley and Sons. new York

Martyn, R.D., and Miller, M.E (1996): *Monosporascus* root rot and vine decline: An emerging disease of melons worldwide. Plant Dis. 80: 716- 725.

Martyn, R.D., Lovic, B.R., Maddox, D.A., Germash, A., and Miller, M.E. (1994): First report of *Monosporascus* root rot/vne decline of watermelon in Tunisia. Plant Dis.. 78 1220

Mc Collum, R.E. (1978): Analysis of potato growth under different P regimes. II. Time by P- status interactions for growth and leaf efficiency. Agron. J.. 70: 58- 66

Mertely, J.C., Martyn, R.D., Miller, M. E. and Bruton, B.D. (1991): Role of *Monosporascus cannonballus* and other fungi in root rot/vine decline disease of muskmelon Plant Dis.. 75 1133-1137

Mertely, J.C., Martyn, R.D., Miller M. E and Bruton, B.D. (1993): An expanded host rang for the muskmelon pathogen *Monosporascus cannonballus*. Plant Dis. 77 667-673

Miller, M.E (1990) Melon production systems in South Texas. Annu. Res. Rep., Texas Agricultural Experiment station, Weslaco, Tx

Pivonia, S., Cohen, R., Kafkafi, U., Ben Ze'ev, I., and Katan, J (1997): Sudden wilt of melons in Southern Israel Fungal Agents and relationship with plant development Plant Dis 81 1264- 1268

Pivonia, S., Cohen, R., Katon, J and Kigel, J (2002). Effect of fruit load on the water balance of melon plants infected with *Monosporascus cannonballus*. Physiological and Molecular Plant Pathology 60 39-49-51.

Pivonia, S., Levita, R., Maduel, A., Isikson, A., UKO, O., Cohen, R., and Katan, J. (1998): Improved solarization to control sudden wilt of melons (Abstr.) Phytoparasitica 26:169.

Reuveni, R., Krikum, J., and Shani, U. (1983): The role of *Monosporascus* sp. in a collapse of melon plants in arid area of Israel. Phytopathology 73: 1223- 1226.

Richards, F.J. (1969): Plant physiology, the quantitative analysis of growth, 377pp. Academic press, Inc. 111 Fifth Avenue, New York, USA

Ristaino, J.B., and Thomas, W. (1997): Agriculture, Methyl, bromide and the ozone hole, can we fill the gap. Plant Dis. 81: 964-977.

Roads, F.M. and Blood Worth, M.E. (1964): Areqa measurements of cotton leaves by dry weight. Agron. J., 56 (5): 520-522.

Shehata, S.A. and Bakeer, G.A. (1995): Effect of irrigation methods and nitrogen levels on potatoes in sandy soils. " The role of Agr. Eng. in Sustainable Development " 3rd Conference of Misr Society of Agr. Eng., 5-6 October, 1995.

Singh, N. and Sood, M.C. (1994): Water and nitrogen needs of potato under modern irrigation methods. Indian potato Association: 146- 152. (Field Crop Abstr. 47: 5859).

Snedecor, G.W. and Cochran, W.G. (1980): "Statistical methods". 7th Ed. The Iowa State Univ. Press, Ames, Iowa.

Tanner, C.B. and Lemon, E.R. (1962): Radiant energy utilized in evapotranspiration. Agron. J. 54: 207- 212

Theodero D., Sammis W. (1980): Comparison of sprinkler, subsurface and furrow irrigation methods for row crop. Agron. J. 72: 701- 704

Tsay, J.G., and Tung, B.K. (1997): Effects of *Monosporascus cannonballus* on the growth of cucurbit seedlings. Plant Pathol. Bull. 6: 123-131

Ucko, O., Maduel, A., Grinstern, A., and Katan, J. (1992): Combined methods of soil disinfestations for controlling melon collapse with reduced methyl bromide dosages (Abstr.) Phyto parasitica 20: 229-230

Wolf, D.W. (1994) Genotype, fruit load and temperature affect *Monosporascus* root rot/vine decline symptoms expression in melon (*Cucumis melo* L.) pages 280-281 in: proc. Eucarpia Meet. Cucurbit Genet. Breed. 6th

Wolf, D.W. (1995) Fruit load affects *Monosporascus* root rot/vine decline symptoms expression. Pages 87-88 in Melon Production Systems in South Texas. M.E. Miller,ed. Ann. Res. Rep. Texas Agricultural Experiment Station. Weslaco. Tx

تأثير بعض العمليات الزراعية كبدائل لبروميد الميثايل ضد مرض الذبول الفجائي في القاوون طراز الجاليا

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أجريت هذه الدراسة خلال موسمين متتالين للعروة الصيفية المتأخرة لأعوام ٢٠٠٢و ٢٠٠٣، بهدف دراسة تأثير بعض العمليات الزراعية مثل كمية مياه الرى وعدد الثمار للنبات كبدائل لمادة بروميد الميثايل المستخدمة في تعقيم التربة على مرض الذبول الفجائي في القاوون الذى يسببه الفطر مونوسبوراسكس كانون بللس، وعلاقة ذلك بالنمو الخضرى والمحصول ومكوناته، وكذلك كفاءة استخدام المياه، وكان الصنف المستخدم هو الصنف إيديال من طراز الجاليا، وأوضحت النتائج ما يلي:-

أ- نسبة الإصابة وعلاقتها بالنمو الخضرى والمحصول:

- أدى استخدام بروميد الميثايل إلى انخفاض نسبة الإصابة بالمرض، وكان التأثير أكثر فاعلية عند استخدام المعدل الأعلى (٦٠جم/ م^{٢}) الذى أدى إلى انخفاض نسبة الإصابة إلى ١٨,٦% مقارنة بالنباتات التي عوملت بالمعدل المنخفض (٣٠جم/ م^{٢})، أو التي لم تعامل، وانعكس ذلك على صفات النمو الخضرى والمحصول، فقد زاد معنويا كل من الوزن الجاف للنبات والمجموع الجذرى، كذلك زاد عدد السيقان الرئيسية للنبات، وطول النبات، ومتوسط مساحة الورقة، ومعدل النمو النسبي، ومعدل التمثيل الغذائي، ومتوسط وزن الثمرة، والمحصول الكلى، والمحصول القابل للتسويق - كل هذه الصفات سجلت أعلى قيمة عند استخدام بروميد الميثايل في تعقيم التربة سواء كان ذلك في المعدل الأقل أو الأعلى مقارنة بالنباتات الغير معاملة.
- زيادة كمية مياه الرى المستخدمة، وإن لم تكن بنفس تأثير استخدام بروميد الميثايل، أدى إلى خفض النسبة المئوية للنباتات الذابلة وكان هذا الانخفاض معنويا وسجلت اقل نسبة ذبول عند استخدام معدل ١٥م^{٣}/ فدان/ يوم وسجلت ٣٠,٨% ، وذلك بالمقارنة بين كمية المياه الأقل(٥م^{٣}/فدان/ يوم) أو المتوسطة (١٠م٣/ فدان/ يوم)، وانعكس أثر ذلك بزيادة معنويا في صفات النمو الخضرى، ومتوسط وزن الثمرة، والمحصول الكلي والمحصول القابل للتسويق كلما زادت كمية مياه الرى.
- كان لتأثير عدم خف الثمار وتركها على النبات بمتوسط ٣ ثمار/ للنبات تأثيرا معنويا في زيادة نسبة النباتات الذابلة، فقد وصلت هذه النسبة إلى ٥٣,١% مقارنة بالنباتات التي تم خف الثمار فيها، فقد انخفضت النسبة المئوية للإصابة إلى ٣٦,١، ٤٣,٢% في حالة وجود ثمرة واحدة أو ثمرتين على النبات على الترتيب- وانعكس ذلك بتأثيره المعنوي على خفض قيم

الصفات الخضرية كلما زاد عدد الثمار للنبات، بينما سجلت قيم المحصول الكلي والمحصول القابل للتسويق أعلى قيم عند عدم خف الثمار بالمقارنة فى حالة ترك ثمرة أو ثمرتين على النبات حيث أدى ذلك إلى خفض كمية المحصول الكلي والمحصول القابل للتسويق.

- أدى خف الثمار إلى زيادة معنوية في متوسط وزن الثمرة حيث وصلت إلى ١,٢٠٥، ١,٠٤٢، ٠,٨٨٢ كجم فى حالة ترك ثمرة واحدة أو ثمرتين أو ثلاث ثمار (بدون خف) على الترتيب.

ب- محتوى الثمار من المواد الصلبة الذائبة:

- زاد محتوى الثمار فى النباتات المعاملة ببروميد الميثايل مقارنة بالنباتات الغير معاملة.
- زاد المحتوى عند عدم خف الثمار مقارنة بالخف بوجود ثمرة أو ثمرتين على النبات.
- قل محتوى الثمار من المواد الصلبة الذائبة بزيادة كمية مياه الرى المستخدمة.

جـ- كفاءة استخدام المياه:

- زادت كفاءة استخدام المياه بانخفاض كمية مياه الرى المستخدمة حيث سجلت القيم ٠,٠٤٢، ٠,٠٧٠، ٠,٠٨٧م٣/ كجم فى النباتات التى رويت بمعدل ١٥،١٠،٥م٣/ فدان/ يوم على الترتيب.
- تم مناقشة أثر التداخل والتفاعل بين كل هذه المعاملات على الصفات السابقة الذكر فى هذه الدراسة وكان التفاعل الأكثر تأثيراً فى انخفاض نسبة الإصابة بالذبول وبالتالى زيادة قيم صفات النمو الخضرى ومتوسط وزن الثمرة هو التفاعل الناتج من التعقيم بالمعدل العالى من بروميد الميثايل (٦٠جم/م٢) والرى بكمية ١٥م٣/فدان/يوم وخف الثمار على ثمرة واحدة للنبات - فى حين سجلت أعلى قيم للمحصول الكلي والمحصول القابل للتسويق عند ترك النباتات بدون خف مع تعقيمها بـ ٦٠جم/م٢ وريها بمعدل ١٥م٣/فدان/يوم.

وأوصت الدراسة بعدم تجاهل دور العمليات الزراعية، وترشيدها للحد من خطورة هذا المرض بالرغم من أن تأثير بروميد الميثايل كان أكثر فاعلية فى مقاومة المرض، وربما يحتاج هذا إلى بعض الوقت والدراسة فى المستقبل القريب.