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EVALUATION OF SOME NEW CANTALOUPE HYBRIDS FOR THEIR RESISTANCE TO FUSARIUM WILT

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ABSTRACT

Five hybrids of muskmelon were evaluated for their vegetative and yield characteristics in addition to their reaction to fusarium wilt disaese caused by *Fusarium oxysporum* f. sp. *melonis*. Local commercial cultivar susceptible to fusarium wilt was also growing for comparison. The experiments were carried out in commercial fields naturally infested with *F. o.* f. sp. *melonis* at Kantar Shark (Ismailia Governorate) during autumn season of 2000/2001 and 2001/2002 and in a pathogen free field at El-Arish (North Sinai Governorate), which showed no previous problems with wilt disease of melon. Vascular wilt is a sort of disease could not easily controlling this disease. Growth characters, fruit yield, disease incidence and severity were reported. Results showed that high disease incidence and severity were recorded in Kantara Shark infested soil on the susceptible cultivar Shahd Eldokki and Galia, Vicar and Ideal hybrids. In addition they recorded the lowest early marketable and total yield. On the contrary Primal and Regal hybrids recorded low level of fusarium wilt severity and higher early and total fruit yield specially in pathogen free field of North Sinai Governorate.

INTRODUCTION

Cantaloupe (*Cucumis melo* var. reticulatus) is one of the most important vegetable crops grown under protection condition or open field in new cultivated sandy soils in Egypt. It has become an important commercial crop for local market or exportation.

Soil born pathogenic fungi including *Fusarium oxysporum* cause major losses in vegetable crops (Booth, 1971). Fusarium wilts of melon caused by the fungus *Fusarium oxysporum* .f.sp. *melonis* is the most important one attacking melon indicated that they are four races designated [0, 1, 2 and 1,2]. (Zuniga *et al.* 1997) Once the disease is established in a field, the pathogen is likely to remain for years especially when the subsequent crop is susceptible melon cultivar (Banihashemi and Dezeeuw 1975). Effective control of this disease could be achieved only through the use of disease – resistant cultivars (Latin *et al.* 1986).

Frolov (1992) reported that hybrid Tavrichanka was yielded 14.4 and 19.4t/ha and fruit weight was 1.8kg. Also he maintains that Tavrichanka has resistance to fusarium wilt, cracking and moderate keeping quality.

Galala (2002) mentioned that average fruit weight of commercial F_1 hybrids Primal and Ideal was 676.0 and 708.1g respectively during his study for the possibility of producing some new local melon hybrids.

Nerson (1989) found that the percentage marketable yield was 63% in control plot during the grown season (1986). On the other hand the values were 78%-31% at 1988 in weed free and weed infested field respectively.

Abd El–Khalek (1996) found that Honey Dew and Galia produced the highest marketable yield during the summer season, However Shahd Eldokki produced low marketable yield with significant differences compare to the other two cultivar.

Galala (2002) found that commercial F_1 hybrids (Primal F_1 and Ideal F_1) were recorded marketable yield 17.1 and 17.9t/fed.

Gordon and Jacobson (1990) investigated eight F_1 hybrids of muskmelon and open–pollinated cultivars susceptible to fusarium wilt for resistance to race 2 of *Fusarium oxysporum* f. sp. *melonis* were grown in commercial muskmelon field naturally infested with *F. o* f. sp. *melonis* race 2 and in a field where the pathogen was absent. They found that a high incidence of fusarium wilt was observed on the susceptible cultivar in the infested field. Resistant entries also yielded more fruit when grown in infested soil than the susceptible cultivars and many of the hybrids produced superior yield in the absence of the disease. In the infested soil in 1987 the yield of PMR45 was only 30% of the mean yield for the F_1 hybrid. Meanwhile the yield was in non infested soil 91%. Moreover, in 1988 PMR45 produced 44% of the mean yield of the resistant entries at infested soil compared with 80% in non infested soil.

The aim of this study is to evaluate five cantaloupe hybrids (Galia type) for their resistance to fusarium wilt. The tested hybrids were compared with the local susceptible cultivar (Shahd Eldokki).

MATERIALS AND METHODS

This investigation was precede to evaluate five of muskmelon hybrids and a local commercial cultivar to determined the effect of fusarium wilt on growth, yield component and resistant to fusarium wilt. These studies were carried out in open field naturally suffered from fusarium wilt at Kantara Shark (Ismailia Governorate) in autumn season under plastic tunnel at El-Arish (North Sinai Governorate) during winter seasons from 2000-2002.

Six muskmelon cultivars namely: Shahd Eldokki, Galia F_1, Primal F_1, Regal F_1, Vicar F_1 and Ideal F_1 were used in these studies.

The chemical characters of the experimental soils are given in Table (1).

Table (1): Chemical analysis of soil and irrigation water at the two experimental sites.

Soil depth cm	Ec. mmhos/cm	Chemical properties Meq /L.				pH
		Ca^{++}	Mg^{++}	Na^{+}	Cl^{-}	
Kantara Shark						
0-20	3.11	16.00	11.5	10.52	7.00	7.72
40-60	5.11	32.5	17.00	15.43	13.00	7.78
irrigation water	1.00	1.80	1.100	7.00	8.10	7.50
EL-Arish						
0-20	0.41	2.00	0.11	1.19	1.50	8.00
40-60	0.61	0.65	0.11	0.53	0.65	8.30
Irrigation water	4.40	8.50	0.17	28.35	37.50	7.30

Experimental layout:

A randomized complete black design with four replicates was used in all experiments, each plot was covered with black plastic mulch of 0.2 – 0.3mm thickness and 140cm wide after adding organic manure and chemical fertilizers to the soil 7 days before planting. Each plot contain 20 plants spaced at 0.5 x 1.0 in all seasons. The planting data was 15Aug. in Kantara Shark and 1Jun. in El-Arish region. All data obtained were subjected to statistical analysis according to Snedecor and Cochran (1972). Mean values represented. the various investigated varieties were compared by the Duncan multiple range test (Duncan, 1955).

Isolation of the causal organism and identification. Diseases assessment:-

Disease incidence.

Was calculated as (number of wilted plant/total number of plant)x(100).

Disease severity.

Its assessment was based on the number of runners showing wilted symptoms as follows.

0= No runners showing symptoms.
1= One runners showing symptoms.
2= Two runners showing symptoms.
3= Three runners showing symptoms.
4= Any combination of four or more runners wilted or dead.

Disease severity was calculated as follows:

$$\text{Severity} = \frac{\text{No. of plants x 0 + No. of plants x 1 ... No. of plants x 4}}{\text{Total no. of plants x 4}}$$

Assessments were made at appearance of the beginning of fruiting and four weeks later (Martyn *et al.* 1991).

Isolation of th e causal fungus.

Muskmelon plants showing wilt symptoms were collected from different locations representing Kantara Shark at (Ismailia Governorate) and EL-Arish at (North Sinai Governorate).

Roots of the diseased plants were washed with tap water to remove any adhering soil particles. Small portion from roots, crowns and stems of infected plants were surface disinfected using sodium hypochlorid solution (3.0%) for 2 minutes.

Then these portions were dried using sterilized filter paper and transferred into patri dishes containing water agar media. Plants were incubated at 27C^0 for 24 to 48 hours, Hyphal tips of growing were transferred into Petri dishes containing potato dextrose agar (PDA) and incubated at 27C^0 for a week. Single spore cultures were obtained from the grown fungi.

Identification the causal organism:

Identification was based mainly on morphological features. Booths system was used for identifying fusarium isolates to the species level (Booth,

1971). Spore morphology, conidiophores, chlamydospores and psudoperithecia formation are the major characters. Formae specials were identified according to the ability to incite wilt symptoms on melon.

RESULTS AND DISCUSSION

1- Average fruit weight:

Presented data in Table (2) and figure (1&2) showed that. In season 2000/2001 the heaviest fruit weight were found when using Ideal F_1 followed by Regal F_1 in El-Arish area with significant reduction by 31% and 29% compared with Kantara Shark location (Infested with fusarium wilt). Meanwhile in Kantara location there were no significant differences between Galia F_1, Vicar F_1 and Shahd Eldokki cultivar. The lowest value of fruit weight was found when Galia cultivar grown in Kantara shark. In addition average fruit weight reduced by (28% and 33%) in plant of Shahd Eldokki cv. grown in infested area in the first and second seasons respectively. This results were in agreement with Galala (2002).

2- Marketable yield:

It is clear from the data in Table (2) and figure (3&4) that the highest cultivars was Regal F_1 followed by Primal F_1 with significant different between them. Meanwhile the lowest value recorded in all hybrids at Kantara location with no significant difference between Galia F_1 and Vicar F_1 at infested area. Such treatment reduced marketable yield in Shahd Eldokki cultivar by 54.8% and 56.8% in the first and second season respectively when grown in infested area. This results were agreement with Nerson (1989), Abd EL-Khalek (1996) and Galala (2002).

3- Total yield:

Data in Table (2) and figure (5&6) showed that the highest value of total yield were observed in two location in Regal F_1 and Primal F_1 in growning seasons of 2000/2001 and 2001/2002 at the infested soil with no significant differences between Shahd Eldokki cultivar and Galia F_1 which recorded the lowest value. This results were agreement with Gordon and Jacobson (1990), and Galala (2002).

4- Disease severity and percentage:

Table (3) and figure (7&8) showed that Regal and Primal were the most resistant hybrids, they recorded the lowest disease incidence and severity. They were followed by Vicar F_1 and Ideal F_1 with as significant differences. On the other hand, Galia F_1 and Shahd Eldokki cultivar were relatively susceptible; they recorded highest percentage and severity of infection. Meantime they showed no significant difference between them. However in El-Arish location this result was not true, which may indicate that high infestation of Shahd Eldokki in El-Arish may be due to seed- borne pathogen. As for the evaluation in El-Arish location, the same trends of results were obtained with extremely low figures in percentage and severity of infection.

Table (2) Average of fruit weight, marketable yield and total yield (Kg/ plot) of different muskmelon hybrids seasons of 2000/2001 and 2001/2002.

Cultivars	Kantara Shark						El-Arish					
	Average of fruit weight		Marketable yield		Total yield		Average of fruit weight		Marketable yield		Total yield	
	2000/2001	2001/2002	2000/2001	2001/2002	2000/2001	2001/2002	2000/2001	2001/2002	2000/2001	2001/2002	2000/2001	2001/2002
Shahd Eldokki	10.693 a	10.123 a	7.05 a	5.87 a	11.01 a	10.49 a	13.383 a	12.773 a	15.60 a	13.59 a	36.02 a	31.04 a
Galia	10.427 a	9.594 a	11.08 b	9.83 b	15.39 a	13.79 a	12.854 a	12.244 a	25.19 cd	21.91 b	35.42 a	30.80 a
Primal	12.449 ab	11.905 ab	20.49 c	19.91 c	40.39 b	39.04 c	15.165 ab	14.555 ab	25.99 d	24.26 c	51.00 b	47.35 bc
Regal	13.630 b	13.280 b	24.50 d	24.95 d	47.29 b	47.01 d	16.540 b	15.930 b	28.18 c	27.34 d	54.00 b	52.82 c
Vicar	11.265 ab	10.949 ab	11.46 b	10.63 b	24.07 a	21.85 b	14.209 ab	13.599 ab	22.84 b	20.09 b	47.82 a	41.07 b
Ideal	13.590 b	13.436 c	14.48 b	17.59 c	36.01 b	34.92 c	16.69 b	16.086 b	24.03 b	19.86 b	43.71 a	39.65 ab

Table (3) Reaction of different cantaloupe hybrids as compared to Shahd Eldokki cv. for reaction to wilt disease in Kantara Shark and El-Arish during growing seasons of 2000/2001and 2001/2002.

Cultivars	Kantara Shark				El-Arish			
	Per.		Sev.		Per.		Sev.	
	2000/2001	2001/2002	2000/2001	2001/2002	2000/2001	2001/2002	2000/2001	2001/2002
Shahd Eldokki	52.50 a	60.0 a	0.44 a	0.47 a	22.50 a	27.50 a	0.16 a	0.23 a
Galia	41.25 ab	45.0 ab	0.33 b	0.38 a	10.00 b	17.50 ab	0.05 b	0.11 b
Primal	11.25 d	12.5 d	0.07 d	0.10 bc	0.00 c	3.75 cd	0.00 b	0.01 c
Regal	6.25 d	6.25 d	0.02 d	0.03 c	0.00 c	1.25 d	0.00 b	0.00 c
Vicar	33.15 bc	35.0 bc	0.19 c	0.20 b	6.25 bc	13.75 bc	0.03 b	0.08 b
Ideal	20.00 cd	20.0 cd	0.09 d	0.08 bc	7.60 bc	16.25 b	0.04 b	0.08 b

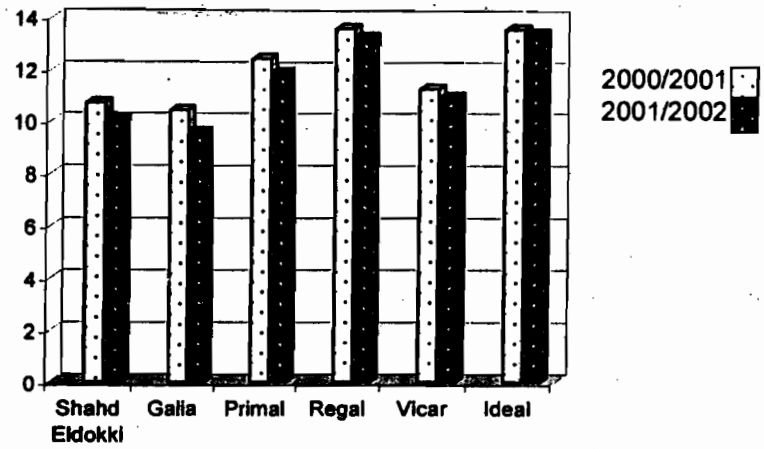

Figure (1): Average fruit weight (kg/plot) of different muskmelon hybrids as influenced by fusarium wilt at Kantara Shark during seasons of 2000/2001 and 2001/2002.

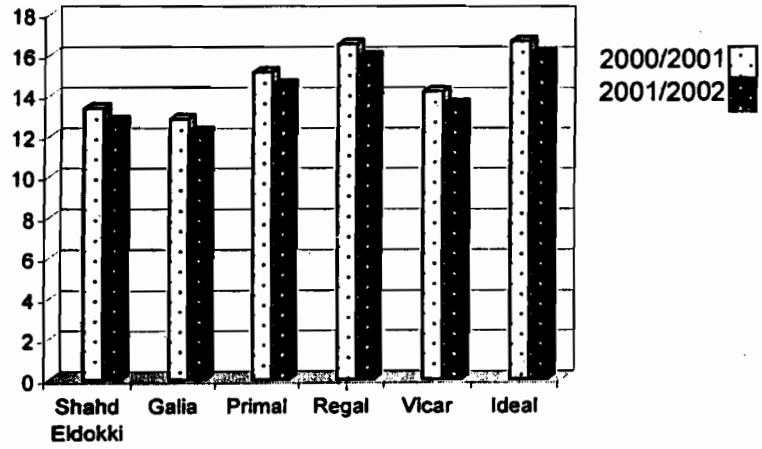

Figure (2): Average fruit weight (kg/plot) of different muskmelon hybrids as influenced by fusarium wilt at El-Arish during seasons of 2000/2001 and 2001/2002.

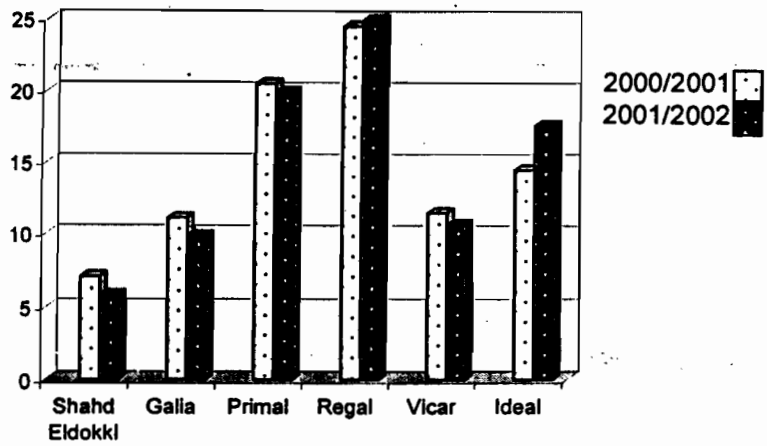

Figure (3): Average of marketable yield (kg/plot) of different muskmelon hybrids as influenced by fusarium wilt at Kantara Shark during seasons of 2000/2001 and 2001/2002.

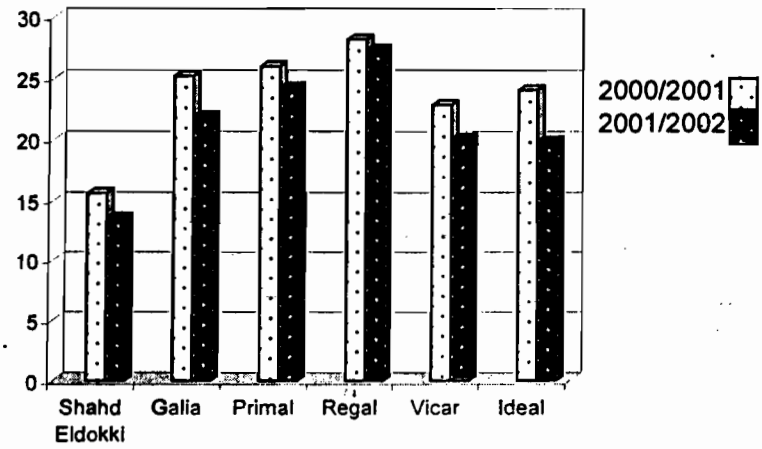

Figure (4): Average of marketable yield (kg/plot) of different muskmelon hybrids as influenced by fusarium wilt at El-Arish during seasons of 2000/2001 and 2001/2002.

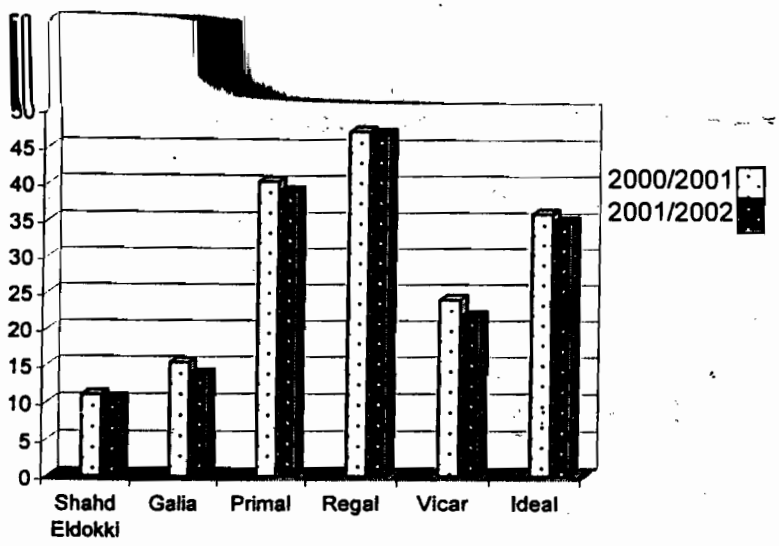

Figure (5): Weight of total fruit yield (kg / plot) of different muskmelon hybrids as influenced by fusarium wilt at Kantara Shark during seasons of 2000/2001 and 2001/2002.

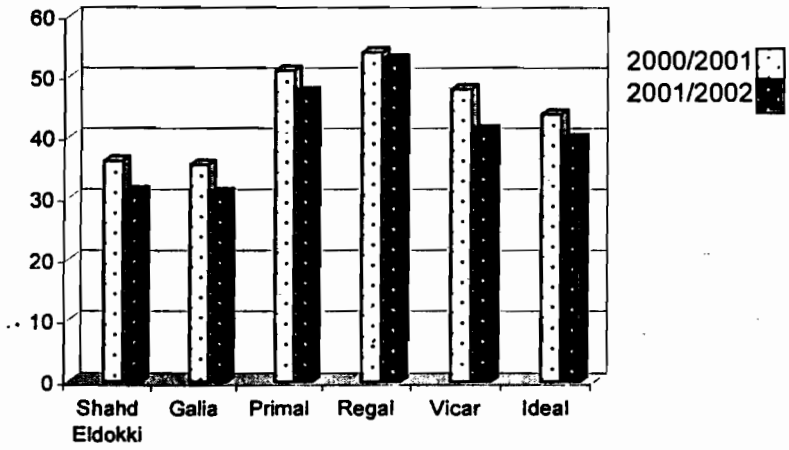

Figure (6): Weight of total fruit yield (kg / plot) of different muskmelon hybrids as influenced by fusarium wilt at El-Arish during seasons of 2000/2001 and 2001/2002.

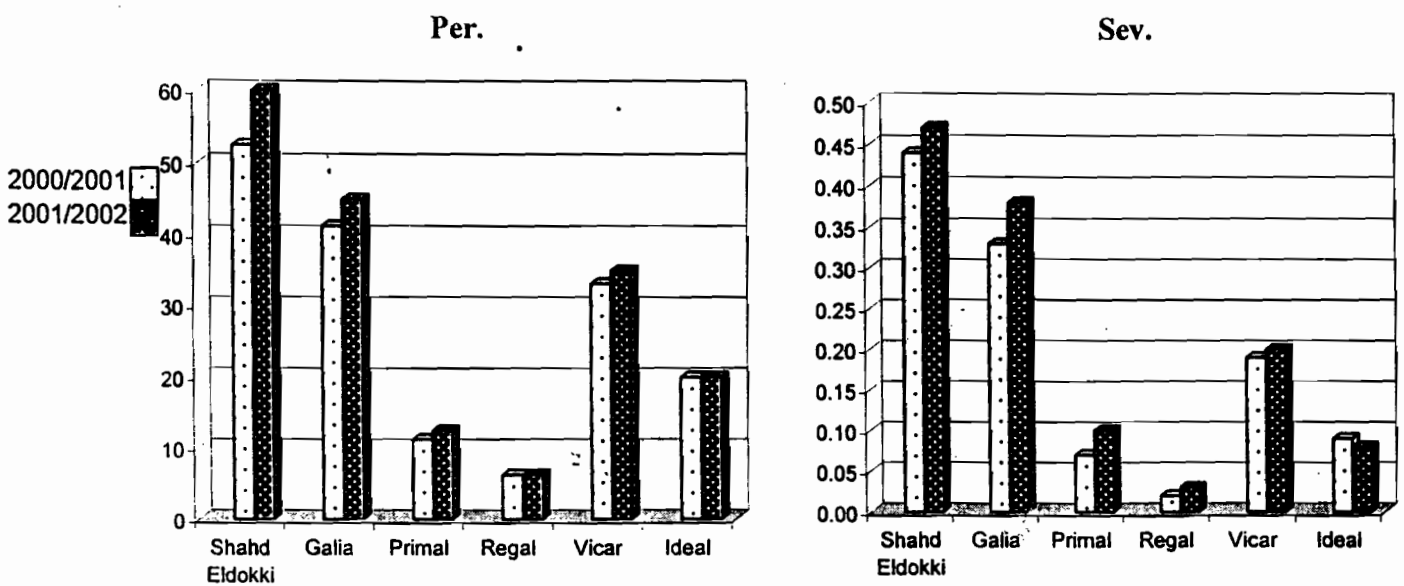

Figure (7): Percentage and severity on different muskmelon hybrids as influenced by fusarium wilt at Kantara Shark during seasons of 2000/2001 and 2001/2002.

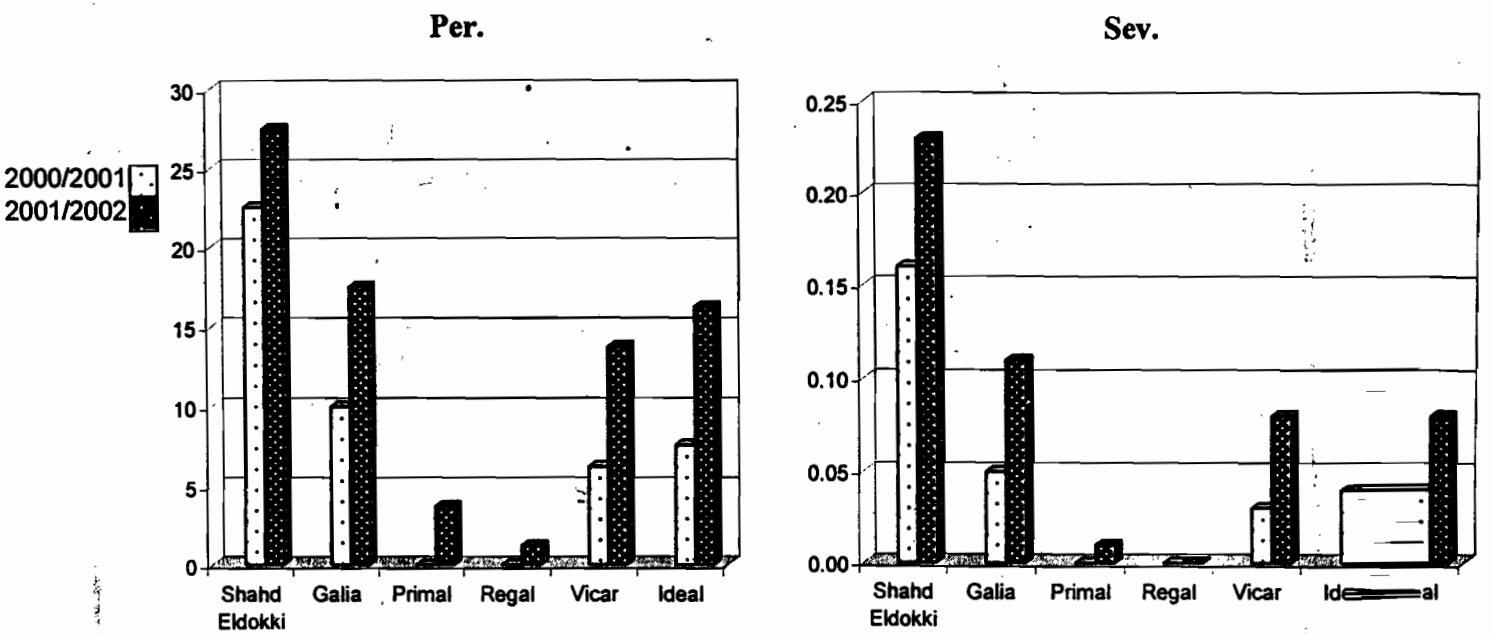

Figure (8): Percentage and severity on different muskmelon hybrids as influenced by fusarium wilt at El-Arish during seasons of 2000/2001 and 2001/2002.

The absence of infested plants in Primal and Regal hybrids at El-Arish location in 2002-2001 growing season indicated that this location was free of the pathogen. Occurrence of height infection in the previous hybrids in growing season 2001-2002 in addition to higher infection in other entries confirm the hypothes that the pathogen infested this field through seed-borne inoculums as reported by Punja *et al.* (2001) & Thomas and Zitter (1999).

High infestation of Kantara soil may be due to repetition of growing the same crop at the same site, which increases fungus population as reported by Banihashime and Dezeeuw (1975).

These results were due to the degree of temperature that favored for the infection and symptoms expression. At the second season, this phenomena was obvious in the relatively susceptible entries in both the two locations. In this respect Punja *et al.* 2001. Reported that disease severity is maximum at soil temperatures of (64-77f ^{0}), at high soil temperatures plants became infected but may not wilt. Sandy soils and air temperature between (25-30C^0) favor disease developments.

CONCLUSIONS

From the obtained results, it could be concluded that disease severity and percentage were higher in Kantara Shark Compared to EL-Arish region Shahd Eldokki, Galia F_1, Vicar F_1 were the more cultivars effected by disease. Meanwhile Regal and Primal hybrids was more resistance to fusarium wilt. Heaviest fruit weight were found when using Ideal F_1 followed by Regal F_1 in El-Arish. Meanwhile kantara location there was no significant differences between Galia F_1, Vicar F_1 and Shahd Eldokki.

The highest values of marketable yield were recorded in Regal F_1 and Primal F_1 Meanwhile the lowest value recorded in all hybrids at Kantara Shark.

gal F_1 and Primal F_1 were recorded the highest value of total yield in two location in growing season of 2000/2001 and 2001/2002 at the infested soil with no significant differences between Shahd Eldokki cultivar and Galia F_1 which recorded the lowest values.

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تقييم بعض هجن الكنتالوب الجديدة ومقاومتها لمرض الذبول الفيوزاريومى

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قيمت بعض هجن الكنتالوب الجديدة طراز جاليا خلال العروة الخريفى فى أرض مكشوفة ينتشر بها المســبب المرضى فى منطقة القنطرة شرق. وخلال العروة الشتوى تحت الأقبية البلاستيكية فى أرض جديدة لم تزرع من قبــل بأى من أفراد العائلة القرعية فى منطقة العريش وذلك خلال موسمى الزراعة ٢٠٠٠/٢٠٠١ ، ٢٠٠١/٢٠٠٢.
تم عزل المسبب المرضى من النباتات المصابة وتنقيته وتعريفه تبعا للصفات المورفولجية للجراثيم والمزرعة.
وأوضحت النتائج أن :-

- الفطر الذى تم عزله وتنقيته وتعريفه هو فطر الفيوزاريوم المسبب للذبول الفيوزاريومى فى الكنتالوب وقد تــأثر كلا من شهد الدقى والهجين جاليا بشدة حيث ارتفعت نسبة وشدة الإصابة مع عدم وجود فرق معنوى بينهما فــى منطقة شرق القنطرة والعريش وذلك خلال موسمى الزراعة كما سجلت أقل نسبة إصابة لكلا من الهجينين ريجال وبريمال مع عدم وجود فروق معنوية بينهما.
- سجلت أعلى قيمة لمتوسط وزن الثمرة لكلا من الهجين ايديال وريجال مع عدم وجود فرق معنوى بين الــهجن تحت الاختبار فى منطقة العريش أما فى منطقة شرق القنطرة فلا يوجد فرق معنوى بين شهد الدقــى والجاليــا والفيكار.
- سجل كلا من الهجين ريجال وبريمال أعلى قيمة للمحصول القابل للتسويق مع وجود فرق معنوية بينهما بينما أقل قيمة سجلت لجميع الهجن الأخرى فى منطقة الإصابة.
- أعطى كلا من شهد الدقى والجاليا أقل قيمة للمحصول الكلى مع عدم وجود فروق معنوية بينهما ويليهم الــهجين فيكار وذلك فى منطقة الإصابة فى حين سجل كلا من ريجال وبريمال أعلى قيمة للمحصول الكلى