

COMPARATIVE STUDIED ON FOUR GRAPE CULTIVARS UNDER CONDITIONS OF EI-BEHERA GOVERNORATE, EGYPT

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ABSTRACT

The present investigation was carried out for two successive seasons 2003 and 2004, with the aim of evaluating four grape cultivars, one seedless: Concord Seedless (V. Lbrusca) and three seeded varieties (Italia, Muscat Hamburg and Red Globe).

These cultivars were grown in a private vineyard at Wadi El- Natron, El-Behera governorate, Egypt. Parameters were studied as to be used to express and qualify the leaf morphology. Lengths and angles of leaf veins were used to characterize the shapes of leaves. To describe lobbing, relative depth of lateral sinuses in relation to veins was estimated. Three vein ratios were established in relation to midrib to help in identification. The principal vein angles with one another and their values also provided a useful element for vine identification. Morphological studies included: growing tip, leaves, tendril, bunches and berries TSS, acidity and TSS \ acid ratio. The average bunch weight was large in Red Globe and Italia cvs., while it was small in Concord seedless and Muscat Hamburg cvs. Berry weight and size were very large for all cultivars except Concord Seedless cv. which was medium. Berry shape was obovoid in Concord Seedless cv., spherical in Muscat Hamburg and spherical obovoid in Italia and Red Globe cvs. Berry colour was Golden in Italia cv., blue -black in Muscat Hamburg, Pinkish red in Red Globe while, in Concord Seedless cv. was red with the skin typically blue. Concord Seedless is considered from seedless cultivars, while the other cvs. were seeded. Concord Seedless cv. showed that the lowest bud burst% and coefficient of bud fertility compared to Red Globe cv. which had the highest bud burst% and coefficient of bud fertility.

INTRODUCTION

Grape is considered as one of the most important fruit crops in the world. In Egypt, grape occupies the second rank after citrus. The total grape area in Egypt reached 160005 feddans with production of 1391749 Tons according to the latest statistics of Ministry of Agriculture (2005). Most of these areas are planted with Thompson seedless variety (Kamel et al. 1982). Other grape cultivars are planted in few areas, all over the republic. Some cultivars have been recently introduced to Egypt and were planted in Wady El Natron region that also, includes some local cultivars and ancient varieties such as Muscat Hamburg which is one of the most delicious Muscat cultivars (1927); it has strong exquisite Muscat flavor. Since those newly introduced cultivars were not previously tested under local conditions, some of them were selected for evaluation.

The morphological examination of some grapevine parameters remains the most important and easiest means for identification of grape species, varieties and clones (Schneider, 1996).

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Cultivars can be characterized by several methods: (1) Morphological description of parts of the plants (woody shoot, bunches, etc.) at different phenological stages (Oiv, 1984). (2) Morphometry based on the measurement of parameters of plant organs (leaves, bunches, berries Galet, 1952; Cabello *et al.* 1993). (3) Analysis of biochemical compounds either quantitatively or qualitatively.

Pervious trials dealt with the description and evaluation of grape cultivars (Perold and Dr. Phil 1927, Olmo 1946, Kamel 1964, Winkler *et al.* 1965, Brook and Olmo 1972, Watt 1983, Walker and Boursiquot 1992, Abd El Kawi and El-yam 1992 a, b, and c, Abd El-Fattah and Kastor 1993 a and b, Morrison 1994, Tourky *et al.* 1995, El-sharkawy 1995, Haggag *et al.* 1996, Fawzy 1998, Aisha *et al.* 1998, Ahmed *et al.* 2001, El obeidy and Abd El- Ghany 2001, Marwad 2002 and Aisha 2006).

The purpose of the present study was to evaluate four grape cultivars namely: Concord seedless (*V. labrusca*), Italia (*V. Vinifera*), Muscat Hamburg (*V. Vinifera*) and Red Globe (*V. Vinifera*) grape cultivars under Egyptian condition.

MATERIAL AND METHODS

This work has been carried out through two successive seasons: 2003 and 2004 on 5-year- old grapevines of Concord Seedless, Italia, Muscat Hamburg and Red Globe.

The vines of each cultivar were nearly uniform in vigor planted in a sandy soil spaced 2x3 m apart and irrigated by the drip irrigation system. Vines were supported by the Gable system. Each cultivar was represented by 9 vines (3 replicates x3 vines per replicate).

I. Morphological characteristics:

The morphological studies of the considered cvs. were carried out according to the international Ampelographic registered schedule (Dalmasso and Cosmo, 1958 and Cosmo *et al.* 1958).

The following parameters were studied:

- 1- Growing tip: in (1950) Breider classified the growing tip into downy, cobwebby or glabrous.
- 2- Leaf characteristics: the following parameters were determined using the 7 and 8 leaf from the shoot base : 2.1 shape, was classified as follows according to Singh & Singh (1940): a) orbicular: the leaves are round, b) reniform: the leaves are kidney shaped, c) truncate: the leaves are square, d) cuneiform the leaves are wedge shaped, e) cordate: the leaves are heart shaped; 2.2.colour (upper leaf surface); 2.3.number of lobes; 2.4. petiole sinus shape;2.5. Margin; 2.6. Length; 2.7. Width; 2.8. size; measured as width x length according to Bioletti (1929), leaf size was classified as follows: a) very small 75cm², b) small 75-149cm², c) medium 150-299 cm², d) large 300-600 cm²; 2.9.petiole length(p); 2.10. Midvein length (L); 2.11.the ratio between P and L (P/L) was expressed as follow:

a) Short: when p is noticeably shorter than L 0.60-0.79

b) Medium: when p is little shorter than L 0.80-1.19

c) Long: when p is noticeably longer than L 1.2

2.12 The number of teeth/ leaf was classified according to Bioletti (1929) as follows: a) few 50, b) medium 50-79, c) many 79.

2.13: Midrip tooth. To assess the shape of tooth, the following ratio was calculated: $P = \text{height of the tooth} / \text{width of the tooth}$.

3- Tendril characteristics: 3.1. tendril sequence on shoot was classified according to Kolenati (1946): to a) continuous, b) discontinuous) intermittent, 3.2 .tip shape; 3.3. tendril color.

4- Ampelometry:

The following parameters were studied as shown in Fig (1).

L1:Midrib

L2:Superior lateral vein

L3: Inferior lateral vein

L4: Petiolar vein

SS:Superior lateral sinus

SI: Inferior lateral sinus

OI: Distance from the petiolar junction to the base of the inferior sinus

OS: Distance from the petiolar junction to the base of the superior sinus

The length of a vein is ascertained by measuring the distance between its junction and the tip of the corresponding tooth. Three vein ratios were established in relation to midrib L1; $A=L2/L1$, $B = L3/ L1$ and $C = L4/ L1$. The obtained quotients will be fractions.

Values of vein angles with one another were measured. Angle is the angle between L1 and the base L2 (up to the first bifurcation). Similarly, is the angle between L2 and L3, and is the angle between L3 and L4.

To estimate the relative depth of lateral sinuses in relation to veins L2 and L3, the distance from the base of the sinus to the petiolar Junction was measured. The following two ratios were considered:

SS (superior sinus) = $OS/L2$

SI (inferior sinus) = $OI /S3$, where O is the petiolar junction, the base of the superior sinus and I is the base of the inferior sinus (Fig 1).

5- Yield per vine.

6- Cluster characteristics : 7.1 color .7.2 shape ; 7.3 size: classified according to its weight as follows: a) very small < 84g , b) small 84- 297g , c) medium 297-588 g, d) large 588 – 896 g, e) very large >896 g ; 7.4.wieght ; 7.5 length, 7.6.width, 7.7. Number of berries per cluster, 7 .8. Cluster weight loss.

7- Berry Characteristics: 6.1. Shape; 6.2 color; 6.3. Dimension; 6.4 Size (expressed as the longest dimension) was classified as follows: a) very large > 2.4 cm, b) large 1.8 – 2.4 cm, medium 1.2-1.79 cm, d) small 0.8-1.19 cm, e) very small < 0.8, and 6.5 weights of 100 berries. 6.6 size of 100 berries. 6 .7, juice weight of 100 berries. 6. 8 berry firmness, 6.9 seeds/ berry: classified according to its number as follows: a) few seeds < 2 seeds, b) many seeds >2 seeds.

8- Juice TSS, acidity and TSS/acid ratio.

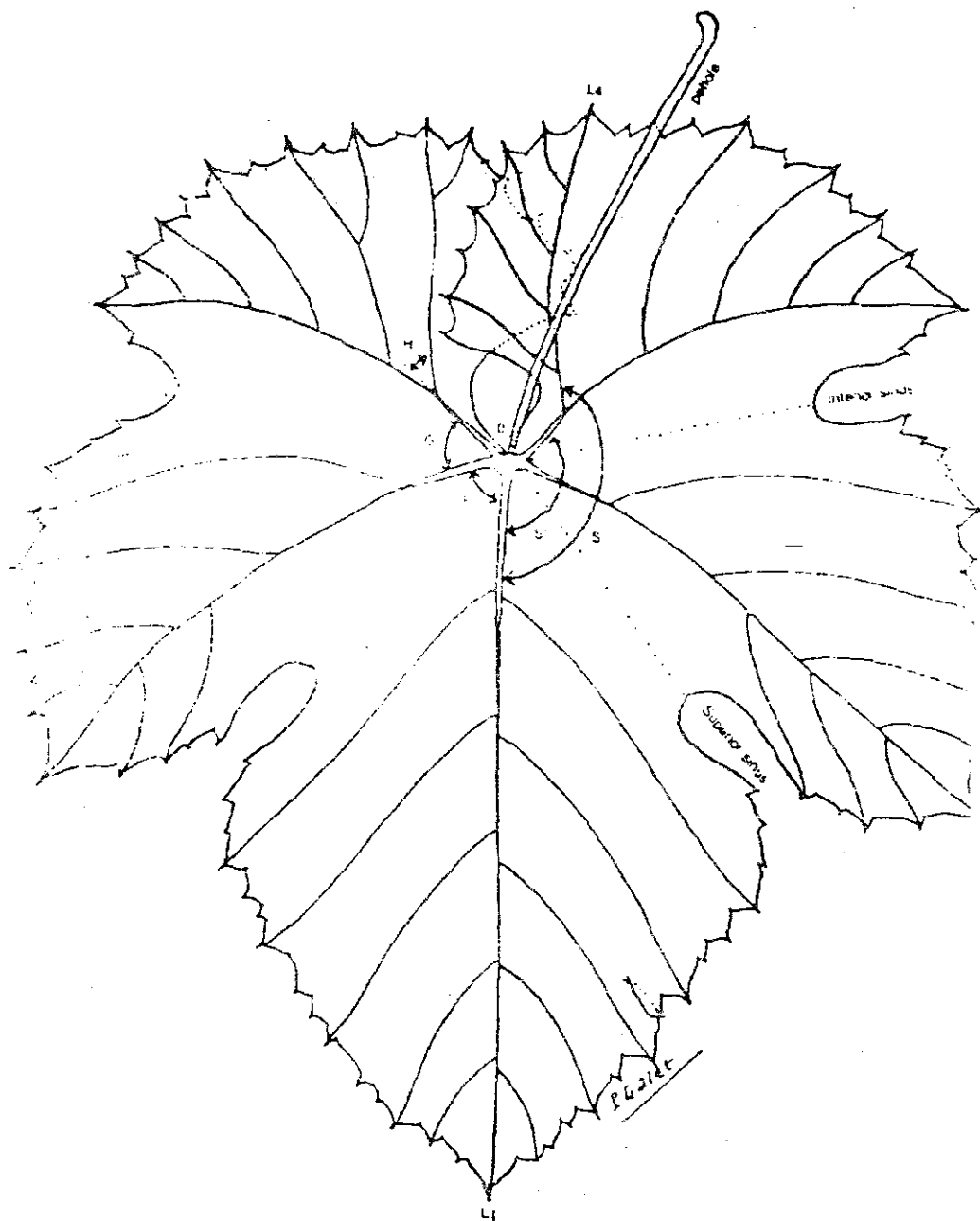


Fig (1): Ampelometry

II. Some phenological and agrobiological aspects

1. Date of bud burst
2. Ripening date
3. Number of days from bud burst date to harvest.
4. Coefficient of bud fertility was calculated by dividing average number of clusters per vine by the total number of buds/vine according to Bessis (1960).

III. Statistical analysis:

The completely randomized design was followed throughout the whole work. The obtained data were subjected to the analysis of variance. Duncan's multiple range test was used for comparison between means (Snedecor and Cochran, 1980).

RESULTS AND DISCUSSION

Ampelographic characterization was found to be a useful tool for identifying grape varieties grown in Egypt.

Parameters were studied as to be used to express and quantify the leaf morphology of different grapevines in 2003 and 2004 seasons.

I. Morphological characteristics:

The considered morphological characteristics of the studied cvs. are shown in table (1) and illustrated in Fig. (2), and the following is a brief description of the studied Cvs.

• Growing tip:

- Hairs:

The growing tip of Concord Seedless cv. was felty but in Italia and Muscat Hamburg cvs. were downy while in Red Globe cv. was cob-webby hairs.

- Color of young leaves:

Color of young leaves of Concord Seedless cv. was rust, Italia cv. was yellowish with orangy patches, Muscat Hamburg cv. was bronze patches and Red Globe cv. was yellowish green.

• Leaf:

- Leaf shape and size:

All cultivars studied have an orbicular shape with a medium leaf area except Red Globe cv. which was large in size.

- Leaf color:

All cultivars studied have a yellowish green colour.

- Leaf lobes:

There are three leaf lobes in Concord Seedless cv.; five leaf lobes in Italia cv. but Muscat Hamburg and Red Globe cvs. have four lobes of the leaf.

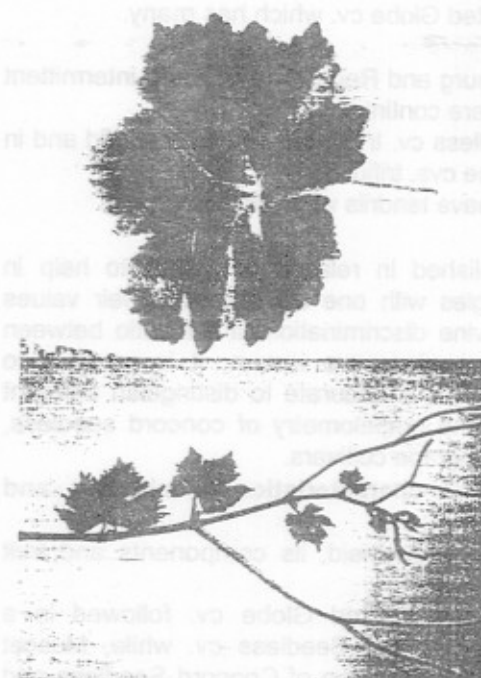
- Petiole sinus:

Petiole sinus (P/L) for Concord Seedless and Red Globe cvs. is short but in Italia and Muscat Hamburg cvs. medium. Petiole sinus shape of the studied cultivars is U shaped.

Table (1): Morphological characteristics of four grape cultivars

Cultivar	Shoot tip		Leaf										Tendrils		
	Hair	Color of young leaves	Shape	Size	Color	No. of lobes	Petiole sinus shape	Petiole length (P) (cm)	Midvein length (L) (cm)	P/L	Leaf margin	No. of teeth	sequence	Tip shape	color
Concord seedless	Felty	Rust	Orbicular	medium	Yellowish green	3	V. U	7.5	10	0.75	Irregularly dentate	72	Continuous	Dibid & trifid	Green
Italia	Downy	Yellowish with orangy patches	Orbicular	medium	Yellowish green	5	U	8.3	9.4	0.88	Irregularly dentate	65	Intermittent	Trifid	Green
Muscat Hamburg	Downy	Bronze patches	Orbicular	medium	Yellowish green	5	U	10.5	10.6	0.96	Irregularly dentate	61	Intermittent	Trifid	Green
Red Globe	Cob Webby	Yellowish green	Orbicular	large	Yellowish green	5	U	10	13.5	0.74	Irregularly dentate	87	Intermittent	Trifid	Green

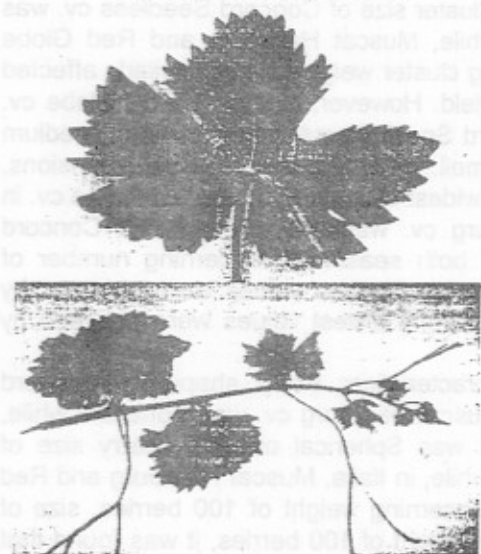
Cultivar	Ampelometry								Cluster		Berry				Seeds
	A	B	C	α	β	δ	SS	SI	Shape	Size	Shape	Size	Colour	Flavour	Number
Concord seedless	0.91	0.61	0.42	61°	55°	32°	0.78	-	Winged double	Small	Obovoid	Medium	Red with typically blue skin	Large aromatic	Seedless
Italia	0.79	0.65	0.42	65°	60°	35°	0.43	0.77	Winged double	Medium	Spherical obovoid	Very large	Golden	Musky flavor	Many (2.62)
Muscat Hamburg	0.76	0.54	0.37	68°	60°	50°	0.42	0.67	Conical shouldered	Very large	Spherical	Very large	Blue-black	Muscat flavor	Many (2.68)
Red Globe	0.89	0.55	0.35	62°	58°	32°	0.36	0.66	Conical shouldered	Very large	Spherical obovoid	Very large	Pinkish red	Natural flavor	Many (2.66)



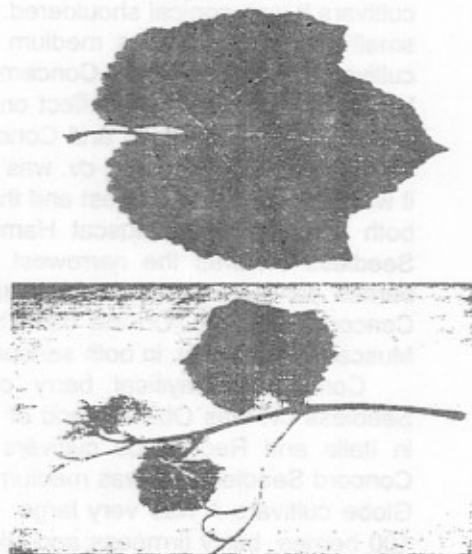
Red Globe Cv.



Italia Cv.



Muscat Hamburg Cv.



Concord Seedless Cv.

Fig (2): Shoot tip and leaf in different cultivars

- Leaf margin:

The types of margin in all studied cultivars were irregularly dentate with a medium teeth numbers except for Red Globe cv. which has many.

• Tendrils:

Tendrils of Italia, Muscat Hamburg and Red Globe cvs. are intermittent while in Concord Seedless cv. they were continuous.

Tip of tendrils in Concord Seedless cv. trifid and some time difid and in Italia, Muscat Hamburg and Red Globe cvs. trifid.

The four cultivars under study have tendrils with green colour.

• Ampelometry:

Three vein ratios were established in relation to midrib to help in identification. The Principal vein angles with one another and their values also provided a useful element for vine discrimination. If the ratio between vines and the angles between these vines are known, it is possible to reconstruct the entire leaf, as a result, it is accurate to distinguish different fundamental forms. Table (1) show the ampelometry of concord seedless, Italia, Muscat Hamburg and Red globe grape cultivars.

• Yield and physical and chemical characteristics of clusters and berries:

Data of table (1&2) and Fig. (3) show yield, its components and fruit quality.

The highest yield was obtained from Red Globe cv. followed in a descending order by Italia cv. then Concord Seedless cv. while, Muscat Hamburg cv. gave the lowest yield. Cluster shape of Concord Seedless and Italia cultivars was winged double while, in Muscat Hamburg and Red Globe cultivars it was conical shouldered. Cluster size of Concord Seedless cv. was small and Italia cv. was medium while, Muscat Hamburg and Red Globe cultivars it was very large. Concerning cluster weight, it was similarly affected by the cultivars and their effect on yield. However, cluster of Red Globe cv. were very large; in Italia and Concord Seedless cultivars they were medium while, in Muscat Hamburg cv. was small. With respect to cluster dimensions, it was found that the longest and the widest was obtained by Red Globe cv. in both seasons while Muscat Hamburg cv. was the shortest and Concord Seedless cv. was the narrowest in both seasons. Concerning number of berries per cluster, it was found that the greatest values were obtained by Concord Seedless. On the other hand, the lowest values were obtained by Muscat Hamburg cv. in both seasons.

Concerning physical berry characteristics: Berry shape of Concord Seedless cv. was Obovoid and of Muscat Hamburg cv. was Spherical while, in Italia and Red Globe cultivars it was Spherical obovoid. Berry size of Concord Seedless cv. was medium while, in Italia, Muscat Hamburg and Red Globe cultivars it was very large. Concerning weight of 100 berries, size of 100 berries, berry firmness and juice weight of 100 berries, it was found that the uppermost was recorded by Red Globe cv. in both seasons followed by Italia cv. while, Concord Seedless cv. gave the lowest values. Berry colour and flavour of Concord Seedless cv. was red with the skin typically blue and is highly aromatic; Italia cv. was Golden, it has a lovely golden yellow color

and delicate musky flavor and Muscat Hamburg was blue-black, it has strong Muscat flavor while, Red Globe cv. was Pinkish red, it has crisp skin, fleshy pulp and a natural flavour. As for number of seeds per berry, it was noticed that Concord Seedless is considered among seedless cultivars, while the other cvs. were seeded. The three cvs. have many seeds /berry according to Bioleti who classified (1938) the average number of seeds per berry as (a) Few seeds: less than 2 seeds/berry, (b) Many seeds: more than 2 seeds/berry.

Concerning chemical berry characteristics; i.e. juice TSS, acidity and TSS/acid ratio, it was found that Concord Seedless generally resulted in higher percentage of TSS, TSS/acid ratio and lower acidity of the juice as compared the Red Globe cv.

The description of the studied cvs. is in harmony with those reported by Perold and Dr. Phil (1927), Wnkler *et al* (1965), Weaver (1976), Olmo *et al* (1981), Hagag *et al* (1996), and Gaser (2006).

II. Some phenological and agrobiological aspects

Table (3) shows the dates of bud burst and harvesting, number of days (bud burst- harvest), bud burst% and coefficient of bud fertility.

Concord Seedless cv. recorded the earliest bud burst date (1/3 & 5/3) and the earliest harvesting date (1/7 & 5/7) for both seasons respectively. The period from bud burst to harvesting was (120 & 118 days) compared to Red Globe cv. which was the latest to reach bud burst date (28/3 & 1/4) and harvesting date (15/8 & 17/8) for both seasons respectively. The period from bud burst to harvesting was (140 & 145 days). The other cvs. were intermediate for both seasons. With respect to bud burst% and coefficient of bud fertility: Concord Seedless cv. showed the lowest bud burst% and coefficient of bud fertility compared to Red Globe cv. which had the highest bud burst% and coefficient of bud fertility.

Table (2): Yield and physical and chemical characteristics of clusters and berries of four grape cultivars in 2003 and 2004 seasons

First season													
Characteristics	Yield / vine	Cluster weight	Cluster length	Cluster width	No. of berries	Weight of 100 berries	Size of 100 berries	Berry firmness	Juice weight of 100 berries	No. of seeds	TSS	acidity	TSS/acid
Cultivars	(kg)	(g)	(cm)	(cm)	per cluster	(g)	(cm ³)	(lb/finch)	(gm)	per berry	(%)	(%)	ratio
Concord seedless	9.23c	233c	18.6b	10.6d	97.66a	184 d	132 d	2.04 c	130d	Seedless	21.58a	0.58b	36.76a
Italia	12.3b	462b	18.7b	12.23b	65.0c	688 b	506 b	4.70 b	511b	2.61a	17.36b	0.70a	25.58b
Muscat Hamburg	7.16d	149d	16.46c	11.36c	51.66d	253 c	236 c	5.64 ab	242c	2.68a	16.96b	0.63ab	25.81b
Red Globe	15.5a	946a	23.53a	13.26a	85.00b	1135a	934 a	7.22 a	960a	2.66a	16.20c	0.66a	25.59b
Second season													
Concord seedless	9.26c	245c	18.4 b	10.96c	99.33a	178 c	126d	2.1 c	123d	Seedless	20.73a	0.56b	37.04a
Italia	12.26b	445b	18.46b	12.23b	70.0 c	550 b	500 b	4.9 b	504b	2.63a	17.60b	0.76a	25.37b
Muscat Hamburg	6.56d	160d	16.2 c	11.73cb	52.0 d	345c	231c	5.75 ab	235c	2.67a	16.86c	0.66ab	26.08b
Red Globe	16.00a	960a	23.83a	13.43a	92.0 b	1120a	923 a	7.35 a	948a	2.66a	15.86d	0.69ab	22.89c

Table (3): Dates of bud burst, harvest date, number of days from bud burst to harvesting, bud burst% and coefficient of bud fertility of four grape cultivars in 2003 and 2004 seasons

Characteristics Cultivars	Date of bud burst		Date of harvesting		Days from bud burst to harvest		Bud burst %		Coefficient of bud fertility	
	First season	Second season	First season	Second season	First season	Second season	First season	Second season	First season	Second season
Concord seedless	1-Mar	5-Mar	1-Jul	5-Jul	120 c	118 d	56.4 b	57.2 c	0.77 b	0.74 b
Italia	28-Mar	30-Mar	1-Aug	6-Aug	134 b	138 b	58.9 ab	59.1 b	0.85 a	0.81 ab
Muscat Hamburg	15-Mar	18-Mar	15-Jul	20-Jul	132 b	135 c	60.2 a	59.4 b	0.87 a	0.82 ab
Red Globe	28-Mar	1-Apr	15-Aug	17-Aug	140 a	145a	61.7a	62.0 a	0.87 a	0.83 a

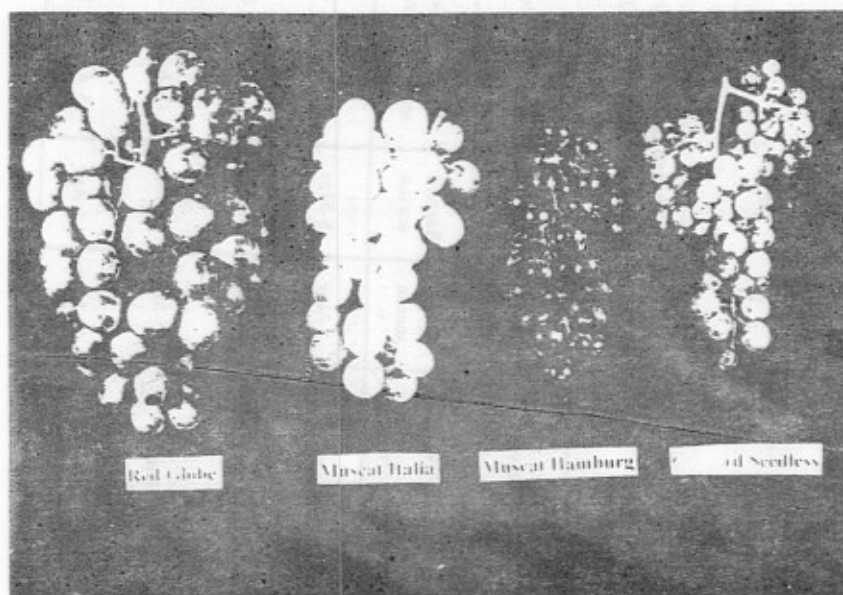
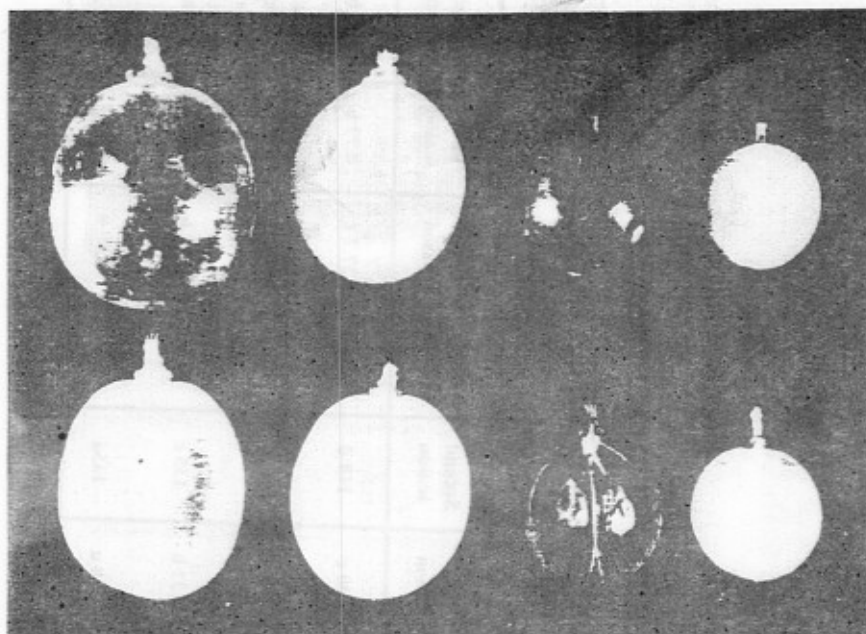


Fig (3): Bunches and berries of different cultivars

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دراسة مقارنة لأربعة أصناف عنب نامية تحت ظروف محافظة البحيرة في مصر فيكتور حبيب جرجس معهد بحوث البساتين - مركز البحوث الزراعية بالجيزة - مصر

أجرى هذا البحث خلال موسمي ٢٠٠٣، ٢٠٠٤ لتوصيف وتقييم أربعة أصناف من العنب كونكورد سيدلس وهو صنف لا بذري من أصل أمريكي وثلاثة أصناف بذرية من أصل أوربي وهم ايطاليا ومسكات هامبورج، ريدجنوب. وكانت هذه الاصناف منزرعة بأحد المزارع الخاصة بوادي النطرون- محافظة البحيرة - مصر.

درست الخصائص التي يمكن عن طريقها توضيح وتحديد مظهر الأوراق. واعتمد على الأطوال والزوايا بين العروق في تحديد أشكال الأوراق، ولوصف انتفصيص قدر التعمق النسبي لفتحات الورق نسبة الى العروق. وللمساعدة في التعرف اعتمد على ثلاثة قيم كنسب بين العروق والعرق الوسطى. تعتبر الزوايا بين العروق وقيمتها عنصر هام للتعرف على الكرمه. ولقد شملت الدراسة التوصيفيه ميعاد تفتح البراعم القمسم النامية - الأوراق - المحاليق - العناقيد والحبات - المواد الصلبة الذاتية الكلية - الحموضة - نسبة المواد الصلبة الذاتية الكلية الى الحموضة.

ولقد اعطت هذه الاصناف نموا قويا وجوده عالية للعناقيد والحبات وكان وزن العنقود في صنف ريد جنوب وايطاليا كبيرا بمقارنه لوزن العنقود لصنفي كونكورد سيدلس ومسكات هامبورج. وكان حجم ووزن الحبات كبير جدا في جميع الاصناف باستثناء صنف الكونكورد اللابذري كان متوسطا. وكان شكل الحبة بيضاوي في صنف الكونكورد اللابذري ومستدير في صنف مسكات هامبورج بينما كان بيضاوي يميل للاستدارة في صنفى ايطاليا والرد جنوب. كان لون الحبة ذهبيا في صنف ايطاليا وأزرق قاتم في صنف مسكات هامبورج وأحمر قرمزيا زاهيا في صنف الرد جنوب وفي صنف الكونكورد اللابذري كان اللون أحمر مشوبا بزرقة. ويعتبر صنف الكونكورد اللابذري من الأصناف عديمة البذور أما باقي الأصناف فهي أصناف بذرية. وقد لوحظ أن صنف الكونكورد اللابذري سجلت أقل قيمة في كلا من النسبة المئوية لتفتح البراعم ومعامل الخصوبة بينما صنف الرد جنوب سجل أعلى القيم.