Evaluation study of some table Grape Genotypes selected from Khartoum orchards

Fatima A.El-Rauof
Associate Professor, Horticultural Crop Research Center, Khartoum, Sudan.

Dawoud H.D
Professor, Horticultural Crop Research Center, Khartoum, Sudan.

Abstract – The present study was carried out at Shambat Research station through 8 successive seasons of 2003 to 2013. Data were collected on eleven lines were represented table grape genotypes selected from different Khartoum orchards The genotypes classified into three groups according to their origin and size. In the first year, shedding by the end of the season ranged between27.87 percent and 47.89 percent. Examination of 5019 buds on canes of different genotypes showed that flower bud formation was very low, average from 3.0 percent to8.26 percent of total buds. The percent flower bud was higher in the thicker cane. The number of clusters per vine ranged from 8.09 to 14.37 clusters as average for the three groups. Individual genotypes however, gave from 0.20 to30.60 cluster per vine which allows for selection of adaptable genotypes. The percent bud opening on the canes was very low.eg, in large size Egyptian genotypes ranged between 39.56-35.46percent Shortening the canes into spurs increased the percent bud opening within the remaining buds but most of these forced buds were vegetative rather than flower buds. Fruit maturity was reached early in May and June in most genotypes for spring clusters. In the second year a similar trend of results was obtained. Leaf analysis was made for N, P, K, Ca, Mg, Na, and Cl for eight genotypes. Generally the nutritional status was not correlated with the low yield.

Index Terms – Promising Grapes genotypes for Khartoum State.

1. INTRODUCTION

Interest in grape growing in Sudan is significant. The potential success of the different grape varieties is, therefore, worth exploring fully. This need to evaluate and assessment of different grape vine growing under Khartoum conditions. Eleven genotypes were selected from different famous grape growers at Khartoum and put under study in order to determine their relative performance under Shambat Research station. All the growers introduced the cultivars from abroad mainly Lebanon and Egypt but the problem they lost the varietal names of all the introduced varieties, this study aimed to determining the following:

- The maximum leaf shedding percent.
- The frequency and position of the latent, vegetative and flower buds on cane
- The relation between cane thickness and fruitfulness.
- The amount of yield and quality in the different varieties
- The mineral status of the leaf petioles as possible factor affecting yield

2. PROPOSED SYSTEM (Materials&Methodes)

The present study was carried out at Shambat Research station through 8 successive seasons of 2006 to 2013 in order to get some information on yield, fruit quality, and fruitfulness of bud at different positions on canes containing two experiments:

Evaluation survey for grape vine orchards to select some promising cultivars. The survey cover17 orchards, eleven genotypes of grape vine were selected from:

A - Ali Abarrsee Orchard, Shambat area-Three genotypes Abarrsee -1, Abarrsee - 2 and Abarrsee 3

B- Hassan Alymani Orchard, Al Hereazab, North Omdurman, Three genotypes,

Alymani- 1, Alymani -2 and Alymani- 3

C - Mohamed Osman Awoud El Lial. Khartoum North, 3 genotypes, Awoud El Lial-1, Awoud El Lial-2 and Awoud El Lial -3

D- Ali Alkheder Kambal house, Khartoum, One genotypes

E- Ezadean Omar Almaki house, Khartoum, One genotypes.

These eleven genotypes were planted at Shambat research nursery as cuttings December, 2004 and then transferred to the permanent site after a year in December, 2005.
According to the origin of the vine and the berry size we classified the genotypes as follows:

- Egyptian, large size, genotypes: Three genotypes were included in this group, each genotypes was replicated 3 times with each replicate including 3 vines
- Egyptian, medium size, genotypes: Five lines were included in this group; each genotypes was replicated3times with each replicate including 3 vines
- Lebanese genotypes: Three genotypes were included in this group; each genotypes was replicated 3 times with each replicate including 3 vines

The entire vines received routine cultural practices when necessary; they are showing satisfactory vegetative growth.

The maximum percent leaf shedding was determined immediately before pruning was done.

This calculated after counting the total number of nodes on the two selected canes on each vine and counting the number of leaves remaining on the same two canes. In both years pruning was done during the period from December 25 and January 10.

Cane pruning was practiced in this study with cane bent downwards and tied to the lower wire.

During March of each year all canes and spurs on each vine in the experiment were examined to determine whether the bud remained dormant, gave a vegetative shoot or gave a fruiting shoot. A total of 5019 buds in2011/12 and 2622 buds in2012/13 only for that purpose. The positions of the different types of buds were also recorded but will be presented separately. At the same time the cane thickness was measured between the 4th and 5th node from the base of the cane. The number of the clusters on each cane was also counted. At time of harvest the total yield per vine was determined in terms of number of clusters on each cane and weight of clusters. Composite samples of berries were taken for fruit quality determinations. Five determinations were averaged to represent the percent total soluble solids. The average number of seeds per 50 berries and the average weight of 50 berries were also determined.

The three Lebanese grape lines were studied for the levels of macro elements in the first year. Each line was represented by five replicates of two vines each. Only leaf petioles were sampled according to [1] .Samples were collected at the end of October in both years. N,P,K,Ca,Mg,Na and Cl were determined in the first year. In the second year only N was determined .No chemical fertilizer was added in the first year. In the second year, however, each vine received 100 gms of (NH4)2SO4 at time of flowering and fruit set.

This was done on the bases of the results of the analysis of the first year. The leaf samples were collected, carefully washed, dried at 60-70°C to constant weight, ground and stored for subsequent analysis N was determined by the micro-Kjeldal method, P by the vanadomolybdo-phosphoric yellow color method in nitric acid system, K and Na by a flame photometer, Ca and Mg by the versinate method and Cl by titration with silver nitrate [1].

3. RESULTS AND DISCUSSIONS

3.1. Leaf shedding

The data in Tables (1) indicated that in both years leaf shedding was never complete in any of the Eleven lines studied .Similar results were reported in India [15] also [5] stated that in tropical climates, the grape vine is ever green but the growers stop the irrigation practices for a 45-60 days before flowering, lead physiologically to the same shedding practices.

3.2. Bud opening%

The data in table 2, 3&4 indicated that 60.41, 72.08 and 79. 55 percent of the buds on the canes in 2011/12 and 64.54, 66.83 and 57.86 percent in 2012/13 remained dormant. This is a very high percent dormant buds as [11] stated that the remained dormant buds of commercial grape varieties must not be more than 43.80, 41.20, and 33.50 for thin medium and thick canes respectively.

3.3. Flower buds%

Tables 5 and 6 present the percent flower buds in the different lines. It ranged from 0.00 to 14.00 percent of the total buds on the canes. Other vinifera grape varieties in a cooler climate gave much higher percentages of flowers buds [11] Nevertheless, the data also showed that there were large differences between the different varieties with respect to the percent flower buds. This would allow for selection of the more productive varieties under such conditions. The relation between the percent flower buds and number of cluster per vine is rather clear (Tables 5and 6).The data of these tables, however, showed that the number of the clusters per vine as an average of all genotypes of each of the three groups was very low. This expected [5].

3.4. Relation between cane thickness and flower bud formation

The data in Tables 7 and 8 showed that, in general the thick canes had a lower percentage of latent buds and higher percentage of flower buds as compared with medium and thin canes. The thin canes were the least productive. This in line with the results reported in other studies [11] & [12].Thick canes have been reported to have a large leaf area per leaf [11]. This might contribute to more flower bud formation.

3.5. Yield and fruit quality

The yield as measured in number of clusters per vine was much higher in 2011/12than in2012/13 in spite of the fact that the percent latent buds were higher in 2011/12 (Tables 7 and 8). This might be explained in light of two facts, namely (a) the total number of buds per vine was higher in 2011/12 as compared with the following year (Table 5 and 6) the percent flower buds in the first year was higher than in the second year (Tables 7and 8) .The lower percentages of latent buds and flowers buds in the second year were compensated for by higher percentages of vegetative shoot production. In Table 9 data are given for yield and fruit quality of the eight of the most productive genotypes under the conditions of the present experiment as an average of the two years. The data showed that the yield per vine was rather low. This in line with [5]who stated that in tropical climates the vine produced small crops of very poor quality .The effect of climate on fruit quality has been studied by many investigators[10]; [9]; [14].High

temperatures during the ripening period are generally associated wi.th grapes high in sugars and low in total acidity. This is in line with the high percentage of total soluble as early as may in the present study. The small berry weight in the present study is also expected since high heat reduces fruit growth [10].

3.6. The mineral status of leaf petioles

Table 10 Indicates the percent N, P, K, Ca, Mg and Cl in leaf petioles of 5 genotypes of the present study. The data indicated that only N was Low (0.677 percent) according to the standard level of 0.80 percent [17]. In the second year, however, was normal(0.79 percent).It was also evident that Na,Mg and Cl were all high as compared with the standards given by [2]and [4] P was normal and K slightly low [2]or normal [1] . [6] And [17] found about 2.0percent K and 0.8 percent N to be standard values in leaf stalks of high yielding Concord grapes. This is higher K than the K level in the present study (1.488 percent). [1], however, gave the normal percent K as more than 0.8percent. [17] Cited that the optimum range of K in grape petioles was more than1 percent. This is lower than what was found in the present study. No standards were found for Ca. Furthermore, Mg was high. [8] Stated that grape leaves show deficiency if they contain Mg at the rate of 0.15 percent—0.18 percent. This much lower than the figures in table 10.

The data in table 10 therefore, don't account for the low yield encountered under the conditions of the present experiment especially in the second year.

4. CONCLUSIONS

This study consider as a preliminary report on growers grape vine efforts, who introduced unknown varieties from Egypt and Lebanon, without any specifications of chilling requirements of each variety. although in 1960s Horticulture Research section in ARC introduced more than 42 varieties from Greek ,Italy, Lebanon and Egypt, planted and examined under different climatic conditions, as Jebal Marra ,Hudiaba and Arkweit area at Red Sea State, due to poor management we lost all these varieties.

According to the results of this study, Individual genotypes however, gave from 0.20 to30.60 cluster per vine which allow for selection of adaptable genotypes i.e. we recommend to introduced specific varieties with chilling requirements flexible under hot climatic conditions also build up the essential Viticulture operations as the training programme and protection practices.

No. of genotypes	Origin	2011/2012		2012/2013	
		Range of leaf shedding %	Mean of genotypes	Range of leaf shedding%	Mean of genotypes
3	Egyptian , medium size genotypes	40.97-54.83	47.89	32.50-54.301	43.10
5	Egyptian ,large size genotypes	37.53-59.07	44.69	31.40-47.10	37.40
3	Lebanese table genotypes	14.80-46.50	27.87	28.00-38.80	34.56

Table 1. Leaf shedding % at the time of pruning in different grape genotypes at2011/2012&2012/2013

	genotypes	Bud opening %	
		1styear	2ndyear
1	Abarrsee -2	36.47	39.25
2	Alymani-1	37.05	26.63
3	Awoud El Lial-2	45.17	40.51
	Mean of genotypes	39.56	35.46

Table 2 Bud opening % on canes in different large size Egyptian genotypes2011/2012&2012/2013

	genotypes	Bud opening %	
		1st year	2ndyear
1	Abarrsee -1	28.93	27.98
2	Abarrsee -3	29.98	27.74
3	Alymani-2	27.79	50.10
4	Alymani-3	21.14	28.02
5	Awoud El Lial-3	29.78	31.94
	Mean of genotypes	27.92	33.17

Table3 Bud opening% On canes in different medium size Egyptian genotypes2011/12& 2012/13

	genotypes	Bud opening %	
		1st year	2ndyear
1	Awoud El Lial-2	28.79	49.30
2	Ali Alkheder Kambal	17.11	43.20
3	Ezadean Omer Al maki	15.45	33.91
	Mean of genotypes	20.45	42.14

Table 4 Bud opening % on canes in different Lebanese genotypes2011/12& 2012/13

No. of lines	Origin	No. of buds examined	Flower buds% on all canes		No. of clusters/vine	
			Range of genotypes	Means of genotypes	Range of genotypes	Means of genotypes
3	Egyptian, large size genotypes	13176	0.24-14.00	8.26	0.63-26.23	14.37
5	Egyptian, medium size genotypes	17834	0.11-10.62	3.15	0.10-27.77	6.83
3	Lebanese genotypes	9620	0.12-11.96	3.00	0.20-30.60	7.01

Table 5 Flower buds% and yield in different grape genotypes2011/12

No. of genotypes	Origin	No. of buds examined	Flower buds% on all canes		No. of clusters/vine	
			Range of genotypes	Means of genotypes	Range of genotypes	Means of genotypes
3	Egyptian, large size genotypes	8854	0.00-8.09	2.63	0.00- 7.00	2.54
5	Egyptian, medium size genotypes	8566	0.0- 7.59	2.79	0.00- 7.33	2.64
3	Lebanese genotypes	4542	0.0- 1.33	0.52	0.00-1.30	0.46

Table 6. Flower buds% and yield in different grape genotypes at Shambat Research Station 2012/13

	Origin	Type of bud	Percentage on					
			Thick cane		Med cane		Thin cane	
			1st year	2nd year	1st year	2nd year	1st year	2nd year
3	Egyptian, large size genotypes	L	66.84	78.47	71.29	76.77	76.28	78.37
		V	22.05	17.72	21.55	20.61	20.68	20.41
		F	11.11	3.8	7.15	2.62	3.04	1.22
5	Egyptian, medium size genotypes	L	77.88	65.70	79. 82	71.94	81.65	68.95
		V	18.14	30.95	17.52	24.93	16.35	29.77
		F	3.98	3.35	2.66	3.77	2.00	1.28
3	Lebanese table genotypes	L	77.04	63.42	78.42	61.72	82.66	68.54
		V	18.80	34.71	18.97	37.94	16.46	31.46
		F	4.15	1.87	2.60	0.34	0.86	0.00
11	Mean of all genotypes	L	73.92	69.20	76.51	70.14	80.20	71.95
		V	19.66	27.79	19.34	27.82	17.83	27.21
		F	6.41	3	4.14	2.24	1.97	.83

Table 7 Relationship between cane thickness and flower bud formation in different grape genotypes 2011/12 &2012/13

L= Latent; V= vegetative; F= Flowers bud

	genotypes	No. of clusters vine	Average Wt. of Cluster(gms)	Average Wt. of50 berries(gms)	Average No. of Seeds in 50 berries	T.T.S %	Date of Harvest
1	Ali Alkheder Kambal	9.59	153.6	81.9	84.0	16.2	15May-end June
2	Ezadean Omer Al maki	9.88	138.2	81.5	112.0	14.7	15May-end June
3	Abarrsee -1	12.61	158.4	101.3	98.6	16.2	15May-15July
4	Abarrsee -3	12.85	177.4	54.9	94.5	17.3	15May-15July
5	Alymani-2	14.12	87.4	87.8	88.0	20.4	15May-15June
6	Alymani-3	11.90	110.2	132.5	115.0	17.1	All June
7	Awoud El Lial-2	9.30	139.4	77.2	88.0	17.0	15May-15July
8	Awoud El Lial-3	15.75	109.1	93.3	104.0	11.6	15May-15June

Table 8. Yield and fruit quality of promising grape genotypes(Average of 2011/12& 2012/13)

genotypes		No. of clusters vine	Average Wt. of Cluster(gms)	Average Wt. of50 berries(gms)	Average No. of Seeds in 50 berries	T.T.S %	Date of Harvest
1	Ali Alkheder Kambal	9.59	153.6	81.9	84.0	16.2	15May-end June
2	Iz Eldean Omer Al maki	9.88	138.2	81.5	112.0	14.7	15May-end June
3	Abursi -1	12.61	158.4	101.3	98.6	16.2	15May-15July
4	Abursi -3	12.85	177.4	54.9	94.5	17.3	15May-15July
5	Alymani-2	14.12	87.4	87.8	88.0	20.4	15May-15June
6	Alymani-3	11.90	110.2	132.5	115.0	17.1	All June
7	Awoud El Lial-2	9.30	139.4	77.2	88.0	17.0	15May-15July
8	Awoud El Lial-3	15.75	109.1	93.3	104.0	11.6	15May-15June

Table 9 Yield and fruit quality of promising grape lines at Shambat Research Station (average of 2004/5 and 2005/6)

genotypes		1st year							2nd year
		N	P	K	Na	Ca	Mg	Cl	N
1	Ali Alkheder Kambal	0.78	0.266	1.300	1.15	1.54	0.98	0.451	0.73
2	Ez Eldean Omer Al maki	0.68	0.246	1.820	0.48	1.24	0.59	0.725	0.90
3	Abarrsee -1	0.78	0.332	1. 560	0.28	1.21	0.79	0.389	0.73
4	Abarrsee 3	0.61	0.196	1.700	0.37	1.32	0.50	0.566	0.73
5	Alymani-2	0.67	0.206	1.670	0.46	1.31	0.93	0.566	0.84
6	Alymani-3	0.61	0.238	1.380	0.41	2.00	0.74	0.610	0.78
7	Awoud El Lial-2	0.60	0.222	1.356	0.46	0.90	0.50	0.371	0.79
8	Awoud El Lial-3	0.67	0.206	0.990	0.36	1.43	0.77	0.371	0.84
	mean	0.677	0.244	1.488	0.37	1.38	0.76	0.525	0.79

Table 10. Element% in dry petiole material of leaves of eight genotypes grape growing under Shambat Research Station

REFERENCES

[1] Chapman,H.D. (1967). Plant analysis values suggestive of nutrient status of selected crops.Soil testing and plant analysis. Part 2 plant analysis. Soil Sci. Soc.Amer. Inc.
[2] De Geus,J.G.(1987). Fertilizer Guide for Tropical and Sub-tropical Farming. Centre d,Etude de I,Azote,Zurich
[3] Palma,B.A.,and Jackson,D.I.,1981.Effect of temperature on flower initiation in grapes.Bot.Caz.142(4);490-493.Department of Horticulture, Landscape ,and parks, Lincoln Collage, Canterbury, Newzealand. Research publication No.628.
[4] Shannon, L. M. (1954). Mineral contents of fruit plants. Fruit Nutrition, Chapter 18, Childers Ed. Somerset Press.
[5] Winkler, A. J. (1978).General Viticulture, Univ. Calif. Press.
[6] Beattie J.M.and C.G.Forshey ,(1984). Asurvey of the nutrient element status of Concord grapes in Ohio.Proc.Amer. Soc. Hort. Sci. , 64:21-8.
[7] Forshey, C. G. (1989). Potassium nutrition of deciduous fruits. Hort. Science,4: 39-41.
[8] Jones W.W. and T.W.Embleton, (1969). Potassium nutrition of subtropical fruits. Hort. Science, 4:37-38.
[9] Kliewer, W. M.(1988). Effect of temperature on the composition of grap es grown under field and controlled conditions. Proc. Amer. Soc. Hort. Sci., 93: 797-806.
[10] Kliewer, W. M. and L. A. Lider,(1980),Effect of day temperature and light intensity on growth and composition of Vitis vinifera L. fruits. Jour. Amer. Soc. Hort. Sci., 95: 766-69.
[11] Minessy, F.A. (1964). Fruitfulness of Thompson seedless and Melouki grapes as influenced by cane thickness and nitrogen level . Alex. Jour. Agric. Res. 12:149-65.
[12] Minessy F. A. (1965). Some studies on fruitfulness of four vinifera grape varieties. Alex. Jour. Agric. Res. 13:19-29.
[13] Minessy , F. A., M. A. Barakat and E. M. Elazab, (1970). Effect of water table on mineral content, root and shoot growth, yield and fruit quality in Washington navel orange and Balady mandarin. Jour. Amer. Soc. Hort. Sci., 95: 81-85.
[14] Palma,B.A.,and Jackson,D.I.,1981.Effect of temperature on flower initiation in grapes.Bot.Caz.142(4);490-493.Department of Horticulture, Landscape ,and parks, Lincoln Collage, Canterbury, Newzealand. Research publication No.628.
[15] Pai,C.,Janes.,n,Z.Dav., (1980).Studies in the development of new varieties of grapes (Vitis vinifera L.) by seedling selection. Tropical Science, 11: 286-97.
[16] Hor6ticulure Research Annual reports ARC. 1969-1972 Sudan Minstry of Agric.
[17] Larsen, R. P.(1985). Shortages of potash limit Michigan grape yields. Better Crops with Plant Food. Techniqual report.

Authors

Dr. Fatima Abd Alraouf Ahmed is a currently drector of Horticultural crop center - Agricultural Research corporation, Ministry of agriculture Sudan

Professor Dr. Dawoud Hussien Dawoud is currently a fruits&Ornamental Plants National coordinator, Agricultural Research corporation, Ministry of agriculture Sudan.