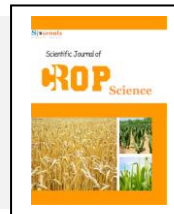


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CROP ScienceJournal homepage: www.Sjournals.com**Original article****The comparison yield and some fruit quality traits of grapevine cultivars****H.R. Fanaei*, H. Akbarimoghadam, H. Rohanienejad, A. R. Akbarimoghadam***Agricultural and Natural Resources Research Center of Sistan, Zabol, Iran.*

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ABSTRACT

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The selection suitable cultivar is one of the factors critical in increasing quality and quantity production of crop. Grapevine is one of the well-adapted crops to the Sistan climate located in South East of Iran. In order to comparison yield and some fruit quantity traits of 20 grape cultivars along with local control (Yaghoti Ghermez Zabol) was conducted a experiment on based of randomized complete block design (RCBD) with 3 replications in Agricultural and Natural Resources Research Station of Zahak, during year 2011-2012. Results indicated that the cultivars are different in term yield, total soluble solid (TSS), titratable acidity (TA), and technical maturity index (TSS/TA). Askari Sefid Shiraz cultivar (18.5 t ha⁻¹) had highest yield. Yaghoti Ghermez Zabol (17.5 t ha⁻¹) and Khalili Varamin (16 t ha⁻¹) had second and third ranks. From aspect, TSS, cultivars of Yaghoti Ghermez Ghazvin, and Varamin (26 %), Yaghoti Siah Shiraz (24 %) and Yaghoti Ghermez Zabol (22 %) had highest Brix degree. Also revealed higher rates from TSS/TA index in cultivars of Yaghti Ghermez Ghazvin, Yaghoti Varamin, Yaghoti Siah Shiraz and Yaghoti Ghermez Zabol with mean 65, 62.60 and 46, respectively. Grapevine cultivars includes, Yaghoti Ghermez (varamin, Ghazvin, Zabol) for earliness and have good production and high quality, accompany with, Askari Sefid Shiraz and Khalili Varamin are recommendable in Sistan climatic conditions.

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1. Introduction

Grape (*Vitis vinifera* L.) is considered as one of the most important commercial fruit crops of temperate to tropical regions (Gowda et al. 2008). The grape is gaining popularity for its high nutritive value, excellent in taste, multipurpose use and better returns (Ghosh et al. 2008). Successful viticulture must meet the requests of consumers and growers for good wine quality, disease and insect tolerance and low environmental impact (Broome and Warner, 2008). A constant and steady improvement is observed in worldwide table grape consumption (Celik et al. 2005). Increasing grape quality of regional vineyards is dependent on carrying out different practices such as selection suitable cultivars. Choice of grapevine cultivars for sowing must be determined on basic weather conditions, soil and other factors need (Childers, 1983). In the warm areas with fertile soils and high productivities can be planted, high yield cultivars but in cold areas with less fertile soils is better that, cultivation of cultivars that not the high performance but grapevines produced with the high quality (Najafi et al. 2006). The choice of grapevine varieties for a specific region, insofar as it implies assessing the genotype-environment dynamics, requires investigating the crop's phenological stage timing and behavior, which are in turn related to regional climate (Mullins et al. 1992). Pacifico et al., (2013) showed that yield was significantly high, with over 20 t/h obtained for the most productive hybrids and 4-5 t/ha obtained for the least productive varieties. In study was conducted on 125 grapevine cultivars in the collection of the Agricultural Research Station Dastgerd of Esfahan 15 grapevine cultivars were better than other cultivars from aspect, crop yield, flowering time, number and cluster size, berry size, sugar content, taste the fruit, time to maturity and market-friendly, so were better than other cultivars, were selected for further study (Ghasemi, 2000). Najafi et al. (2006) on based analysis variance of molecular showed that exist genetically diversion rate between grapevines in regions of Iran. In study conducted by Jahantyghi and Ahmadi (2005) cultivars had significant different in terms of yield, so Askari Sefid Shiraz (11.21 t ha⁻¹) had yield highest and lowest belong to cultivar Molaee Sharyar. Mossazades et al. (2012) investigated the characteristics of grapevine cultivars in two climatic conditions and reported that there were significant differences between all characteristics of grapevine cultivars. Them announced that all the cultivars have Total soluble solid (TSS) higher in Razavi Khorasan than North Khorasan, so that climate effective in result. Kamiloglu (2011) announced grape quality and composition were affected by the amount of products in vine.

Grapevine is one of the well-adapted crops to the Iran Mediterranean climate. Iran is the sixth country in the world in grape orchard area (288030 ha) and grape production (2342210 tons) (Nourjou et al. 2011). Yaghoti Ghermez grape in north Sistan and Baluchistan province of Iran in country has most area and production, but low yield and high density and compacted berry in cluster in Yaghoti Ghermez leading to decrease competition it's with commercial grapes in market. Thus the main objective of this research was to survey yield, phenological, and some qualitative performances, of 20 grape cultivars, in order to selection cultivars with high yield, early ripening and adapt with climate conditions of sistan region.

2. Materials and methods

2.1. Site description

This experiment was carried out to selection cultivars with high yield, early ripening and adapt grapevine cultivar or cultivars in during 2011-2012 year, at Agricultural and Natural Resources Research Station of Zahak, (31°54'N; 61°41'E, and 483 m above sea level) that located at eastern of Iran with mean annual precipitation less than 50 mm in year.

2.2. Experimental design and treatments

The experimental design was Randomized Complete Block design (RCBD) with three replications. We selected 20 varieties of important regional grape in Iran country, that listed in Table 1. In each plot exist 24 trees in 3 rows. The vine spacing was 3 × 1.5 m (222 vines/ha), and the vines were trained using the lying system

2.3. Cultural practices

Chemical Fertilizers along with manures were applied at beneath plant in holes with 30 cm depth (based on the results of soil analysis). Grapevine cultivars had lying education system and uniform from aspect old, growth and vigor position. During the growing season has been carried out, all agricultural practices (weeds pests and

diseases control and irrigation), when they were required and as recommended for commercial Grapevine production (Jahantyghi and Ahmadi, 2005).

Table 1
Varieties investigated in the study.

Variety	Color of berry skin	Origin
Bidaneh Sefied Qazvin	White	Iran
Bidaneh Germez Qazvin	Red	Iran
Perlet	White	U.S.A
Tokhmeh Tehrani Shiraz	White	Iran
Hosseini Sefied Ferdos	White	Iran
Khalili Bidaneh Rezvan	White	Iran
Khalili Varamin	White	Iran
Shahani Qazvin	Black	Iran
Shahani Ghasreshirin	Black	Iran
Askari Sefied Shiraz	White	Iran
Askari Sefied Varamin	White	Iran
Kardinal	Red	U.S.A
Molaei Shariar	White	Iran
Yaghoti Sefied Zabol	White	Iran
Yaghoti Ghermez Shiraz	Red	Iran
Yaghoti Seiah Shiraz	White	Iran
Yaghoti Ghermez Zabol	Red	Iran
Yaghoti Ghermez Ghazvin	Red	Iran
Yaghoti Ghermez Ghasreshirin	Red	Iran
Yaghoti Ghermez Varamin	Red	Iran

2.4. Data collection and analysis

Proportional to the arrival time of each cultivar were harvested in the spring and summer. Yield mean in plant calculated on multiple mean of cluster number in mean weight one cluster in each plant (Jahantyghi and Ahmadi, 2005). In ripening stage in order to investigate some properties quality, fruits samples was transferred to laboratory. 50 berries were squeezed for each cultivar in repeat and grape juice was used for characteristics such as Total soluble solid (TSS), Tatrasiion Acidity (TA), TSS/ TA. Total soluble solid (TSS) content (%) in the juice was determined using hand refract meter (Atago Model ATC-1E) and juice pH was determined by pH meter. Tatrasiion Acidity (TA) measured using potentiometric method, while prepared juice was titrated with 0.1 N, NaOH solution until 8.1 value was read on the pH meter and results were calculated in percentage of tartaric acid. Techntraical Maturity Index, calculated as TSS/TA (AOAC, 1990). Data were analyzed by using MSTAT-C statistical package (MSTAT-C, Version 1.41, Crop and Sciences Department, Michigan State University, USA). Duncan Multiple Range Test was used to comparing means ($P \leq 0.05$).

3. Results

3.1. Fruit yield

Results of variance analysis fruit yield indicated that there was significant difference $p \leq 0.01$, between various cultivars of grape (Table 2). The highest fruit yield was belonged to cultivars Askari Sefid Shiraz (18.5 t ha⁻¹), Yaghoti Ghermez Zabol (17.5 t ha⁻¹), Khalii varamin (16 t ha⁻¹) (Table 3). The lowest with average 5, 6 and 7 t/ha obtained for Yaghoti Seiah Shiraz, Molaei Shariar, Perlet and Hosseini Sefied Ferdos. Local landraces (Yaghoti Ghermez and Yaghoti Sefeid Zabol) in terms of fruit performance had second and 7th ranks respectively. Different among cultivars in terms of some of the cluster components can be affect in above deferments, due to that increase in cluster weight and cluster length increased yield (Kamiloglu, 2011). Pacifico et al. (2013) reported that

varieties with low yield had lower cluster weight. Johantyghi and Ahmadi (2005) that shown local landraces were well adapted to environmental stresses in sistan region. Our results are in agreement with the findings of Pacifico et al. (2013) and Johantyghi and Ahmadi (2005) that shown high variability among genotypes in term fruit yield.

One of main phenological stages, veraison (defined as 50% of plants upon the stage) were evaluated and the variation quantified. The phonological data showed a high variability among genotypes in veraison phase (Table 3), reflecting a higher and different sensitivity to spring weather compared with “Yaghoti Ghermez”. Yaghoti Ghermez” is considered as an early grape variety, registering veraison in the first decade of May. Yaghoti Ghermez grapevine was early ripening than other cultivars, and almost simultaneously to be harvested ready in the three decade of May. Other cultivars were harvested at 10-45 days after Yaghoti Ghermez. However the results of this study showed superior yield in cultivar Sefeid Askari, but harvested one month after Ghermez Yaghoti Ghermez. The Hosseini Sefid Ferdus considered as latest ripening variety, so in the second decade of Jul harvestrd. Our results are in agreement with the findings of Pacifico et al. (2013) that shown high variability among genotypes in term, veraison stages.

Absolutely attention to high yield cannot be suitable criterion for economic advantage. Earlier production is important factor in region for make economic produces grapevine. Therefore, from this aspect, Yaghoti Ghermez cultivars are dominant in competes with other cultivars. Weak binding berry to the tail of fruit causes loss of fruit in Askari Sefeid cultivar considerably and this can be difficult for transferring especially in long distances.

Najafi et al. (2006) and Mossazades et al. (2012) were announced that climatic conditions affect on phenology and morphology of grapevine cultivars. In warm tropical zones the temperature remains steady within a 20 to 30°C range, which stimulates faster phonological phenomena than temperate and subtropical climate temperatures (Valor and Sánchez, 2003).

Table 2

Analysis of variance for fruit yield of grapevine cultivars.

Source of variation	Degree freedom	Fruit yield
Replication	2	7350000
Cultivar	19	45700657**
Error	38	2431579

** : Indicate Significant at 1% level.

3.2. Quality traits

Total soluble solids (TSS) and acidity play an important role in fruit quality improvement (Chanana and Gill, 2008; Oliveira and Sousa, 2009). Results mean comparison showed that there was difference among the genotypes. The highest value in terms of TSS was obtained in Yaghoti cultivars, Yaghoti Ghermez Ghazvin, and Varamin (26 ° Brix), Yaghoti Siah Shiraz (24 ° Brix) and Yaghoti Ghermez Zabol (22 ° Brix) (Table 3). Pacifico et al. (2013) reported high variability of the soluble solids (TSS) among the hybrids, which reflect differences in their genotypes and the annual climate conditions. Sugar accumulation and acid degradation were monitored upon the initiation of veraison to determine the ripening level and the harvest time (Pacifico et al. 2013). In study Almanza et al. (2010) were announced that during over ripening there was another considerable TSS increment because the fruits, experimented a fresh mass loss that increased TSS concentration up to 28.4±0.8°Brix. Mehmandoost et al. (2008) showed that the best time of harvesting when the total soluble solid (TSS) is high value 22 percent.

The highest value in terms of Tatrason Acidity (TA) was obtained in cultivars, Hosseini Sefied Ferdos (1.05 %), Shahani Ghasreshirin and Bidaneh Germez Qazvin (0.71 %) and lowest observed in Molaei Shariar (0.39 %) and Khalili Bidaneh Rezvan (0.38 %) (Table 3). Almanza et al., (2010) states TA ranges between 7 and 10 g L⁻¹ (0.7 to 1.0 %) as expressed in tartaric acid, which is in agreement with the results of the present work. Acidity decrease not only due to the transformation of malic acid into other compounds, but also to respiration, to dilution resulting from water accumulation, and to migration of bases from the roots, which increases ash alkalinity (Reynier, 1995). High acid values indicate a positive trait in the present global warming scenario and also represent desirable characteristics, particularly for sparkling wines. The increase of air temperature corresponded with a similar increase in pH values in must (Pacifico et al. 2013).

Also revealed higher rates from TSS/TA index in cultivars of Yaghti Ghermez Ghazvin, Yaghoti Varamin, Yaghoti Siah Shiraz and Yaghoti Ghermez Zabol with mean 65, 62.60 and 46, respectively. These cultivars have the

lowest Titratable Acidity (Table 3). Almanza et al. (2010) states that until harvest, total soluble solid (TSS) and technological maturity index (TMI=TSS/TA), increased while TA declined. Pacifico et al. (2013) in during comparison of the yield per vine to the sugar richness revealed that “Regent” and “Seibel 7052” had good production and high-soluble solids (TSS); no negative regression was observed among the hybrids between the two parameters. But in study Kamiloglu (2011) Negative correlations were identified between vine yield and TSS, pH, TSS/acidity, total anthocyanins. Differences in results can be related to typical grape and climate conditions.

Table 3

Average fruit yield and some quality characteristics of grapevine cultivars.

Cultivar	TSS/TA	TSS %	TA%	Fruit Yield (t ha ⁻¹)	Veraison date
Bidaneh Sefied Qazvin	23.5	16	0.68	12/5	First decade of Jun
Bidaneh Germez Qazvin	28.2	20	0.71	12	First decade of Jun
Perlet	37.7	20	0.53	6	First decade of Jun
Tokhmeh Tehrani Shiraz	17.7	11	0.62	11	First decade of Jun
Hosseini Sefied Ferdos	10.5	10	1.05	7	Third decade of Jun
Khalili Bidaneh Rezvan	39.5	15	0.38	8/5	First decade of Jun
Khalili Varamin	33.3	18	0.54	16	First decade of Jun
Shahani Qazvin	29.6	16	0.54	9/5	Third decade of May
Shahani Ghasreshirin	22.5	16	0.71	7/5	Third decade of May
Askari Sefied Shiraz	15.4	10	0.65	18/5	Second decade of May
Askari Sefied Varamin	19	12	0.63	15/5	Second decade of May
Kardinal	23.7	14	0.59	8/5	First decade of Jun
Molaei Shariar	41	16	0.39	6	Second decade of May
Yaghoti Sefied Zabol	33.3	16	0.48	12/5	Second decade of May
Yaghoti Ghermez Shiraz	41.2	21	0.51	11	Second decade of May
Yaghoti Seiah Shiraz	60	24	0.4	5	First decade of May
Yaghoti Ghermez Zabol	45.8	22	0.48	17/5	First decade of May
Yaghoti Ghermez	65	26	0.41	12/5	First decade of May
Ghazvin					
Yaghoti Ghermez	40.4	19	0.47	11/5	First decade of May
Ghasreshirin					
Yaghoti Varamin	61.9	26	0.42	14	First decade of May

TA= Titratable Acidity

TSS= Total Soluble Solid

TSS/TA= Technological Maturity Index (TMI)

4. Conclusion

Results showed that there are variations in various cultivars of grapevine from aspect fruit yield, ripening and quality traits that condition of each region can be effective in increasing or decreasing them. Determined that in harvest time, high TSS and TSS/TA are good criteria for choices cultivars with high quality. Based on results can be conclude that Grapevine cultivars includes, Yaghoti Ghermez due to earliness and have good production and high quality, along with, Askari Sefied Shiraz, Khalili Varamin, Ghermez and Ghermez Bidaneh, and Shahani Qazvin, for give diversity to cultivars and increasing economic benefits are recommendable in Sistan climatic.

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