EFFECT of CONVENTIONAL and ORGANIC FARMING SYSTEMS on YIELD and QUALITY of VINEYARDS

ÜLFET ERDAL[1] , ÖMER SÖKMEN[1], ALI RIZA ONGUN[2] , ATILA ERTEM[3]

1 International Agricultural Research and Training Center, Menemen-Izmir/Turkey, ulfeterdal@utaem.gov.tr
2 Ege University, Faculty of Agriculture, Department of Soil Science and Plant Nutrition, Bornova-Izmir/Turkey.
3 Senior Expert on Organic Agriculture, Bornova-Izmir/Turkey

Abstract
In this study, the aim was to compare changes in yield and various qualities in vineyards where conventional farming systems (CFS) and organic farming systems (OFS) are practiced. The experiment was carried out in 5 replicates with a completely randomized design in Manisa-Salihli, Poyrazdamları Village over a period of 9 year between 2000 and 2008. According to soil analysis results, certified fertilizer, green manure and vineyard pruning waste were applied in organic plots. 21% ammonium sulphate, 26% ammonium nitrate, 43% triple super phosphate as P2O5 and 48-52% potassium sulphate as K2O were applied in conventional plots. When the yields were assessed, table grape and raisin yields were higher in conventional plots at a statistically significant degree.
Key words: *Organic, Conventional, Vineyard, Turkey*

1. INTRODUCTION

In Turkey, organic agriculture started in the mid of 1980s as a result of the demand of European importers and was concentrated primarily in the Aegean Region. Raisins (sultanas), apricots and figs are the first products produced by organic farming. Turkey has produced and exported organic raisins since 1986 and is the world leader in organic raisin production. Raisin exports from Turkey have largely increased over the years. While in 1986 there were few producers and a limited amount of table grape production, as of 2012 more than 10.000 tons were produced in Turkey. In this study, the aim was to compare differences in yield and various qualities in vineyards where conventional farming systems (CFS) and organic farming systems (OFS) are practiced.

2. Material and methods

In this study, the aim was to compare differences in yield and various qualities in vineyards where CFS and OFS are practiced.
The experiment was conducted in the Gediz Basin (Manisa-Salihli), in the Aegean Region of Turkey (38°35´35.26˝N; 28°07´42.70˝E). Manisa-Salihli is dominated by a Mediterranean climate, where summers are hot and dry, and winters mild and rainy. The soil has a loam texture with a pH of 7.5 and contains 0.56 % organic C and 0.079 % total N. The experiment was carried out in 5 replicates with a randomized design over a period of 9 years between 2000 and 2008. Soil samples were taken at the depths of 0-20 and 20-40 cm. According to soil analysis results, certified fertilizer and green manure and vineyard pruning waste were applied as plant nutrition material in organic plots (Table 1). On the other hand, 21% ammonium sulphate, 26% ammonium nitrate, 43% triple super phosphate and 48-52% potassium sulphate were applied in conventional plots. Certified products and traps permitted in the related regulations, Bordeaux mixture, copper preparations and sulphur were used in the OFS for disease and pest control. In the CFS, synthetic pesticides were used as plant protection material in the plots.

Table 1: Fertilization program

	Conventional	Organic
2000	150 kg N ha^{-1}	GM + VPR + 600 kg AB ha^{-1}
2001	150 kg N ha^{-1}	GM + VPR + 600 kg AB ha^{-1}
2002	150 kg N ha^{-1} + 60 kg P_2O_5 ha^{-1} + 100 kg K_2O ha^{-1}	GM + VPR + 600 kg AB ha^{-1}
2003	150 kg N ha^{-1} + 60 kg P_2O_5 ha^{-1} + 100 kg K_2O ha^{-1}	GM + VPR + 600 kg AB ha^{-1}
2004	150 kg N ha^{-1} + 60 kg P_2O_5 ha^{-1} + 100 kg K_2O ha^{-1}	GM + VPR + 600 kg AB ha^{-1}
2005	150 kg N ha^{-1}	GM + VPR + 600 kg AB ha^{-1}
2006	150 kg N ha^{-1}	GM + VPR + 600 kg AB ha^{-1}
2007	150 kg N ha^{-1}	GM + VPR + 600 kg AB ha^{-1}
2008	150 kg N ha^{-1}	GM + VPR + 600 kg AB ha^{-1}

N: ½ $(NH_4)_2SO_4$ + ½ NH_4NO_3
GM: 80 kg vetch(Visia villosa L.) ha + 20 kg barley ha-1 VPW: Vineyard pruning waste
AB: Agro-Biosol (N:P:K 7:1.5:3.5)

Result and Discussion

The yield of the organic and conventional systems at the vineyards between 2000 and 2008, as well as the results obtained at some quality parameters, were examined, and interpreted as follows:
Table grape and raisin yield: The experiment was started in 2000, when the vine stocks were 4 years old. Since the vineyards were not ready for full yield, the lowest grape yields in both systems were in 2000. In the experiment areas, after they became ready for yield in 2001 (5th year), the table grape yields demonstrated the lowest yields in both systems in 2002. The difference in table grape yields from OFS and CFS were found to be statistically significant (Table 2).
When the table grape yields from CFS and the yield from OFS in 2002, 2003, 2004 and 2005 are compared, the difference between the practices were at a statistically significant level. The yield upsides in conventional production in the mentioned years were 24%, 33%, 11% and 14% respectively. The highest difference in yield between the two systems was found in 2003. When the yields were assessed statistically, they were found to be significant in favor of conventional agriculture in 2002, 2003, 2004 and 2005. In 2008, which was the last year of the experiment, although there was not a statistically significant difference between the yield values obtained from conventional production and the yield values obtained from organic production, it was observed that the organic production (4009,88 kg/da) provided a yield value close to conventional production (4103,70 kg/da) (Table 2). The average organic and conventional table grape yields obtained in this study are in accordance with the product amounts obtained in the region (İlter, 1980; Erdem et al, 1995; Altındişli and Kısmalı, 1998; Ilgın et al., 2002). The variance analysis concerning the raisin yield values of the OFS and CFS is summarized in Table 2. The difference between the organic and conventional systems was found to be statistically significant. The values concerning raisin values are shown in Table 2. It was found out that a raisin yield, which was higher compared to organic production at a statistically significant degree, was obtained from conventional production in 2003.

Table 2: Effect of CFS and OFS on table grape and taisin yields

	Table grape (kg da^{-1})				Raisin (kg da^{-1})			
Years	CFS		OFS		CFS		OFS	
2000	681.12	f	570.39	e	133.28	f	105.45	e
2001	2514.56	de	2590.12	c	585.43	de	590.86	bc
2002	2309.87	e	1755.55	d	476.91	e	393.33	d
2003	4096.90	a	2756.76	bc	952.44	b	697.48	bc
2004	3846.28	ab	3416.08	ab	767.28	c	699.04	bc
2005	3090.00	cd	3650.60	c	639.60	cd	557.20	c
2006	3218.40	bcd	2871.40	bc	708.20	cd	663.00	bc
2007	3236.60	bc	2889.60	bc	729.20	cd	717.00	b
2008	4103.70	a	4009.88	a	1170.36	a	1229.60	a
(** tukey p<0.01)		**		**		**		**

In other years, differences with statistical significance were not found between the practices. The average yields of OFS and CFS, obtained from the experiment, are in compliance with the grape yields obtained in the same region (Ilgın et al., 2002).
Concerning table grape yields, there are differences between two systems at a statistically significant degree. However, these gaps between the yield values obtained from both practices are not noteworthy in the practical sense. Especially when the yields of the last year are compared, it can be seen that very close values are obtained. The yields, which were low during the first years, increased in years and demonstrated a more stable trend, and reached the highest level in the last year. In raisin yield, a difference in favor of conventional was observed again at a statistically significant degree. The table grape and raisin yields obtained from the organic plots are similar to the conventional yield averages obtained in the region.
Size in raisin: There is a statistically significant difference between two systems. It is determined that size of table grapes which were cultivated with organic agriculture in 2000 and 2004 are higher than the sizes of those which were cultivated conventionally in the same years (Table 3 and 4).
Dried matter (brix %) in table grapes: There is not an overall statistically significant difference between two systems. It was determined that there are differences at a statistical significance level for dried matter amounts between the practices in 2001 and 2008. In 2001 it is stated that there was a 12.5% higher amount of total brix for CFS compared to OFS but in 2008 we see that there was an 8% higher amount of total dried matter for OFS compared to CFS. In the trial area the percentage of sugar in grapes cultivated for drying changes from province to province yet Altındişli et al. (2004) informed that this must be around 18% - 20% (Table 3 and 4).

Table 3: Effect of CFS and OFS on dried matter (brix %) and size

	Dried matter (brix) (%)				Size			
Years	CFS		OFS		CFS		OFS	
2000	18.700	ab	18.600	bc	9.700	a	10.300	a
2001	19.900	ab	17.400	c	9.450	a	9.450	b
2002	17.200	b	17.800	c	7.000	d	7.000	e
2003	18.500	ab	18.400	c	9.500	a	9.800	ab
2004	18.100	ab	17.400	c	7.900	c	8.400	d
2005	18.160	ab	18.120	c	9.200	ab	9.200	bc
2006	17.400	ab	16.120	c	8.600	bc	8.700	cd
2007	20.140	a	21.380	a	9.350	a	9.350	bc
2008	19.552	ab	21.280	ab	8.250	c	8.450	d
(** tukey p<0.01)		**		**		**		**

Table 4: Comparision of the effects of CFS and OFS on yield and some quality characteristics

	CFS (n=45)	OFS (n=45)	
Table grape yield (kg da^{-1})	3010.83 a	2612.26 b	**
Raisin yield (kg da^{-1})	684.74 a	628.11 b	**
Dried matter (brix %)	18.63 a	15.50 a	ns
Size	8.77 a	8.96 a	ns
(** tukey p<0.01) (ns: not significant)