Impacts of Different Natural Fertilization Techniques that was Implemented on Organic Agriculture System on Fruit Quality Criterions of (*Ficus Carica* L. Cv. Sarilop) Dried Fig Cultivar

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ABSTRACT

Dried fig is second range (14,39%) as quantity and third range as value (15,89%) in Turkey total organic agricultural crops exports. Main aim of the project was determined that impacts on fruit quality parameters of 'Sarilop' dried fig variety of applied different natural fertilization technics on organic agriculture system. That research was carried out in a farmer orchard which consisted of Sarilop dried fig variety, located in Isafakilar village, Incirliova, Aydin, during 2002-2005 years. This experiment was designed in respect of randomized blocks with four replications and each replication was comprised of one tree. Totally six applications are on the carpet; those are includes control, vetch, natural vegetation, 20, 40 and 60 kg farmyard manure applications, respectively. The data which were obtained from the study was evaluated to analysis of variance using SPSS packet program. The means were separated by LSD multiple comparison test at 0.01 and 0.05. In that research, rate of the cull figs (%) (the worst quality dried fig fruit), cracking fruit rate (%), sunscalded (sunburn damage) rate (%), average fruit weight (g), total soluble solids content (TSS) (%), ostiole width (mm), skin colour parameters were investigated, respectively. It has been determined that impacts of the applications on some important properties on fig involved cracking fruit and sunscalded rate, average fruit weight, ostiole width.

Keywords: Dried fig, fertilization, fruit quality, organic agriculture.

INTRODUCTION

It is accepted that ecologic agriculture (biological agriculture, organic agriculture) is an active alternative for solution of health and environmental problems which has occurred by using of intensive agriculture inputs.

When it is analyzed period of ecological agriculture comprises environment friendly production techniques and aims to have increased welfare from farmer to consumer as years, the first half of 1900 years that was begun of using agrochemicals in agriculture, results of some approaches on soil productivity which were supported by some European pioneers, it has been seen that base of ecologic agriculture was occurred (Aksoy, 2001).

While Australia that has 11300000 hectare organic agriculture land is first range in total world organic agriculture land, such as countries of Argentina (2800000 ha), Italy (1052000 ha) have followed it. Turkey has 103190 hectare organic agriculture land. It is determined organic agriculture lands in total

agriculture areas of the countries are 0.22-6.86% around. Turkey has 103190 hectare organic agriculture land and that area is constituted of 0.39% of total agriculture land (26000000 ha) (Table 1). The rate of organic agriculture lands is 0.4% (103190 ha) in its total agriculture lands (26000000 ha) (MARA, 2004).

Table 1. Total quantities of organic agriculture lands (ha) and the rate of its in total agriculture lands (%) in the world

Countries	Organic agriculture lands (ha)	The rate of its in total agriculture lands (%)
Australia	11300000	2.48
Argentina	2800000	1.70
Italy	1052000	6.86
the USA	930810	0.22
Brazil	803180	0.23
Uruguay	760000	4.00
Germany	734027	4.30
Spain	725254	2.84
England	695619	4.42
Turkey	103190	0.39
Others	6554190	-
Total	26458270	-

Source: SOEL, 2005. SOEL (Fondation for Ecology and Agriculture) Survey, February 2005.

MATERIALS and METHODS

The research material is consisted of the farmer dried fig orchard which is planted 'Sarilop' dried fig variety located in Isafakilar village, Incirliova, Aydin. In the trial, treatments were conducted of three different dosages of dairy manure and vetch, mulches application which was shaped from leaving of cutting foreign herbs.

The trial was conducted of randomized blocks experiment design, the treatments were 4 replications and each replication was consisted of one tree. Implementations were 6 numbers which have been explained below:

Control: It was continued the normal farming management and agricultural processes that have been made by a farmer in normal production period.

Natural vegetation: The natural herbs on the orchard land was cut and left on upper side of the soil.

Vetch: It was planted 12 kg/da in October-November months and it was mixed with soils in beginning of flowering in spring period.

20 kg fertilizer/tree: 20 kg/tree farm manure was given in each tree crown projection in January and February months.

40 kg fertilizer/tree: 40 kg/tree farm manure was given in each tree crown projection in January and February months.

60 kg fertilizer/tree: 60 kg/tree farm manure was given in each tree crown projection in January and February months.

Statistic analysis of data obtained from the trials were made considering randomized parcels experimental design using with SPSS Statistical Software Programs.

The methods of fruit analysis: Dried fig samples were obtained from dried fruits which fallen and were dried on wooden divan of shrink figs. Ostiole width (eye) was measured by a digital compass (BTS, 0-150 mm). Fruit skin was determined by sensitive tests and samples were evaluated considering colors with dark (1), middle (2), light (3) and very light (4) and average class values were calculated with sample numbers of each class were multiplied class values and were divided average class values. Soluble solids were determined with a hand-held refractometer (N.O.W., 0-32% Brix) from diluted fruits. In the study, some important quality parameters on fig such as different quality categories. Cracking parameter of fruits were evaluated in two ways. More than cracking of fruits length of 1/3 and good ones. It was evaluated the dried fruits for sunscalded parameter; more than sunlight damages of 1/3 of fruit outer space and good ones. The rate of the worst quality dried fig fruit was determined fruits from which had cracking, sunlight damage, excessive dried fruits and bird and insect damages fruits separately.). The worst quality dried figs are called cull figs which cannot be marketed for human consumption (Özbek, 1958)

RESULTS AND DISCUSSION

The rate of cull figs: For the rate of cull figs (the worst quality dried fig fruits), it was determined the significance among years in statistical manner. The fewest rate of the worst quality dried fig fruits were obtained from first year of the research as %22.35 value (Table 2).

Table 2. The rate of cull figs (%)

Application	2003	2004	2005	Average
Control	22.48	42.91	32.45	32.61
Natural vegetation	22.62	49.86	32.20	34.89
Vetch	20.17	31.55	31.81	27.84
20 kg fertilizer/tree	26.65	38.44	39.93	35.00
40 kg fertilizer/tree	19.28	24.16	30.74	24.73
60 kg fertilizer/tree	22.87	26.86	44.74	31.49
Year averages	22.35 b	35.63 a	35.31 a	31.09
Year $_{LSD, 0.05}$ = 6.18				

Among implementations, the rate of worst quality dried fig fruit wasn't found statistically significant. In addition, the most excessive rate of the worst quality dried fig fruit was obtained from 20 kg fertilizer/tree application as 35% value, the fewest rate of the worst quality dried fig fruit was obtained from 40 kg fertilizer/tree application as 24.73 % value.

Sunscalded and cracking damages are the first ranges in the fig growing. Aksoy et al. (1987) explained that the rate of sunscalded fig fruits rate may be arrived 27% and this negative event is increased the worst quality dried fig class. The ratio of severely sunscalded (sunburn damage) fruits in the 'Sarilop' cultivar grown under Aegean conditions were reported to range from 0.0% to 47.2% in 1992 and from 2.7% to 59.4% in 1993 (Aksoy, 1994).

Anac et al. (1991) obtained the rate of the worst quality dried fig fruits between 13.30-89.12% and they declared that unsuitable fruit bearing is caused product and value lost in fig production in the research had been made to determine nutrition status of dried fig orchards in Small Meander Valley, Turkey.

The rate of cracking fruits

Table 3. The rate of cracking fruits (%)

Application	2003	2004	2005	Average
Control	11.85	12.78	10.05	11.56 ab
Natural vegetation	5.26	2.81	9.94	6.00 c
Vetch	9.30	11.76	12.91	11.32 ab
20 kg fertilizer/tree	5.75	6.95	12.65	8.45bc
40 kg fertilizer/tree	9.79	11.22	16.16	12.39 ab
60 kg fertilizer/tree	12.23	10.73	19.40	14.12 a
Year averages	9.03 b	9.38 b	13.52 a	10.64
Year $_{LSD,\ 0.05}$ = 3.55 Implementation $_{LSD\ 0.05}$ = 5.03				

In the rate of cracking fruits, it has been fixed that there has been statistically difference among implementations. And also it was observed the most cracking fruits rate were 14.12% in 60 kg fertilizer/tree and the fewest cracking fruits rate were 6% in natural vegetation applications (Table 3).

According to published TS 541/T1 dried fig standard in 2007 year, cracking fig fruits were described between dried fig stalk and more than its 1/3 length cracking dried figs are inside split, torn dried fig descriptions.

The cracking in fig fruits is important quality losing and is affected by some factors such as high humidity and nutrition balance. Aksoy and Anac (1994) were investigated impacts of $CaCl_2$ implementations were carried out on the fig leaves on fruit quality and contents of fruit and leaf nutrition elements in 'Sarilop', 'Göklop' and 'Bursa Siyahi' fig cultivars. It was observed that the evidence of fruit cracking was diminished by 1% $CaCl_2$ application, statistically important.

Aksoy et al. (1987) declared that increasing of the rates of K/Ca and K/Ca+Mg in leaf palm and stalk was caused negative effects on fruit cracking. And also Aksoy and Anac (1994) obtained nitrogen levels were increased by 1% $CaCl_2$ applications in 'Sarilop', 'Göklop' and 'Bursa Siyahi' fig cultivars. Shear (1975) determined deficiency of calcium was caused cracking on apple, cherry, dried plums and carrot. In addition it was obtained some spoils which occurs depends on calcium, are increased with nitrogen fertilization. These findings are concordant with our results.

There was determined statistically difference among years. It was seen that the rate of cracking fruit was increased in the third year of the experiment.

The rate of sunscalded figs

Table 4. The rate of sunscalded figs(%)

Application	2003	2004	2005	Average
Control	10.63	10.30	12.79	11.24 b
Natural vegetation	17.36	8.77	13.83	13.32 b
Vetch	10.88	10.07	14.40	11.78 b
20 kg fertilizer/tree	20.90	12.35	19.03	17.43 a
40 kg fertilizer/tree	9.49	4.37	6.27	6.71 c
60 kg fertilizer/tree	10.64	4.46	6.78	7.29 c
Year averages	13.32 a	8.39 b	12.18 a	11.30
Year $_{LSD,\ 0.05}$ = 2.43 Implementation $_{LSD\ 0.05}$ = 3.44				

For the rate of sunscalded figs (sunborn damage), there was indicated statistically difference among implementations. And also it was observed the worst sunlight damages rate were 17.43% in 20 kg fertilizer/tree and the fewest sunlight damages rate were 6.71% in 40 kg fertilizer/tree application (Table 4).

According to published TS 541/T1 dried fig standard in 2007 year, dried fig fruits with sunborn damages were described more than 1/3 of dried fig stalk had been lost its elasticity, being hardiness and being occurred sunburn damages dried fig fruits.

Anac et al. (2001) indicated that while ripening period has been continuing, it was determined increasing sunburn damages and decreasing cracking fruit rate because of impacts of current climate conditions results. With increasing potassium rate, they were reported good fruits rate which haven't been affected from sunburn damages, were increased.

In addition nitrogen content of soils affected fruit numbers with positive direction and reduced sunburn damages but these correlations haven't been found for nitrogen content of leafs also. It was indicated in a research study which was made by Aksoy et al. (1987) on 'Sarilop' dried fig cultivar, potassium content of leafs impacts sunburn damages of the fruits significantly and there are positive correlations with potassium content of leafs and good fruit rate.

There was determined statistically difference among years. It has been seen that the rate of fruits with sunburn damage was increased first and third year of the experiment.

The average fruit weight

Table 5. The average fruit weight (g)

Application	2003	2004	2005	Average
Control	12.23 ab	14.42 d	15.10 d	13.92
Natural vegetation	13.37 ab	15.71 cd	22.03 b	17.03 c
Vetch	14.46 ab	17.97 bc	21.63 b	18.02 bc
20 kg fertilizer/tree	11.61 b	14.91 cd	18.21 c	14.91 d
40 kg fertilizer/tree	14.46 ab	20.23 ab	21.51 b	18.73 b
60 kg fertilizer/tree	14.64 a	21.29 a	26.09 a	20.67 a
Year averages	13.46 c	17.42 b	20.76 a	17.21
Year $_{LSD,\ 0.05}$ = 1.07 Implementation $_{LSD\ 0.05}$ = 1.51 Int. Year*Implementation $_{LSD\ 0.05}$ = 2.62				

Among implementations, for the average fruit weight there was determined statistically difference. While the largest fruit was obtained from 60 kg/tree fertilizer application as 20.67 g, the smallest fruit was measured from control treatment as 13.92 g. There was obtained statistically difference among years. In third year of the experiment, the largest fig fruit (20.76 g) was obtained, the smallest fig fruit was determined in first year of the research (Table 5).

Aksoy et al. (1987) declared in the research paper which was conducted to determine nutrition status of fig orchard located in Germencik province, average dried fruit weight which was dried in natural conditions and methods, was 16.3 g and it was explained phosphorous nutrient matter increases dried and fresh fig weight and impacts positive approaches.

Anac et al. (1991) indicated calcium content of soil impacts fruit size, especially causing small size. However, low potassium degree in the soil and K/Ca imbalance in a plant have been affecting on that result.

Depending of the years there was determined statistically difference among implementations. While 60 kg fertilizer/tree application was given the largest fruit size in every 3 years in the experiment, it was obtained the smallest fruit size in the second and third years of the trial.

Total Soluble Solids

Table 6. Total Soluble Solids (%)

Application	2003	2004	2005	Average
Control	50.88	56.00	46.90	51.26
Natural vegetation	46.63	57.63	47.95	50.73
Vetch	55.75	57.00	46.20	52.98
20 kg fertilizer/tree	44.50	51.75	49.48	48.58
40 kg fertilizer/tree	48.63	55.88	50.40	51.63
60 kg fertilizer/tree	48.88	60.50	48.65	52.68
Year averages	49.21 b	56.46 a	48.26 b	51.31
Year $_{LSD,\ 0.05}$ = 2.50				

There wasn't found statistical difference among implementations on the rate of total soluble solids. In vetch application, there was determined the highest total soluble solids as %52.98 (Table 6).

The sugars take the most important share in total dried fig structure. It has been explained that the rate of total soluble solids on the figs are changing between 47-63.1%. Beside the it was reported iron content of leafs impacts on fruit composition and increases total soluble solids and dissolves part of fruit in water which consists of important share of total soluble solids (Aksoy et al., 1987).

In the research paper which was carried out to investigate difference of soil specials in fig orchards on shoot developing and fruit quality, it was declared that physicals characteristics of soils are relating with fruit composition planted on ground fig orchards and pH state of soil has positive impacts total soluble solids of fruit (Aksoy et al., 1991).

Hernandez et al. (1994) explained in a research article which was made to determine 6 different irrigation and 6 different nitrogen levels on quality and nutrient contents of fruits in fig trees, nitrogen affected positive direction on total soluble solids of fruits in only one season, but nitrogen declined calcium (Ca) content of leafs.

There was determined statistical difference among years. In second of the experiment rate of total soluble solids was higher than other years.

Ostiole width (eye)

There was obtained statistical difference for ostiole width among the treatments. Considering grouping value, there was measured the highest ostiole width in 60 kg fertilizer/tree as 3.94 mm and the lowest ostiole width in control application as 2.88 mm (Table 7).

Table 7. Ostiole width (mm)

Application	2003	2004	2005	Average
Control	2.88	3.07	2.68	2.88 d
Natural vegetation	3.51	3.62	3.39	3.50 bc
Vetch	3.93	3.71	4.13	3.92 a
20 kg fertilizer/tree	3.17	3.23	3.12	3.17 cd
40 kg fertilizer/tree	3.85	3.96	3.73	3.85 ab
60 kg fertilizer/tree	3.94	3.97	3.91	3.94 a
Year averages	3.54	3.59	3.49	3.54
Year $_{LSD, 0.05}$ = 0.39				

Ferguson et al. (1990) states that breeding efforts focus on the common type 'Calimyrna' quality fig with closed ostiole to restrict insect access.

It has been indicated ostiole width which causes entrance of insects and diseases is narrowed by impacts of calcium (Aksoy et al., 1987).

In a study that to investigate impacts of zinc applications through leafs and soil on yield and some quality components ‘Sarilop’ dried fig variety, for zinc applications there wasn’t determined statistical difference on ostiole width (Aydin et al., 2000).

Irget et al. (1998) declared $Ca(NO_3)_2$ and KNO_3 applications caused narrowing of ostiole width.

Skin color (scale of class value)

Table 8. Skin color (scale of class value)

Application	2003	2004	2005	Average
Control	1.89	1.95	2.36	2.07
Natural vegetation	1.80	2.02	2.42	2.08
Vetch	1.88	2.01	2.32	2.07
20 kg fertilizer/tree	2.12	1.99	2.38	2.16
40 kg fertilizer/tree	1.80	2.13	2.50	2.14
60 kg fertilizer/tree	1.78	1.89	2.31	1.99
Year averages	1.88 b	2.00 b	2.38 a	2.09
Year $_{LSD, 0.05}$ = 0.13				

In the study, it was used scale of class value for skin color, from 1: dark, to 4: very light, there wasn’t obtained statistical difference among implementations for skin color. However, there was determined statistical difference among years. In the third year of the experiment, it was observed skin color of the fruit between middle and light.

Aksoy et al. (1987) explained in a research study, 49.8, 39.3, middle and 10.9% of total dried fruit samples were light, middle and dark color, respectively. In the same study, it was declared that magnesium, iron and boron has negative impacts on dried fig fruit skin color.

The dried fig with light color, flexible, soft, closed eye and sugar is important parameters as quality and delicious. Aksoy et al. (1991) indicated in another study iron, zinc and copper elements have impacts on fruit skin color, iron and copper increase rate of fruits with dark color, but zinc affect skin color of the fig fruits especially planted on ground orchards.

As a result, it was determined that the application of 40 kg fertilizer/tree was declining fruit rate which has sunburn damage, was increasing average fruit weight. Despite the fact that it wasn't obtained statistical difference, that application was declining the worst quality dried fig fruit rate.

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