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Use of Grape Leaves in Canned Food

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Abstract: The objective of this research was to investigate suitability of fresh (unprocessed) and canned grape leaves to prepare Sarma, a traditional Turkish dish. Leaves from four different variety; Hacitesbihi, Agrazaki, Karaerik, and Kabuguyufka were blanched in two different solutions, and the leaves were placed into jars, then filled with tap water and brine containing 3.5 percent salt + 1 percent citric acid and stored for 7 months in ambient temperature. The results of chemical and physical analyses showed that quality of the Karaerik leaves was better than that of the other variety leaves. Also, sensory evaluation indicated that Karaerik and Kabuguyufka varieties were the most suitable grape leaves to produce Sarma dish. We conclude that Kabuguyufka and Karaerik leaves are convenient for Sarma dish as canned while Agrazaki and Hacitesbihi as fresh.

Key words: Grape leaf, brine, canned food, stuffed leaves

Introduction

A number of plants have been utilized for years by the human as a food source and therapeutical purposes. Currently, popularity of using different ingredients or raw materials to produce new food varieties has also been increased. As a result of this, consumers are facing variety of new types of food products, which provides more pleasant and healthier nutrition supply. For example grape leaf contains an abundant amount of vitamins and minerals as one of these kinds of foods. It has been reported that grape has important role in controlling of some liver diseases, high blood pressure and anemia. Also fibers and fruit acids in grape have vital role in cleaning blood functions of digestive system and kidney (Celik *et al.*, 1998). In addition, grape leaf is very good source of vitamin C. Baysal (1993) reported that grape leaf contained about 120 mg/100 g vitamin C. Grape leaf is used to make stuffed leaves (Sarma) and forcemeat (vegetable stuffed with forcemeat) which are very popular meals in middle east countries. Stuffing materials are surrounded with grape leaf and than boiled to prepare Sarma dish.

Grape leaves can be used as both in fresh and stored forms. Preservation methods for grape leaves are drying, dry salting, usage of different amount of salt, acids or starter cultures in brine and canned food. Consumers often preserve grape leaves with traditional methods. There is a little research about finding a new method for preservation of grape leaves or improve traditional methods in the literature. Commercially produced stuffed leaves can also be found in market, because there is an increasing demand from consumer to ready to eat foods. Some factors such as maturity and variety of grape, location of grape in shoot can considerably affect the quality. Since old leaves are very hard, it is difficult to make a stuffed dish from these leaves. Therefore, young leaves (immature) are chosen for this purpose. Gokturk *et al*. (1997) reported that harvesting leaves at the beginning of vegetation could give thinner vines, while harvesting leaves late could decrease the quality of canned food. In addition, thick, hairy, with lobness leaves are usually rejected by consumers. Also the Narince and Sultani Cekirdeksiz leaves are reportedly preferred to use in canned foods.

In the study conducted by Dalgıc and Akbulut (1988) some comparisons were made between the leaves harvested from fourth, fifth and sixth row from shoot, and they stored these leaves in brine containing different concentrations of salt and citric acid. The leaves from fifth row and 8 % salt concentration gave the best result in terms of the overall quality.

Basoglu *et al*. (1996) investigated brine preservation of Alfons, Erenkoy Beyazı and Sultani grape leaves. This study indicated that leaves harvested from fifth and sixth rows were suitable for brining, and Sultani leaves were the best for the stuffing. They suggested usage 5 % salt, 3% starter culture and 0.25 % lactic acid in brine preparation.

In the study conducted by Gokturk *et al*. (1997) Narince and Hamburg Misketi grapes, Kober 5 BB and 41 BM.G. grapevine rootstocks were used. Among different salt concentrations, 3.5% salt was given the best results for the brine. Furthermore, Narince and Hamburg Misketi leaves were determined to be the most convenient varieties for canned food. It was shown that 41 BM.G. could be used in canned leaf technology. While Kober 5 BB was not suitable for canning processes.

Ic and Denli (1997), preserved Sultani grape leaves in

brine containing 5% salt and 0.5% lactic acid, and this study concluded that natural fermentation made with the same amount of salt and lactic acid was also achieved in four weeks. Therefore, there is no need for longer fermentation time with controlling environmental conditions, and it can even be shorter.

The purpose of this experiment was to investigate usage of variety of grape leaves in canned food.

Materials and Methods

Materials: In this research, grape leaves from Hacitesbihi, Agrazaki, Kabuguyufka, and Karaerik varieties grown in Uzumlu, Erzincan were used as research materials. Grape leaves were harvested in June 2000 when their size reached to 2/3 of their full size. Wholesome and undamaged leaves with normal appearance were harvested for the research.

Canning Process: Canning processes of the grape leaves were as described in Fig.1. First, the leaves were cleaned and classified according to their size suitability for processing and their petioles were shortened to 2 cm. Then the leaves were blanched in 0.5% citric acid + 1% NaCl solution and in plain tap water. After cooling to ambient temperature, 200 g leaves were put into 500 ml jars and filled with either of brine (3.5% NaCl + 0.5 % citric acid solution) or plain tap water as a control and the jars were exhausted. The sealing the jars were pasteurized with two different heat processes (75 °C 15 min and 90 °C 5 min), cooled under tap water. Then the jars were stored at ambient temperature (20 ± 2 °C) for 7 months.

Physical and Chemical Analyses: On fresh leaves (immediately after harvesting), some physical measurements were made: length of the petiole, dimensions of the leaves, hairiness, lobness, and the number of leaves in per 100 g sample. Both fresh and canned leaves were also subjected to following chemical analyses: moisture (%), ash (%), pH, titratable acidity, vitamin C (mg/100g), crude fiber (%), and salt content (%) by using the techniques outlined by Keles (1983); Anonymous (1983); Cemeroglu (1992). Color of the fresh and canned leaves were measured by a Minolta Colorimeter (Chroma Meter, CR-200, Japan) as described in Anonymous (1979).

Preparation of Sarma: In the second part of the research, a traditional Turkish dish called Sarma were made from both fresh and canned grape leaves containing following ingredients; rice, olive oil, salt and water. Slightly cooked rice was mixed with above ingredients, and due to the fact that only the outer part of the mix is grape leaf, the mix were placed onto a leaf lamina, and then the leaf rolled by hand to cover the mix, and the dish became Sarma after the cooking. The dish was served to the panel members as cold (7-10 °C) due to eating habits. Traditional spices were not added to Sarma dish to evaluate sensory properties of the vine leaves only.

Sensory Evaluation: The Sarma dishes made from both leaf samples (fresh + canned) were subjected to sensory evaluation using 8-trained panelist with 3-4 years experience in food evaluation. The dish samples were scored 5 to 25 point scale (5 unacceptable, 25 very acceptable) for color, flavor, texture, and overall quality.

Results and Discussion

Fresh Leaves: The Results of the physical and chemical analyses of the fresh grape leaves were presented in Table 1 and Table 2.

For the leaf dimensions and number of leaves in 100 g sample, the varieties Hacitesbihi - Karaerik and Agrazaki - Kabuguyufka were similar. Also, Hacitesbihi and Karaerik varieties were large in size and thicker than that of Agrazaki and Kabuguyufka grape leaves (Table 1). As seen in the table, numbers of leaves in 100g samples were ranged from 24 to 41 for the 4 varieties studied. However, the average number reported by some researches in the 100g samples were 40 for Sultani (Ic and Denli, 1997), and ranged from 19.5 to 40.3 for Sultani, Alfons and Erenkoy grape varieties (Basoglu *et al*., 1996). In terms of lobness, Agrazaki variety was unlobbed (Table 1), therefore, it might be most suitable vine leaf variety for the Sarma dish since unlobness is preferred by most of the cooks. Due to the fact that in the leaf with deep lobes, lamina becomes narrower and Sarma preparation gets difficult.

Karaerik variety had higher L, a and b values than that of the other varieties while these values of the Hacitesbihi, Agrazaki and Kabuguyufka varieties were similar (Table 1).

Percent dry matters of the fresh leaves were ranged from 21.41 to 24.72%. Hacitesbihi, Agrazai and Karaerik varieties seemed to be close with each other in terms of dry matter content (Table 2). Dry matter content was the lowest (21.41%) in the Kabuguyufka variety while it was the highest (24.72%) in Karaerik. However, the highest (2.11%) amounts of ash were in Hacitesbihi while the lowest (1.52%) in Karaerik.

pH of the all samples were similar while the titratable acidity varied among the leaf varieties, and the acidity values were 1.78, 1.78, 1.88 and 1.96% for Agrazaki, Karaerik, Hacitesbihi, and Kabuguyufka, respectively. Also, the amount of vitamin C varied significantly among the leaf samples (Table 2), and maximum vitamin C value was in Karaerik variety with 100.29 mg/100g concentration.

It has been known that fresh grape leaves are rich for vitamin C, therefore, the nutritive values of the leaves are usually considered to be high (Baysal, 1993).

Crude fiber content of the samples seemed to be high, and

Table 1: The results of physical properties of fresh grape leaves

	Variety			
Property	Hacitesbihi	Karaerik	Kabuguyufka	Agrazaki
Length cm	17.75	18.20	15.00	13.76
Width cm	17.00	17.95	14.26	14.00
Number of leaves /100 g	28	24	35	41
L	43.99	48.03	42.62	42.60
a	-14.92	-18.54	-13.88	-14.06
b	19.60	26.93	16.73	17.48
Hairiness	little	Little	little	Little
Lobness	3 lobes	5 lobes	5 lobes	unlobes

Table 2: The results of chemical properties of fresh grape leaves

	Variety			
Property	Hacitesbihi	Karaerik	Kabuguyufka	Agrazaki
Dry matter %	24.45	24.72	21.41	24.21
Ash %	2.11	1.52	1.86	1.93
pH	3.39	3.46	3.31	3.43
Titratable acidity %	1.88	1.78	1.96	1.78
Vitamin C (mg/100g)	54.00	100.29	61.75	77.08
Crude fiber %	7. 44	3.21	4.40	6.95
Salt %	0.16	0.19	0.22	0.25

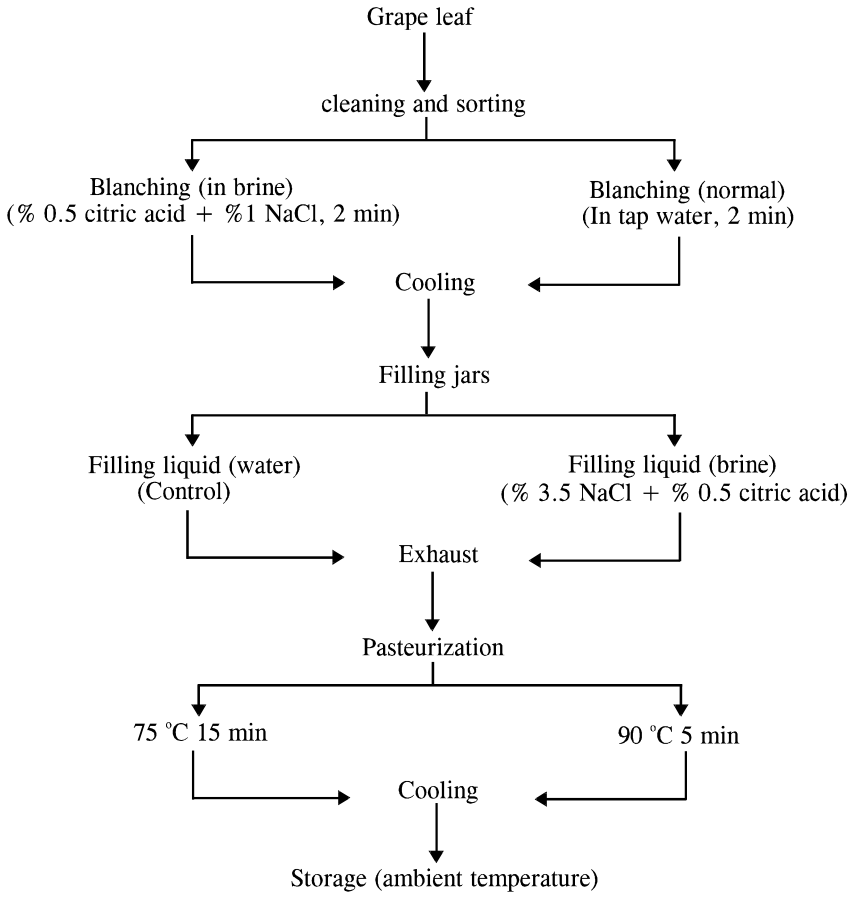

Fig. 1: Canning steps of grape leaves in this study

Table 3. The results of color and some chemical properties of canned grape leaves

Variety		A*	B	C	D	E	F	G	H
Dry Matter									
	Hacitesbihi	17.00	17.75	21.56	21.70	16.92	16.36	18.43	19.08
	Agrazaki	13.39	16.55	17.31	17.05	14.83	14.42	18.38	18.37
	Kabuguyufka	14.22	14.02	16.87	15.40	15.07	13.59	14.37	17.16
	Karaerik	15.19	13.74	18.10	16.53	15.64	17.74	17.21	16.87
Ash									
	Hacitesbihi	2.02	1.58	3.20	2.80	0.85	1.15	2.76	2.79
	Agrazaki	1.17	1.42	3.25	2.91	0.83	0.89	2.61	2.66
	Kabuguyufka	1.26	1.54	3.03	2.59	1.10	1.72	2.33	2.50
	Karaerik	1.13	1.23	2.91	3.02	1.13	0.69	2.55	2.55
PH									
	Hacitesbihi	3.64	3.65	3.28	3.27	3.59	3.59	3.26	3.17
	Agrazaki	3.73	3.67	3.43	3.35	3.62	3.70	3.33	3.27
	Kabuguyufka	3.58	3.62	3.30	3.32	3.59	3.52	3.26	3.26
	Karaerik	3.50	3.57	3.19	3.24	3.57	3.57	3.27	3.29
Titratable									
Acidity	Hacitesbihi	0.88	0.81	1.11	0.96	0.78	0.67	1.11	1.08
	Agrazaki	0.88	0.67	1.05	1.15	0.64	0.67	1.07	1.86
	Kabuguyufka	0.84	0.98	2.08	1.42	0.64	1.05	0.94	1.11
	Karaerik	0.91	0.86	1.16	1.15	0.74	0.78	0.89	0.82
Vitamin C									
	Hacitesbihi	5.16	6.85	5.16	6.38	5.16	6.85	5.16	5.16
	Agrazaki	10.28	10.29	3.38	6.87	6.90	6.40	3.42	6.89
	Kabuguyufka	13.73	24.04	12.03	15.47	6.87	22.32	6.87	10.29
	Karaerik	6.86	10.27	6.86	10.27	6.86	6.86	3.38	6.85
Salt									
	Hacitesbihi	0.09	0.14	2.12	2.23	0.11	0.12	1.96	2.29
	Agrazaki	0.12	0.14	2.99	2.10	0.18	0.19	2.73	2.16
	Kabuguyufka	0.16	0.18	2.77	2.56	0.17	0.20	2.37	2.42
	Karaerik	0.14	0.12	1.77	2.04	0.12	0.18	1.77	2.06
Crude fiber									
	Hacitesbihi	8.98	8.87	8.80	8.64	7.97	7.57	8.67	8.19
	Agrazaki	7.97	8.30	8.10	8.27	7.08	7.07	7.80	7.40
	Kabuguyufka	5.70	5.07	4.57	4.77	5.37	5.80	4.03	5.87
	Karaerik	3.20	3.42	3.12	3.03	3.53	3.20	3.30	3.37
L									
	Hacitesbihi	44.46	43.00	42.44	43.13	45.01	43.58	43.43	44.96
	Agrazaki	42.08	44.48	45.00	43.65	41.67	39.08	42.32	49.18
	Kabuguyufka	43.60	45.91	43.73	46.10	43.85	47.30	44.99	44.59
	Karaerik	43.17	47.34	47.51	45.85	49.28	51.36	48.41	44.16
a									
	Hacliesbihi	-0.29	0.17	-0.14	-0.51	-0.59	0.48	-0.15	0.92
	Agrazaki	-0.42	0.51	-0.78	-0.07	-1.41	1.38	0.70	-0.47
	Kabuguyufka	1.12	0.25	0.38	-0.18	0.85	-0.37	-0.40	0.15
	Karaerik	1.37	0.27	0.69	0.14	-0.41	-0.87	-0.16	1.37
b									
	Hacitesbihi	23.34	22.56	21.69	20.50	24.22	24.21	24.28	27.85
	Agrazaki	18.01	25.14	29.20	25.90	23.14	21.06	22.87	33.92
	Kabuguyufka	24.63	30.52	22.20	26.10	26.70	26.83	25.61	25.17
	Karaerik	24.76	24.86	24.26	23.53	29.80	30.23	29.82	21.24

A*: Blanched in brine (0.5%citric acid + 1%NaCl), heated at 75 ºC for 15 min and the jars filled with tap water
B: Blanched in brine (0.5%citric acid + 1%NaCl), heated at 90 ºC for 5 min and the jars filled with tap water
C: Blanched in brine (0.5%citric acid + 1%NaCl), heated at 75 ºC for 15 min and the jars filled with the brine (3.5%NaCl + 0.5%citric acid)
D: Blanched in brine (0.5%citric acid + 1%NaCl), heated at 90 ºC for 5 min and the jars filled with the brine (3.5%NaCl + 0.5%citric acid)
E: Blanched tap water, heated at 75 ºC for 15 min and the jars filled the tap water
F: Blanched tap water, heated at 90 ºC for 5 min and the jars filled the tap water
G: Blanched tap water, heated at 75 ºC for 15 min and the jars filled with the brine (3.5%NaCl + 0.5%citric acid)
H: Blanched tap water, heated at 90 ºC for 5 min and the jars filled with the brine (3.5%NaCl + 0.5%citric acid)

Table 4: Results of sensory evaluation of the fresh and canned leaves

Varieties		Color	Flavor	Texture	Overall quality	Total
Hacitesbihi	Fresh leaf	20.00	21.22	20.44	20.44	20.53
	A	14.33	18.05	11.94	13.89	14.55
	B	14.33	16.67	16.67	14.72	15.60
	C	20.36	16.11	17.58	17.78	17.96
	D	19.44	19.44	17.58	18.50	18.74
	E	15.28	14.81	12.78	14.17	14.26
	F	13.89	15.56	16.67	15.28	15.35
	G	19.44	14.81	16.19	16.19	16.66
	H	15.72	17.11	15.72	17.11	16.42
Agrazaki	Fresh leaf	22.22	21.53	21.16	21.53	21.61
	A	19.11	16.36	19.21	18.98	18.42
	B	19.02	15.05	19.02	19.22	18.08
	C	17.83	17.06	19.44	18.25	18.15
	D	16.86	18.25	15.47	16.06	16.66
	E	19.44	16.06	18.25	17.83	17.90
	F	19.03	15.86	17.06	18.06	17.50
	G	18.44	17.06	17.83	17.83	17.79
	H	17.83	19.83	19.64	19.03	19.08
Kabuguyufka	Fresh leaf	18.75	18.75	13.53	15.28	16.58
	A	16.25	14.66	15.05	13.89	14.96
	B	14.86	15.28	13.08	15.28	14.63
	C	23.61	22.22	23.19	23.61	23.16
	D	23.39	21.81	21.61	22.61	22.36
	E	13.89	14.17	12.50	17.78	14.59
	F	16.67	15.03	12.69	13.89	14.57
	G	17.06	23.39	18.64	19.44	19.63
	H	15.47	18.83	14.66	15.50	15.87
Karaerik	Fresh leaf	21.61	18.89	14.92	17.06	18.12
	A	14.28	17.06	16.67	17.84	16.46
	B	16.67	16.25	18.25	17.84	17.25
	C	19.44	21.03	20.84	20.53	20.46
	D	18.64	21.81	22.00	22.69	21.29
	E	17.06	12.69	18.64	15.86	16.06
	F	18.05	11.50	17.44	14.67	15.42
	G	22.22	21.22	21.42	21.81	21.67
	H	23.00	21.62	23.00	23.00	22.66

All samples were scored 25 point 25: very good 20: good 15: not bad 10: bad 5: very bad

Hacitesbihi and Agrazaki had similar amount of fiber while it was different in kabuguyufka and Karaerik (Table 2).

Canned Leaves: At the end of the 7-months of storage, the results of chemical analyses and color measurements of the canned leaves were summarized in Table 3. Dry matter contents of the processed leaves were lowered, that might be due to the increase in the moisture content of the leaves during the storage. In the meantime, dry matter content of the brine (filling liquid) was higher than that of the tap water groups. Additionally, the samples that blanched in brine and then canned had higher dry matter contents than that of the samples that blanched in tap water and then canned counterparts (Table 3). This result was probably due to the osmosis and salt content of the leaves.

As expected, the ash content decreased numerically in the tap water leaves while increased in the brined samples. This is because of the brine that was also confirmed by the ash content of the samples, that was higher in brine-blanched leaves than tap water blanched samples (Table 3).

In comparison to fresh leaves, pH values of the tap water group of the canned samples were higher than that of the brined groups. This might be due to the acid content of the brine that had 0.5% citric acid. The titratable acidity of the preserved leaves was generally lower than that of the fresh leaves (Table 2 and 3), and at the moment, there is no explanation for this result.

Vitamin C levels of the all canned leaves were appreciably low when compared to their fresh counterparts. This decrease might be caused by the processing technique, and with the exception of Hacitesbihi variety, vitamin C contents of the blanched leaves seemed to be preserved better in brine compared

to samples that blanched in tap water (Table 2 and 3). This is due to the citric acid content in blanching liquid in which vitamin C is usually more stabile owing to acidic conditions (Lee and Kader, 2000). Additionally, citric acid makes chelats with Fe^{++}, Cu^{++} ions which catalyzes vitamin C loss (Cemeroglu, 1982). The results indicated that high processing temperatures (95 °C and 5 min) had further saving effect on vitamin C content as compared to the lower processing temperatures (75 °C 15 min).

As seen in Table 3, titratable salt content of the tap water groups was lower than that of the brined groups. That is, salt contents of the brined groups were naturally increased because of the osmotic activity between the tissue and the liquid. Compared to fresh leaves, crude fiber contents of canned leaves were high (Table 3), this might be due to the migration of water-soluble leaf compounds into the brine.

Natural green colors of the fresh leaves were decreased while yellow colors increased with both blanching and storage (Table 2 and 3). The color alteration might be due to the chemistry of the pigments like chlorophylls that is usually converted to pheophytine and some other compounds during the thermal processing and storage (Cemeroglu and Acar, 1986).

The Sensory Analysis: Results of the sensory evaluation of the leaves were presented in Table 4. Both fresh and canned leaves were subjected to sensory analysis since the grape leaves can be consumed in either fresh or processed. As the suitability of leaves to prepare Sarma dish determined, Agrazaki variety had the highest score among the fresh leaves, this is because of the leaf of this variety that unlobbed and can easily be rolled. Again the suitability of the leaves canned in brine for Sarma dish characteristics, that scored by the panelists Kabuguyufka and Karaerik variety were superior to the other leaves.

Consequently, all the chemical and sensory evaluation results showed that Agrazaki varieties as a fresh, Kabuguyufka and Karaerik that canned in brine were determined to be most convenient grape leaves to produce Sarma dish in either cases.

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