

## Sensory Evaluation, Microbiological, Chemical Properties and Mineral Contents of Pickling Caperberries (*Capparis* spp.) Paste

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Fresh caperberry fruits at the 0.6-1.8 cm diameter collected from Konya (Selcuklu), Turkey were fermented in 8 % brines at 30 °C for 45 days. After fermentation, acidity, salt, pH, total bacteria, coliform, lactic acid bacteria and yeast/mould values of brine were established. Sensory evaluation of caperberries paste contained some spices, virgin olive oil and yoghurt was performed by 7 trained assessors. The colour value of control sample had higher average score when compared with caperberries paste samples contained to the several additives. Contents of some mineral of the fermented caperberry paste were also determined by inductively coupled plasma atomic emission spectrometry (ICP-AES). The Ca, K, P, Na, Cu, Fe, Mn and Zn contents of caperberry paste were established as 2341.6, 13583, 321.4, 41257, 23.7, 17.4, 32.4 and 173.1 mg/Kg. It is clear that spice provided an approved taste to caperberries paste and yoghurt corrected body of paste.

**Key Words:** Caperberries, Fermentation, Paste, Sensory properties, Composition, Microbiology.

### INTRODUCTION

Capers is a perennial plant having medicinal and aromatic properties. It grows wildly at various regions of the world and has been beneficial for several purposes since ancient times<sup>1-3</sup>. Capers have important roles in the food industry. The fruits are stored in brine and have become a costly product during recent years. Various parts of caper plant that can be used as drug, cosmetic and food are also used in different areas for landscape element, control of erosion or animal feeding. Young shoots, flower buds and fruit are used for human nutrition<sup>4-10</sup>. Researched concerned with technology is limited<sup>8,9,11</sup>.

Processed buds and caperberries of capers are used as taste and flavour increasing in foods such as salads, meat and bakery products, fish, milk products, etc. Raw and mature fruits of *C. decidua* are fermented in brine for 1 month. After fermentation, the fruits are crushed, mixed with salt, spices, oil and vinegar and kept at room temperature for 3 months. After storage, the sensory properties of samples are determined<sup>12</sup>. Özcan<sup>9</sup> also studied on pickling and storage of caperberries (*Capparis*

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spp.). There is limited information on technological and sensory properties of caperberries paste<sup>9,13,10,11</sup>. The purpose of this study is to establish the most suitable product for consumers by using different additives such as cumin, black pepper, mint, red pepper, thyme and yoghurt.

### EXPERIMENTAL

Fresh caperberries (*Capparis ovata* Desf. var. *canescens* (Coss.) Heywood) were classified as 0.6-1.8 cm size. Fermented fruits were crushed with blender at the 15 min (Fig. 1). Spices [cumin(*Cuminum cyminum*), black pepper (*Piper nigrum*), minth (*Mentha piperita*), red pepper (*Capsicum annum*) and thyme (*Thymbra spicata*)] (Oba Spice Company-Konya, Turkey) and yoghurt (Seker Milk Company-Konya, Turkey) used in experiment were purchased from local markets (Fig. 2). The calculated amounts of additives used in formulation are given in Table-1.

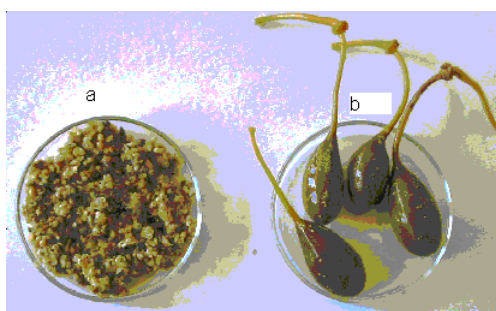


Fig. 1. (a) Caperberries paste, (b) caperberries fruit

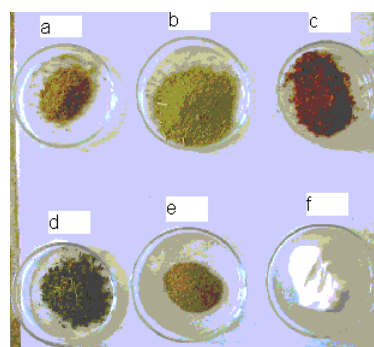


Fig. 2. Materials used in experiment (a) cumin, (b) thyme, (c) red pepper, (d) minth, (e) black pepper, (f) yogurt

TABLE-1  
ADDITIVES USED IN EXPERIMENT (%)

Recipe No.	Thyme	Mint	Cumin	Black pepper	Red pepper	Virgin olive oil	Yoghurt
1	0.1	0.1	0.1	0.1	0.1	2	50
2	0.2	0.2	0.2	0.2	0.2	2	50
3	0.3	0.3	0.3	0.3	0.3	2	50
4	0.4	0.4	0.4	0.4	0.4	2	50

**Processing:** Caperberries were put into 2 L jars and brined at a pack out ratio of  $\frac{1}{2}$  (brine/caperberries). Salt level was established as 8 % brine. Sample was subjected to fermentation at 30 °C for 45 days. Chemical and microbiological properties brine were examined in brine at the end of fermentation. Chemical analyses (acidity, pH and salt) were determined according to AOAC<sup>14</sup>. Acidity was determined as lactic acid by titration method. pH values of the samples were determined by a

pH meter (Sentix 41 Electrode, WTW-315 ISET, Weilheim, Germany). Nutrient agar (Merck, Darmstadt), Potato dextrose agar (Merck, Darmstadt), Rogosa agar (Merck, Darmstadt) and violet red bile agar (Merck, Darmstadt) were used for total bacteria (TB), yeast/mould (Y/M), lactic acid bacteria (LAB) and coliforms (CB) in the microbiological analyses, respectively. Dilutions were prepared ( $\times 10^3$ ) and colonies were measured as colony forming units/mL<sup>8,15</sup>.

Fermented fruits were crushed with blender at the 15 min (Fig. 1) and weighed as 100 g paste. A calculated quantity of spice, olive oil and yoghurt was added into each 100 g paste and the mixture was stirred and put into 250 mL jars. Control sample was also prepared under the same conditions without adding any materials. Analysis were measured three times for each sample.

**Sensory analyses:** Sensory evaluation was undertaken by using dual method at specific intervals by the points [1-5 (very poor to poor), 6-10 (poor to fair), 11-15 (fair to good), 16-20 (good to excellent) and 21 and above (excellent)]<sup>11</sup> method from quantity-quality tests. Sensory evaluation was performed by 7 trained assessors and with experience at evaluating caperberries. Samples were presented to the panelists in white plates in the soundless small room at room temperature (22 °C). Distilled deionized water was used to rinse the mouth between samples. Panelists individually listed terms that described the taste, odor colour, spread notes.

**Determination of mineral contents:** About 0.5 g of dried and ground caperberry paste was put into burnig cup with 15 mL of pure HNO<sub>3</sub>. The sample was incinerated in a MARS 5 microwave oven at 200 °C. Distilled deionized water and ultrahigh-purity commercial acids were used to prepare all reagents, standards and caperberries samples. After digestion treatment, samples were filtrated through Whatman No. 42. The filtrates were collected in 50 mL Erlenmayer flasks<sup>16</sup> and analysed by ICP-AES. The mineral contents of the samples were quantified against standard solutions of known concentrations which were analyzed concurrently<sup>17</sup>.

**Working conditions of ICP-AES:** Instrument: ICP-AES (Varian-Vista RF power: 0.7-1.5 kw (1.2-1.3 kw for Axial), plasma gas flow rate (Ar): 10.5-15.0 L/min (radial) 15" (axial), auxiliary gas flow rate (Ar): 1.5", viewing height: 5-12 mm, copy and reading time: 1-5 s (max. 60 s), copy time: 3 s (max. 100 s).

**Statistical analyses:** Results of the research were analysed for statistical significance by analysis of variance<sup>18</sup>. This research was performed by three duplicates with a replicate.

## RESULTS AND DISCUSSION

The results of the chemical and microbiological analyses of brine at the end of fermentation are given in Table-2. Acidity, salt, pH, total bacteria, coliform, lactic acid bacteria and yeast/mould values of brine were determined as 4 %, 5.07 and 6.00 %,  $4 \times 10^3$ , 0.0,  $27 \times 10^3$  and  $2 \times 10^3$ , respectively. Sensory analyses (colour, odor, taste and spread) for caperberries paste contained to the different additives are given in Fig. 3.

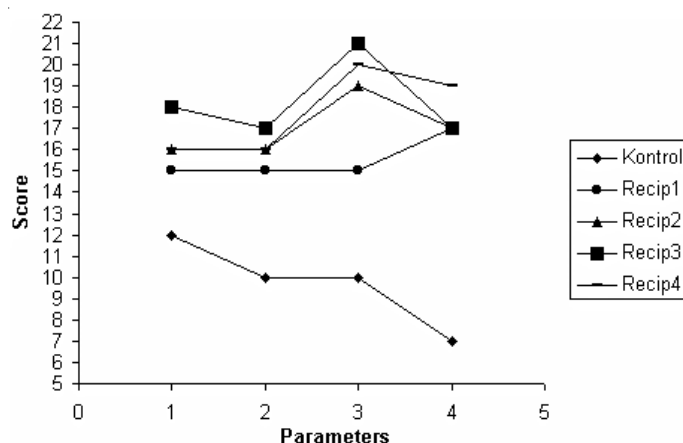


Fig. 3. Sensory evaluation of caperberries (*Capparis* spp.) paste, (parameters: (1) colour, (2) odour, (3) taste, (4) spread)

TABLE-2  
CHEMICAL, MICROBIOLOGICAL PROPERTIES AND MINERAL CONTENTS OF  
BRINE AND FERMENTED CAPERBERRY PASTE (n:3)

Properties	Values	Minerals of caperberry paste (mg/Kg)	
Acidity (%)	4.0* ± 0.3**	Na	41257 ± 32.6
pH	5.07 ± 0.2	K	13583 ± 27.3
Salt (%)	6.0 ± 0.8	P	321.4 ± 12.6
Total bacteria (× 10 <sup>3</sup> )	4 ± 0.6	Ca	2341.6 ± 20.4
Coliform (× 10 <sup>3</sup> )	0.0 ± 0.0	Fe	17.4 ± 2.1
Lactic acid bacteria (× 10 <sup>3</sup> )	27 ± 1.1	Cu	23.7 ± 3.6
Yeast/mould (× 10 <sup>3</sup> )	2 ± 0.3	Mn	32.4 ± 3.1
		Zn	173.1 ± 12.7

\*Mean, \*\*Standard deviation.

The values for colour, odour, flavour and spread properties were found different according to control groups. Puvan values for flavour and spread generally increased (Fig. 3). It is evident that control paste made from fermented fruits secured higher average score for colour than formulations (recipe 1, 2, 3 and 4) made with spice paste. While relation between colour, odour and spread of samples had observed similarity during sensory analyses, marked points puvan difference between the control was established (Fig. 3). But flavour values of samples were at the different properties. All of samples were established as some humidity according to control group. This is probably due to presence of yoghurt. Khurdiya and Verma<sup>12</sup> fermented the raw and mature fruits of *C. decidua* in brine for 1 month. After fermentation, the fruits are crushed, mixed with salt, spices, oil and vinegar and kept at room temperature for 3 months. After storage, the sensory properties of samples are determined<sup>12</sup>. Some mineral contents of caperberry paste were determined by ICP-AES (Table-2) and found to be excellent. The Ca, K, P, Na, Cu, Fe, Mn and Zn contents of caperberry paste were established as 2341.6, 13583, 321.4, 41257, 23.7,

17.4, 32.4 and 173.1 mg/Kg. These values at pickled fruits of *C. ovata* were established as 69598 mg/Kg Na, 16761 mg/Kg K and 248.71 mg/Kg P, 30.36 mg/Kg Cu, 42.4 mg/Kg and 551.3 mg/Kg Zn<sup>9</sup>. The Ca, K, Na and P contents of *C. ovata* paste were found partly low compared with pickled *C. ovata* fruits<sup>13</sup>. Contents of some minerals were determined to be partly high compared with those of raw caper (*C. ovata*) fruits reported by Özcan<sup>19</sup>. Mineral contents were determined to vary widely depending on the different species and locations of caper plant and additives and processing conditions. The soil, fertilizers and other cultural factors also effect the presence of minerals in oil-bearing seeds<sup>20</sup>. Present findings were found different than those of results of Khurdiya and Verma<sup>12</sup>. Because, samples of these researches contained different additives.

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