Quality Evaluation of the Tomato Paste Produced in the Libyan Arab Republic

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ABSTRACT

Five brands of tomato paste produced locally in the Libyan Arab Republic were physico-chemically analysed to evaluate their quality. Their properties were compared with the national standard specifications issued by the Ministry of Industry.

INTRODUCTION

Tomato paste or puree is one of the most commonly used canned products in Libya. It is used almost daily in preparing the main Libyan dishes. Vegetables such as carrots, pumpkins and/or cow-peas cooked with onion, salt, and spices are added to the top of the main dish when served. The main dish may be kos-kosy, macaroni, rice or bazine.

The national tomato paste production represents about 85% of the total annual consumption. The rest is imported mainly from Italy, Spain and Greece.

Little information, if any, is published on the quality of the locally produced tomato paste. However, the Libyan Ministry of Industry issued, very recently, standard specifications for tomato products (7). Thus, it seems useful to evaluate the tomato paste produced locally.

In this investigation some chemical and some physico-chemical properties of such a product were studied taking into consideration, as a measure for quality, the national specifications issued by the Ministry of Industry (7).

MATERIAL AND METHODS

Tomato Paste

Samples of the tomato paste used in this investigation were obtained from Tripoli market. They were from the local plants production of 1971 season. The brands bought were: Reem, El-Fallah, El-Helal, Jaffarah and Mansourah. All the samples were packed in 500 grams lacquered tin cans.

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Moisture Content

The water content of the tomato paste was determined at 70°C in a thermostatically controlled vacuum oven according to the method described by Jacobs (6).

Total Acidity

About five grams of tomato paste were diluted with CO_2-free distilled water and treated with activated carbon for decolourization. The titration was carried out with 0.1 *N* NaOH using phenolphthalein as indicator. The total acidity was calculated as citric acid.

Reducing Sugars

One gram of tomato paste was diluted with distilled water, clarified with neutral lead acetate crystals and then the volume was brought to 100 ml in a volumetric flask. The reducing sugars were determined in lead-free filtrate, after precipitation with sodium oxalate by Lane-Eynon volumetric method (1).

Sodium Chloride

NaCl content of the paste was determined by the silver nitrate volumetric method(1).

Ascorbic Acid

A phosphoric acid-citric acid stabilized tomato paste extract was titrated against a standardized dye of 2.6 dichlorophenolindophenol as indicator (1).

Artificial Colour

Detection of artificial colouring was carried out qualitatively using the wool test technique (1).

pH

The pH value of the paste was determined by the PYE pH-meter, model 78, at room temperature.

Relative Viscosity

The tomato paste sample was diluted with CO_2-free distilled water in a ratio of 1 : 5 (wt/wt). The relative viscosity of the diluted paste was determined at room temperature according to the procedure described by Jacobs (6).

Can Head Space and Internal Pressure

The can head space was measured in millimetres with a caliper and the vacuum was determined by a vacuum gauge graduated in inches and made by the Metal Box Company Limited, London, England.

Total and Net Weights

The total or gross weight was obtained by weighing the sealed can to the nearest gram. The net weight was calculated by subtracting the weight of the empty clean and dry can from the gross weight.

Label Information

The can labels were examined thoroughly to find out how far they might comply with the Libyan Standard Specifications.

RESULTS AND DISCUSSION

The tomato paste samples used in this investigation represent the production of the five different national food processing plants in Libya. These plants produce five brands of tomato paste under the names of Reem, Jaffarah, El-Fallah, El-Helal and Mansourah. The samples were brought from Tripoli markets of the 1971 season production. The paste was packed in No. 1 lacquered tin cans. The chemical and physico-chemical characteristics of the tomato paste of each brand were investigated.

Table 1 shows the chemical properties of the five brands of the tomato paste samples used in this study.

Generally, the results obtained (Table 1) showed that the Reem, El-Mansourah and Jaffarah brands samples had total solids concentration of more than 28 % which is the minimum concentration recommended by the national standard specification for tomato paste (7). On the other hand, El-Helal and El-Fallah brands samples had lower concentration of the total solids than the specified value.

The titratable acidity values of samples analyzed throughout this investigation varied noticeably from one brand to another as well as within the samples of the same brand. This variation may be due to the many varieties of the tomato fruits which are usually delivered to the plants by the farmers. In addition, the acidity of tomatoes depends on the degree of maturity and ripeness. However, all the samples analyzed in this investigation had pH-values around 4.3 which were in agreement with the value given by the Libyan standards which stated that the pH must not be more than 4.5.

Sodium chloride may be added to tomato paste in the late stages of the concentration process of the juice to improve its taste. To fulfil this goal, the amount of salt added should not exceed 3 % in the final product calculated on wet basis. Such a limit for sodium chloride was specified by the Libyan Standard Specifications for tomato paste. The results obtained in this study (Table 1) showed that all the samples of the five tomato paste brands had the specified concentration of the salt.

The data in Table 1 showed that the reducing sugars contents of tomato paste samples were ranging from 12.2 to 15.5 % on wet basis. This wide range in sugar content may be due to sugar variation in different varieties of tomatoes, maturity, ripeness and some farming and environmental factors. Mansourah brand had the maximum reducing sugars content among all the brands studied.

Table 1 Some chemical characteristics of tomato paste produced in the Libyan Arab Republic[1]

Name of brand	Total solids % with salt	Total solids % without salt	mgm Vit. C. per 100 gm paste (1) Wet	mgm Vit. C. per 100 gm paste (1) Dry	Reducing sugar % Wet	Reducing sugar % Dry	Total acidity % Wet	Total acidity % Dry	NaCl% Wet basis	NaCl% Dry basis
Mansourah	31.78	29.41	13.14	40.44	15.50	48.91	2.12	6.71	2.19	6.92
Jafarah	30.30	29.23	12.17	38.82	13.90	44.19	2.05	6.77	1.07	3.52
Reem	31.86	30.34	11.20	34.93	12.20	38.13	2.88	8.83	1.28	4.02
El-Helal	29.31	28.25	8.84	35.93	12.84	43.80	2.40	8.55	0.98	3.54
El-Falah	29.36	28.12	12.99	44.27	14.17	48.58	2.16	7.42	1.23	4.20

[1]Average values of six samples.

The ascorbic acid contents of the paste samples analyzed in this study varied appreciably from one brand to another and also among the samples within the same brand. This phenomenon may be due to the different techniques adopted by the Libyan food industries for concentration of tomato juice in addition to the fact that the vitamin C content of tomatoes varies from one variety to another. Table 1 shows the ascorbic acid content of the different brands of the tomato pastes used in this investigation expressed in milligrams per hundred grams total solids. These amounts were ranging between 35 to 44 mgms.

The presence of synthetic colour in the paste was checked qualitatively. The results showed that all the samples analyzed were free from artificial colours.

The consistency or 'body' of tomato paste may be considered by the consumer as one of the important features of the high quality products. This criterion may be due to the preheating process of crushed tomato fruits. This process releases gummy and pectic substances adhering to the seeds and therefore mixed with the pulp during the steaming and the withholding time of fruits. The relative viscosity of the paste was taken in this investigation as a measure of the consistency of the tomato paste. The values obtained varied greatly from one brand to another as well as within the samples of the same brand. The highest value was 3.4 while the lowest was 2.1 centipoise as shown in Table 2.

Removal of air from the filled cans in order to reach a substantial degree of vacuum is a very important technical step in the canning industry. No doubt that decreasing the amount of air in the can prevents unnecessary strains on the can, i.e. to prevent bulging. In addition, oxidation of the contents will be minimized reserving the nutrient values, colour, flavour of foods, besides which inside corrosion of the can will be prevented.

The head space in the can affects directly the amount of vacuum which may be reached in the can. In this investigation both the head space and vacuum in the tomato paste cans were determined. The results obtained showed noticeable variations in the gross head space and the vacuum in the cans among the samples of the five brands examined. The gross head space ranged from 0–15 mm. The overfilled cans had vacuum reading ranging from 6–13 inches. Although overfilled cans usually have little internal pressure, such cans may be exposed to spring swelling during storage. Thus overfilling should be avoided as a technique for achieving high can vacuum.

The cans used in these five tomato paste brands production were made of lacquered lithographed tin plates. The information written on the cans was not adequate and in some cases was misleading. It was noticed that one of the brands declared the gross weight of the can content. Another brand label showed two different brands names. The word 'dried' was used by one of the producers to show that the product was made by evaporation; such a term is technically wrong and misleading. Generally, this study

Table 2 Some physical properties of tomato paste produced in the Libyan Arab Republic.

Name of brand	Total weight (gm)	Net weight (gm)	Total weight deviation %	Net weight deviation %	Vacuum (inch)	H.S.H. m.m	pH	Rel. Viscosity (Centipoise)
Mansourah	505.0	437.60	+0.88	—	1.25	11	4.22	2.7
Jafarah	501.8	432.80	+0.36	—	4.80	6	4.36	2.3
Reem	511.3	438.16	+2.26	—	9.75	10	4.29	2.6
El-Helal	509.2	446.50	+1.83	+5	5.83	4	4.42	2.7
El-Fallah	494.0	432.50	−1.25	+1.65	4.73	9	4.38	2.4

[1]Average values of six samples.
[2]Head space height.

showed that most of the labels of the cans did not carry sufficient information about the product. In addition they were not written in the form which might comply with the Libyan Standard Specifications (6).

Visual examination of the inside walls of the cans showed that most of them suffered from corrosion. Severe corrosion was observed around the area where the code printings on the lids were placed. Also, different degrees of tin feathering was observed on the inside walls of the cans. In some samples black spots of rust were noticed on the surface of the product in contact with the can wall. Higher quality of tin-plate should be used in can making to avoid such defects. Also, attention and care must be paid to prevent varnish scratching by the code printing process on the cans lids.

In conclusion, much attention must be paid by the processors of tomato paste in the Libyan Arab Republic to improve the quality of their products and lengthen the working days of their factories since their production is still not enough to satisfy the local demands for tomato paste. Forming a cooperative organization between the tomato producers and the processors may be fruitful in achieving the production of high quality and sufficient quantity of tomato paste needed by the local markets. Through such an organization the farmers may obtain selected seeds, fertilizers, advice and guidance to increase their tomato production. A programme of production may be set up so that tomato is planted at different intervals to guarantee a long working season of the plants.

High quality of electrolytic lacquered tin-plates should be used in can making. Also, great care must be taken in handling the tin-plates to avoid surface damage.

Complete and clear information about the product should be declared accurately on the can labels according to the 1970 standard specifications issued by the Ministry of Industry, Libyan Arab Republic (7).

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