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## ACCESSION OF THE KINGDOM OF SAUDI ARABIA

### Communication from Saudi Arabia

The Ministry of Commerce of the Kingdom of Saudi Arabia has submitted the following information on the shelf life of food products. The Attachments and Annexes mentioned are available in the Secretariat (Accessions Division, Room 1126) for consultation.

## INTRODUCTION

Believing in the role of standardization in protecting consumers and making the programs of economic development a success, the Kingdom of Saudi Arabia (KSA) embarked on constitution of the Saudi Arabian Standards Organization (SASO), vide Royal Decree No. M/10 dated 3.3.1392 AH (corresponding to 16.4.1972).

SASO is the only national standardization body in KSA concerned with all the activities associated with standards and metrology inclusive of the following:

1. Development and approval of Saudi standards for all commodities and products as well as the standards concerned with measurement, calibration, codes and definitions of commodities and products, sampling, preparation, inspection and testing methods and other duties assigned to it by virtue of SASO Board of Directors' decisions.
2. Publication of standards in the most appropriate way;
3. Propagation of necessary awareness of the importance of specification and standardization and coordination of the works related to standards and metrology in KSA; and
4. Making the rules of granting Certificate of Conformity, Quality Mark, ISO 9000 certification and regulation of their issuance and the right to use them.

In agreement with the international system in all different standardization fields, SASO participates in the following regional and international organizations:

- Standardization and Metrology Organization for GCC Countries (GSMO);
- Arab Industrial Development and Mining Organization (AIDMO), Standards and Metrology Center;
- International Organization for Standardization (ISO);
- International Electrotechnical Commission (IEC);
- Codex Alimentarius Commission (CAC);
- International Organization for Legal Metrology (OIML).

SASO Board of Directors headed by the Ministry of Commerce presides over SASO affairs, draws its policy and takes the necessary actions for optimal performance of its functions. Observed in its formation that the Board of Directors represents the bodies concerned with standards and metrology in KSA such as commerce, industry, agriculture, health, municipal and rural affairs, public works and housing, customs, in addition to the industrial and commercial chambers (as representatives of industrial and commercial businessmen).

SASO develops Saudi standards by its technical staff and through technical committees that are equally formed of specialists in the field of each respective committee representing legislative, executive and academic bodies, private sector and commercial and industrial chambers. In drafting standards technical committees depend on international standards, researches, scientific studies and specialized references as well as the field experience of industry and commerce men and controlling authorities.

SASO attaches extreme importance to the field of food and agricultural products because of its direct relation to the health and safety of the consumer. In its work, SASO depends on international standards, recommendations and guidelines of CAC and ISO, international regulations and legislations, particularly the legislations of the European Communities and the United States as well as the results of local, national, regional and international scientific studies and researches, and scientific and specialized references. SASO also takes into account the rigorous climatic conditions of Saudi Arabia with regard to the high temperature and relative humidity and their severe differences from one region to the other and from one time to the other in KSA (This affects negatively the safety and quality of food.)

SASO, also benefits from the opinion of government, private and academic concerned bodies inside KSA and abroad, on the draft standards undergoing development, sufficient time before their approval. SASO publishes its draft standards in all possible mass media so as to achieve the interests of the producer, the trader and the consumer. After approval of the standards, whether compulsory, optional or informative, their summaries are published in the official gazette and normally given six months or more time limit (as the case may require) to commence application.

It is worthy mentioning that all the Saudi standards issued by SASO are applied on both local and imported products.

Because food products are processed using several raw materials, technologies and packaging methods, the biological, chemical and physical risks vary considerably from one product to another, in addition to the direct effect of transport, handling, storage and climatic conditions in the level of such risks. Hence each food product has its own shelf life. It is important that this period is calculated using scientific data taking into consideration the type of heat treatment, other preservation treatments, applied chilling methods, used packaging types, expected distribution conditions, storage temperatures and the use of product quality anti-deterioration agents (Hurdles).

Believing in the importance of realistic shelf life calculations for food products and showing the date mark on their labels in helping check the safety and quality of food products available for sale in KSA, SASO issued the Saudi standards SSA 1/1995 "Labelling of Prepackaged Foods", SSA 702/1993 "Expiration Periods for Food Products - Part 1" and SSA 457/1986 "Expiration Periods for Food Products - Part 2", in addition to the standards concerned with each food product, including its definition, the requirements to be met, whether a product safety health - related requirement under SPS agreement or a product quality and its nutritional value requirement subject to TBT agreement.

The following is a presentation of food product shelf life through:

1. the concept of shelf life of food products and the necessity of marking it on food product labels;
2. the importance of determining food products shelf life in general;
3. factors affecting the shelf life of food products and the major criteria taken into consideration on assessing the shelf life of different food products;
4. the methods used to assess shelf life of food products;
5. the need of KSA to determine shelf life of food products in view of its rigorous climatic conditions;
6. scientific criteria on which KSA depends for determining the shelf life of food products.

#### 1. The Concept of Shelf Life of Food Products and the Necessity of Marking it on Labels

What is shelf life? What is its concept?

Definition of shelf life in international legislations and CAC carries the same content of shelf life definition in the Saudi standard. CAC defines shelf life as the period during which the food keeps its microbiological and sensory quality at a specified temperature of storage. This period depends on the Food-specific hazards, heat treatment or other preservation treatments, methods of packaging and any other anti-deterioration agents that may be used.

Shelf life is a reference to consumers indicating the period within which food preserves its essential properties under specified storage conditions before it starts to deteriorate. The shelf life of a product starts from the date of processing and its length depends on several factors including type of the product, its ingredients, processing and preservation methods, type of packaging, and transport, handling, storage and climatic conditions. During this period, the food should:

- remain safe to be consumed;
- keep its proper sensory, chemical and microbiological properties;
- conform to the nutritional requirements mentioned on the product label.

#### Date marking on product label

The Saudi Standard SSA 702/1993 "Expiration Periods for Food Products - Part 1" defines both date of production and date of expiration and clearly stipulates adherence to the following:

- showing production or packaging date without any symbols;
- showing expiry date without any symbols, excluding some food products from showing the expiry date namely table salt, sugar, dry vegetable, medical herbs, spices, dry and dried pulses, tea and rice; and
- showing the date in day/month/year format in case of products with shelf life up to six months, and in month/year format in case of products with shelf life exceeding six months.

The said Saudi standard also allows the use of any of the following stipulation to denote expiry date:

- use by date;
- use before date;
- valid for .... from production date;
- sell by date.

The stipulation of SSA 702/1993 agrees in content with the stipulation of CAC 1/1991 "Labels of Prepackaged Foodstuffs" and international legislations with respect to necessity of showing the date mark on labels of food products together with proper storage instructions. These legislations, and primarily CAC 1/1991, include the following:

(a) Definition of:

- "sell by date": the last day of displaying the product for sale to the consumer after which it can be stored for reasonable period at home;
- "date of minimum durability": the date which indicates the end of period, under any specified storage conditions, through which the product remains marketable, maintaining its taste and requirements quality, the food may remain extra suitable and acceptable after this date;
- "use by date": the last day recommended for consumption or expiry date, it means the day indicating the end of the estimated period under the specified storage conditions. After this date, the product may not have the quality properties normally expected by the consumer. After this date the food should not be considered marketable.

(b) The obligation of marking the date on food product label:

- show the date of minimum durability when the date includes the day;
- date shall be in "day/month" format if the minimum durability period is not exceeding three months, and in "month/year" format for the products with more than three months to 18 months durability period and in "year" format for the products with more than 18 months shelf life;
- date is to be expressed in the following words accompanied with the date itself or reference to the place of the date on the label, followed by explanation of storage conditions, if necessary.
- "Best before": if the date includes the day.
- "Best before end": in other cases.

The following products are excluded from showing the date of minimum durability on the label:

- fresh fruits and vegetables, table salt, vinegar, solid sugars, confectionery products containing sugar with colour or flavour, and bakery products which are consumed as per the nature of its ingredients within 24 hours of production.

In case of microbiological highly perishable foods which may constitute hazards to consumer health after a short time, the "date of minimum durability" is to be replaced by "use by date". In such case, the date should be in day/month/year format without symbols and followed by storage condition details.

2. The importance of determining food products in general:

There has been an international consensus on the importance of date marking on the labels of food products, and also the importance of specifying the conditions of storage. These data shall constitute a part of the binding data on the product label. This has been mentioned in Codex Standard No. 1/1985 "Labelling of Prepackaged Foods" as follows:

- (a) the date of production or the date of packaging shall be declared on all prepackaged food products;
- (b) date marking shall be declared on the product label and shall be expressed as: "date of minimum durability" or "best before date". This date specifies the end of the shelf life under specific conditions of storage during which the product is marketable and still maintains its properties of quality and its nutritional value which meets the consumer's needs. However, the food product may still be acceptable after this date;
- (c) in case of microbiologically highly perishable foods which, after a short period of time, would likely constitute a hazard to the health of consumer, the date shall be expressed as: "Use by date", "Recommended last consumption date" or "Expiration date". In other words, it means the day that specifies the end of the decided period under any specified conditions of storage. After this date, the food product shall not be deemed marketable;
- (d) the date, in an uncoded way, shall declare the day/month/year in case of products whose durability period does not exceed three months. But as for the food products whose durability period exceeds three months, the date shall declare the month/year;
- (e) some food products shall be excluded from date marking on the label such as vinegar, table salt and sugar.

Codex's Alinorm 97, 13 Appendix IV "Hygienic Code of Practice for Chilled Packaged Foods of Long Shelf Life" specifies the recommendations for the preparation, packaging, storing and distribution of chilled foods so as to prevent the growth of pathogenic microorganisms under the principles of Hazard Analysis of Critical Control Point (HACCP). The code defines the shelf life as the period during which the product maintains its microbiological and sensory quality at specified temperature of storage. This period depends on the risks of the product itself, besides heat treatments or any other treatments that may be used to prolong the shelf life of the product. The code defines the term "Use by date" as the date after which the food product should not be consumed, calculated from the date of production and also including the shelf life of the product, and depending on the margin of safety as determined by the manufacturer.

The code specified shelf life for the three food products being taken as models to apply this code at specified storage temperatures.

Recommended International Code of Practice for the frozen fish CAC/RCP 16/1978 and its updating in 1996 made a comparison between the storage periods of frozen fish and the effect of storage temperatures and kind of fish on storage periods.

Many countries, of which the U.S. comes first, laid down guidelines that specify the optimum conditions for the transport, storage and handling of different food products and including also appropriate storage periods at specified storage conditions. Most of these countries obligate the manufacturer to state the specified shelf life of the high perishable products.

In some countries, the governmental bodies, in cooperation with academies and businessmen, specify the shelf life of every food product (except few products) under specified conditions of storage and specified methods of packaging. Jordan, as an example, issued two standards Nos. 288 and 401 for the shelf life of food products. Russia also specifies the shelf life of every product within the product's standard itself.

This world's concern indicates the importance of declaring the shelf life of food products on the product label as this declaration shall benefit the consumer, manufacturer and the merchants at the same time. This will also:

- (a) help guide the consumer to the safety of foods and the product's maintenance of its appropriate sensory, chemical and microbiological properties of food, and the product's compliance with the nutritional requirements declared on the label and which satisfy the consumer's desire and needs;
  - (b) facilitate and organize the circulation of food products through marketing the products that were produced firstly;
  - (c) facilitate and organize the duty of food inspectors in markets;
  - (d) give the opportunity to the consumer so as to participate in food control processes.
3. Factors affecting the shelf life of food products and the major criteria taken into consideration on assessing the shelf life of different food products:

Several sensory, biological and chemical changes, in general, come upon foods during transport, handling and storage, and by the passage of time they negatively affect the quality, safety and hence their shelf life. Hereafter we will present some of these changes:

- (a) biological changes result from:
  - continuous biological enzymatic reactions affecting the sensory properties in addition to making the food more susceptible to attack of microorganisms;
  - microbial growth where microorganisms i.e bacteria, yeast and moulds, can grow in a wide range of environmental conditions, where they degenerate food ingredients leading to deterioration or causing food poisoning because of their reproduction and food contamination by their secretion of poisonous substances such as toxins and aflatoxins;
  - infestation of insects and rodents.
- (b) sensory changes:
  - including the changes of taste, colour, consistency and flavour resulting from chemical reactions or microbial growth and degeneration of food ingredients or due to loss or acquisition of humidity in addition to mechanical changes due to poor-quality processing or below-standard methods of transport, handling and storage.

(c) chemical changes, including:

- (i) reaction of food ingredients with the available oxygen or due to oxidization by an oxidizing agent;
- (ii) interaction of food ingredients, particularly the ones with active groups or as a result of the degeneration of food ingredients or its precipitation or denaturation;
- (iii) reaction of food ingredients with packaging materials such as the reaction of acidic substances with tin cans at the welding lines or internal coating scratches, which leads to can swelling, and may lead to corrosion, release, rusting and microbial contamination, or the migration of some carcinogenic plastic components to the foodstuff such as vinyl chloride.

KSA agrees with all regional and international organizations and scientific specialized institutes that the rate of such changes is the correct criteria for the determination of shelf life of food products. Therefore, the factors which increase the recurrence of such changes lead to rapid deterioration of the food quality specifications and affect its safety and edibility for human consumption.

These factors can be divided into two categories:

(a) Internal factors related to the properties of a food commodity including:

- pH value: it affects the spoilage rate caused by micro-organisms because each micro-organism has its own pH value appropriate to its growth in addition to the effect of the acid on packaging materials, particularly metallic cans;
- water activity: where the lesser the water activity is, i.e. humidity content in the product, the lesser the microbial activity. The water medium helps the occurrence of chemical and sensory changes too;
- food contents: Fatty foods, for example, decay faster than non-fatty foods;
- chemical composition and the contents having anti-bacteria and anti-fungus effects.

Some micro-organisms need vitamins and salts for their growth and reproduction. In addition, some have an anti-micro-organism effect.

- Natural protection, such as the husk of nuts and pulses.

(b) External factors, represented in the ambient external conditions and factors including:

- Temperature: It is known that high temperature increases the recurrence of chemical reactions and increases the growth rate of microbes in all foods in general, as well as the fast decaying chilled or frozen foods in particular.

The rate of chemical reactions doubles with 10°C increase in temperature. In addition, the microbial activity dreadfully intensifies at a temperature of 20-30°C, where the count of bacteria doubles every 20 minutes. It is known that microbial activity is one of the important factors causing food deterioration.

Preserving some foods at a temperature lower than the suitable temperature for storage may affect their quality and may contribute to the aggravation of the microbial activity. For example, chilling fast-decaying foods to a temperature below 2°C brings about the formation of ice crystals, causing the breakage of cells and tissues and consequently increasing the ratio of the separate fluid, exposing greater surface to microbial growth and therefore, to rapid decay.

The most hazardous effect of temperature which leads to rapid quality deterioration and microbiological decay of food is temperature fluctuation during transportation, handling and storage.

- Time: It is known that by time the recurrence of biological, sensory and chemical changes increases, which leads to the degradation of the product quality and safety.
- Oxygen: It is one of the most important hazards to foods during storage. It causes an increase in the reactions of the oxidation of oils, colouring agents and vitamins and can be overcome by adopting a packaging system which gives oxygen no access as is the case in canning, hermetic seal, vacuum seal, seal with an inert gas or by the use of some additives such as glucosides and peroxides, to get rid of oxygen and glucose in eggs, or adding antioxidants.
- Relative Humidity: The biological reactions increase in a humid medium which functions as an appropriate medium for micro-organisms to grow. Preservation method, packaging method and type of the packaging material play an important role in humidity loss or acquisition.
- Light: Light stimulates chemical reactions and increases its recurrence. Moreover, it destroys some vitamins, and, therefore, affects the quality of the food product.
- Primary microbial load: The more the microbial load in the raw material is, the more deteriorated gets the product quality and the more rapidly it decays. This fact is labelled under the quality of raw materials.
- Packaging method, the kind of material used in packaging, its appropriateness to the food product, how tightly sealed it is, its air and humidity permeability and the effect of temperature on the migration of some detrimental packaging materials to the packaged food etc.
- The different processing treatments that reduce the recurrence of biological, chemical and sensory changes of the product and extend its shelf life such as sterilization, pasteurization, canning, salifying, smoking, pickling, chilling or freezing with heed paid to the rapidity of freezing because slow freezing brings about the formation of ice crystals that cause rapid decay of the product. Furthermore, there are lots of additives that reduce the recurrence of changes and prevent the growth of micro-organisms such as the allowed preservatives, and antioxidants etc. which would prolong the shelf life of the product.

Therefore, all these factors overlap in their effects on the recurrence of biological, sensory, and chemical changes and, consequently, affect the shelf life of the product. Those factors can be summarized as follows:



- product: quality of raw material and the nature of the food product and its contents of humidity and nutritional contents;
- processing: processing or preparation conditions, preservation method and hygienic precautions;
- packaging: packaging methods, the kind of packaging materials and their appropriateness to the product;
- conditions of transport, handling and storage;
- prevailing climatic conditions and their effect on the conditions of transport, storage and handling.

4. The subjective methods used for evaluating the shelf life of food products:

They are laboratory methods involving microbiological, chemical and sensory tests. The kind of tests, to be carried out vary according to the kind of the food product, the method of processing, the kind of packaging and the conditions of preserving it.

(a) Direct Method

It is the most common method in many parts of the world; it involves storing the product at selected storage conditions for a period of time longer than the expected shelf life. The product should be inspected at regular intervals, accordingly the rate of the food quality deterioration or its nutritional value could be determined or the time when the food deteriorates and becomes unfit for human consumption as well. This method involves some steps:

- (i) determining the factors which cause the deterioration of the food intended to be evaluated for shelf life, or lead it to be unfit for human consumption or deteriorating its quality level or its nutritional value;
- (ii) selecting suitable tests to be carried out on the product to evaluate its quality and safety, these tests are classified into:
  - Sensory Tests
  - Microbiological Tests
  - Chemical Tests
  - Physical Tests;
- (iii) making a detailed study plan including the number of samples, the specified storage conditions and the selected tests and determining a timetable for carrying out experiments and finalizing the study;
- (iv) making a study according to the timetable and recording the results.
- (v) using these results in evaluating the period in which the food could keep its quality, its nutritional value and the accepted safety under the selected storing conditions and hence determining the shelf life under specified storing conditions;
- (vi) monitoring the product to ensure its quality and safety during the specified shelf life under the selected storage conditions.

## (b) Indirect Method

Methods for evaluating the shelf life without storing the product throughout the expected period of the shelf life. It could be useful in studying the shelf life of the products that have long shelf life. Some of these methods are:

The accelerated shelf life studies: It involves accelerating the deterioration of the quality rate of the product by storing it at high temperatures. The results obtained are used in calculating the shelf life of the products under normal conditions of storage (the appropriate ones). This method depends on the principle that the temperature's rise adversely affects the shelf life of products.

In practice, the product shall be stored at different temperatures so close to the appropriate temperature of storing the product. Any changes in the properties of the product's quality shall be recorded under these temperatures, by using specified mathematic equations (among which the Arrhenius equation which mainly depends on the effect of temperature on the rate of change in the properties of quality). Thus, the shelf life shall be specified. Some researchers use what is known as  $Q_{10}$  to determine the shelf life instead of using Arrhenius equation.  $Q_{10}$  is the low rate in the shelf life (or the increase of specific reaction rate) for each 10°C maximum more than the appropriate temperature of storage.

5. The need of KSA.to determine the shelf life of food products in view of its rigorous climatic conditions:

The importance of determination of shelf life of food products in KSA. springs from its keenness on food safety for the safety and health of the consumer and considering the interests of both the producer and the trader at the same time. The importance of determination of shelf life of food products sold in KSA is due to the following reasons:

(a) The rigorous environmental conditions in KSA and their negative effects on the shelf life of food products:

It is quiet evident through the detailed data of the recorded temperatures and relative humidity throughout the year in all areas of KSA that there is a temperature increase almost in all seasons of the year and a drastic variation from time to time and from an area to another, in addition to the increase in the level of the relative humidity in air in many areas. The field study which SASO has conducted to study the conditions of transportation, handling and storage showed also the severe conditions to which the food products are exposed during transportation, distribution and storage in all areas of the Kingdom whether these products are national or imported (Reference 2, Annex 1). The rigorous climatic conditions in KSA which effectively lead to the increase of the rate of the biological, sensory and chemical changes, consequently have a negative effect on the quality of the food products, their nutritional value and safety for human consumption and hence, reduce the shelf life, are as follows:

- (i) the high increase of temperature in almost all seasons and areas of KSA;
- (ii) the drastic variation in temperatures between day and night and from a season to another and from an area to another;
- (iii) the high increase in the level of the relative humidity in many areas.

In article three, we have showed all the factors that could affect the shelf life of the food products as well as the seriousness of the temperature increase and its fluctuations and the

increase in the humidity content on the quality of the food products, their nutritional value and safety, and particularly their role in:

- increasing the rate of microbic growth and microbic decay of food and their seriousness on the safety and health of the consumer;
- increasing the rate of the chemical reactions which could affect the sensory quality of the food and its nutritional value, it could also affect the safety of the food as a result of forming some harmful materials to health;
- increasing the rate of chemical interactions between food contents and packaging materials as well as the migration of some harmful materials to health to the food such as contaminating metallic elements, lead for instance in the case of metal cans, and vinyl chloride in the case of PVC cans.
- increasing the interaction rate of the packaging materials with the medium such as the rust of the metal cans especially on the welding areas this results in letting off and hence the microbial decay of food and the effect of that on its safety.

The wideness of Saudi Arabia and the variations in temperature led to serious fluctuation in the temperatures of the food products during transportation, distribution and storage, in addition to the susceptibility of the imported products as well to more fluctuations in their temperatures because of the varying conditions they undergo during transportation, shipping and unshipping in different ports.

This becomes clear through the study which SASO has conducted in cooperation with MIRINZ in evaluating the shelf life of chilled lamb meat and the chilled packaged under vacuum and the chilled packaged in carbon dioxide atmosphere whether national or imported (Reference [2] Appendix [1]). Since the results of evaluating the food cold chain from the place of production up to storage in refrigerators showed a drastic variation in the temperature of the meat because of a noticeable increase in temperatures during transportation, shipping and unshipping, all this had a strong effect in reducing the shelf life of the meat consignments which have suffered from high fluctuation in temperatures.

The effect of KSA tropical climatic conditions, according to what has been mentioned, extends to all rings of the food chain from raw materials, manufacturing processes, packaging, storage, transportation, and retail and wholesale distribution to the arrival of the food product to the consumer and keeping it prior to use.

- (b) The KSA imports food products from most of the world countries in spite of the differences in production conditions and variety of raw materials and the methods of preserving, packaging, transport and storage. Not determining appropriate shelf life would lead the serious companies to specify actual shelf life, while other companies may give long and realistic shelf life, although the quality of their products may be less than the quality of products of the serious companies which will lead to dishonest competition.
- (c) The level of nutritional awareness in KSA is still as poor as in the developing countries. So, the determination of shelf life of food products will lead to raise the level of nutritional awareness especially regarding the importance of preserving food products by appropriate method at the specified relative humidity and temperature during transport, distribution and storage of these products which will help to minimize the loss ratio in the food products as a result of wrong methods of transport and distribution by wholesale or retail and storage especially in distant regions from the main cities such as villages.

6. The scientific criteria on which KSA depended for determining the shelf life of food products

KSA has determined realistic shelf life for food products, by adopting the scientific method in evaluation through:

- (a) the results of scientific studies carried out by SASO or through cooperation with some specialized scientific bodies in the world such as MIRINZ or the studies conducted by the universities and research centres in KSA regarding the estimation of shelf life of national and imported food products and the factors affecting shelf life. All these studies relied on the objective method based on the scientific principles in estimating shelf life as clearly mentioned in Section Six. Annex No. (1) shows a list of these scientific researches and studies carried out in KSA;
- (b) the results of scientific studies carried out in various specialized scientific institutes, universities and research centres all over the world where these scientific studies rely on the same scientific method followed in objective methods to estimate shelf life whether following the direct or indirect methods. Annex No. (2) shows a list of some scientific researches and studies carried out by specialized scientific bodies in the world to study the shelf life under specified storage conditions;
- (c) acquainting with many world scientific references comprising the outcome of expertise, studies and the long experience in the field of studying the factors affecting the shelf life of food products and the mode of deterioration. Moreover, acquainting with the studies concerned with the calculation of the shelf life of different food products at specified storage conditions by direct or indirect methods, as well as the optimum conditions for transport, storage, distribution and handling of these products. Annex No. (3) shows a list of scientific references pertinent to the field of shelf life of foods and the factors affecting thereon.

Atop of which comes:

Labuza T.P 1982

Shelf Life Dating of Foods

Food and Nutrition Press Inc., Westport, Connecticut, U.S.A.

which includes, in addition to what has been mentioned, specific recommendations on shelf life of various food products under specified storage conditions, especially temperature and relative humidity, in addition to determining the packaging and processing methods;

- (c) relying on some National and International standards of some countries. The most important standards are:
  - CAC/Codex No. 1/1985 "Labelling of Prepackaged Foods";
  - CAC/International Code of Practice for Frozen Fish No. 16/1978;
  - Canadian Standard: GP-283-32/1973 "Powders of Fruit Drinks";
  - PP-F-381J/1975 "Chilled and Frozen Fish";
  - Jordanian Standard No. 288/1994 "Foodstuffs - Expiration Periods of Foodstuffs";
  - Jordanian Standard No. 401/1984 "Expiration Periods of Foodstuffs - Infant Foods and Children Foods".
- (d) being guided by the views of many research centres atop of which comes Leatherhead Research Center and the International Scientific Institutes such as IIR and the universities as "Maryland University" in the United States and many specialized bodies and associations of food processors

in the world such as Associations of Frozen Food Processors in the United Kingdom and many of the major international companies and factories in the field of foods;

- (e) being guided by the views of all the concerned bodies in KSA i.e. governmental and academic bodies, commerce chambers and businessmen and benefiting of their scientific and practical experience regarding the factors affecting the quality of food products and the effect of transport, storage, handling and climatic conditions on shelf life of food products.
- (f) taking into consideration all the factors leading to the increase of the rate of biological, chemical and sensory changes, and thus affecting the quality and nutritional value of the product and its safety. Taking into consideration the effect of permanent conditions of transport and storage in KSA, the rigorous climatic conditions and its strong effect on the rate of changes and thus adversely affecting shelf life of food products mainly the high rise of temperature and its fluctuation from one time to another and from one region to another besides the rise of relative humidity.

Annex 4 includes examples of each food product, specifying the approved shelf life, the required storage conditions and the references used to determine shelf life mentioning the shelf life recommended in these references under specified storage conditions and packaging types.

Based upon what is mentioned above, it is clearly evident that KSA in specifying food products shelf life, depends mainly on scientific criteria, taking into account the opinions of controlling and academic bodies and industrial and tradesmen inside the Kingdom and abroad, with observance of the domestic rigorous climatic conditions and not being strict in specifying shelf life.

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#### ATTACHMENTS

1. Saudi Arabian Standards Organisation (SASO) Quality Assurance Questionnaire
2. SASO Quality Assurance, Quality Systems Registration Scheme (QSRS), Scheme Summary
3. SASO Quality Assurance Guide to SSA GS ISO 900 Standards
4. SASO, SASO Quality Assurance draft Regulations for the Quality Systems Registration
5. References Used for Evaluation of Shelf Life of Food Products.

#### ANNEXES

1. List of Scientific Research's Conducted in the Kingdom of Saudi Arabia Concerning Shelf Life of Food Products
2. List of Some Scientific Research and Reports Conducted by a Number of Scientific Authorities in the World
3. List of International Scientific References Used for Evaluating Shelf Life of Food Products
4. Examples of Each Food Product Specifying the Approved Shelf Life, Required Storage Conditions and References Used to Assess Shelf Life