

An Overview of the Egyptian Cheese Packaging Closing/ Opening System and its Future Trends

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Abstract

The Closing and opening system of the package is very important for any food product to guarantee safety and convenience. White and Rumi cheese is one of the main types of cheese in Egypt. The packaging of the Egyptian cheese changed over the years. Recently two kinds of packaging invaded the Egyptian market; Tetra Pak and plastic tubs. The paper study the types of packaging used for Egyptian cheese (white and Rumi) how these respond to product and consumer demands and convenience. Two factors are considered: Easy opening and reclosing.

Descriptive, analytical study was conducted to evaluate cheese packaging in the Egyptian Market. A comparison between Interview results representing the industry and consumer questionnaire, which assess the Egyptian cheese packaging, showed conflicts between industry and consumer requirements.

The study results showed that a new Egyptian package format can be used for the Rumi and white cheese packaging in the next few years. New formats should include easy opening composite packaging for Tetra Pak as well as reclosing system for white Egyptian cheese and new skin or vacuum one for hard Rumi cheese.

Key words

Closing/ opening system, Packaging, White cheese, Openability, convenience.

ملخص البحث

تعتبر أنظمة الفتح والغلق للعبوات من الجوانب الأساسية في تحقيق الأمان والموائمة للمستهلك. تعتبر الجبن الأبيض والرومي من أنواع المنتجات الهامة التي لا تخلو منها البيوت المصرية. لا شك ان دور العبوة ليس فقط وصول المنتج بحالة جيدة ليد المستهلك بل إن هذا الدور يمتد طوال فترة الاستخدام، إلا أن العبوات المقدمة لمثل هذه المنتجات لا تقدم المستوى المطلوب من الأمان والموائمة خاصة بعد فتح العبوة وطوال فترة الاستخدام. وتقدم هذه الورقة البحثية دراسة للعبوات المستخدمة للجبن الأبيض في السوق المصري (العبوات الكرتونية متعددة الطبقات – العبوات البلاستيكية) تم دراسة عامل سهولة الفتح وإعادة الغلق بشكل أساسي.

قدمت الدراسة تحليل لأشكال العبوات المستخدمة لمنتجات الجبن الأبيض والرومي للوقوف على مدى موائمتها للاستخدام للمستهلك المصري. كما تم استخدام المقابلة والاستبيان كأدوات لتجميع البيانات واستخدامها في المقارنة لاتجاه المصنع والمستهلك وتقييم أداء العبوات المستخدمة. حيث أظهرت النتائج وجود عدم توافق لحد ما بين اختيارات المصنع والمقدم للمنتج في الأسواق واحتياجات المستهلك والذي ينبأ بحتمية وجود عبوات ذات تصميم متطور يتفق مع متطلبات المنتج والمستهلك.

كما قدمت الدراسة حلول وأفكار تصميمية جديدة لتطوير عبوات الجبن بالسوق المصري.

مشكلة البحث

- يمكن صياغة مشكلة البحث من خلال التساؤلات التالية:
- هل تقدم عبوات الجبن الأبيض والرومي بالسوق المصري المواءمة لمتطلبات المنتج والمستهلك؟
- هل تعتبر أنظمة الغلق المستخدمة لعبوات الجبن الأبيض والرومي بالسوق المصري والتي تعتبر هي مفتاح رضا المستهلك الأداء الوظيفي المرجو؟
- هل من المتوقع حدوث تغييرات في المستقبل القريب لشكل عبوات الجبن الأبيض والرومي؟
- ما هي الحلول التصميمية التي تساعد في رفع الأداء الوظيفي لعبوات الجبن الأبيض بالسوق المصري؟

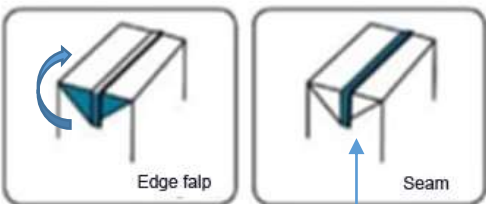
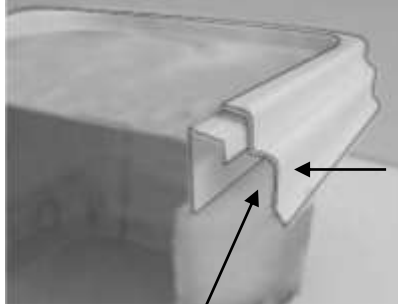
هدف البحث

- تقييم أنظمة الغلق والفتح لعبوات الجبن بالسوق المصري
- تحديد مميزات ومساوئ العبوات من وجهة نظر المستهلك والمصنع بهدف تطويرها.
- نظرة مستقبلية لأشكال عبوات الجبن بالسوق المصري وفقا للوضع الحالي.
- وضع أفكار تصميمية لرفع كفاءة أنظمة الغلق والفتح لعبوات الجبن بالسوق المصري.

محاور البحث

- تم دراسة عوامل التلغف ومتطلبات المنتج (الجبن)
- دراسة وصفية لأشكال عبوات الجبن الأبيض والرومي المتاحة بالسوق المصري.
- تحليل لأنظمة الفتح والغلق لعبوات الجبن الأبيض بالسوق المصري لاستكشاف جوانب الضعف

Table (3)

منظور علوي / جانبي لعبوة كرتونية -تتراباك لعبوة الجبن الأبيض	منظور علوي / جانبي لعبوة بلاستيكية للجبن الأبيض
	
<p>بين الشكل أعلاه الجزء العلوي من العبوة الذي ينتج من طيتين جانبيتين لجعل السطح العلوي للعبوة مسطح لتسهيل الرص والتوزيع. على أية حال تسبب طريقة غلق العبوة الكرتونية بهذا الشكل صعوبة في عملية الفتح حيث يجب أن يتم ادارتها لأعلى واستخدام أداة حادة لفتح العبوة مما يسبب ميل المستهلك للعبوة البلاستيكية سهلة الفتح.</p>	<p>يبين المقطع العرضي للعبوة البلاستيكية الشائعة الاستخدام بالسوق المصري للجبن الأبيض تطابق الحواف الداخلية للغطاء مع حافة فوهة العبوة مع وجود منطقة خارجية مرتدة للغطاء للخارج والتي تسهل فتح العبوة ، بينما قد تسبب تسرب بسيط نسبيا حيث يستخدم فيلم بلاستيكي لضمان إحكام الغلق حتى المرة الأولى للفتح</p>
<p>❌ والنتيجة عبوة صعبة الفتح لا يمكن فتحها إلا باستخدام أداة حادة.</p>	<p>❌ كما هو موضح بالشكل يبين البروز في منطقة الغطاء منطقة ضعف عند التحميل العلوي والاحتكاك الجانبي.</p>

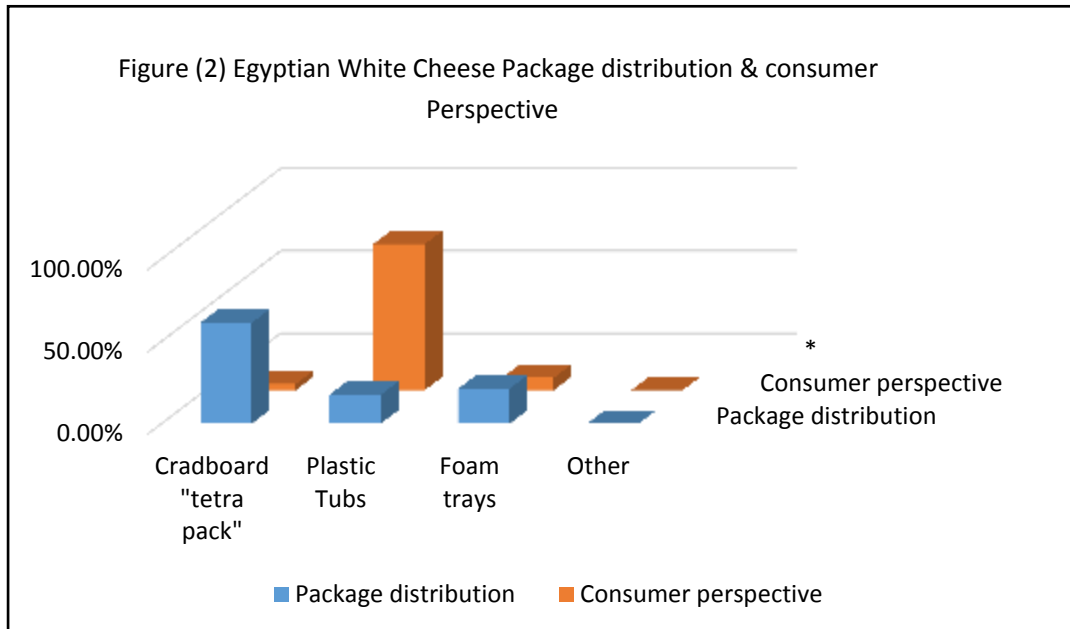
■ تحليل الأداء الوظيفي لطريقة الفتح والغلق لعبوات الجبن الأبيض

يبين الجدول التالي تحليل طريقة الفتح والغلق من خلال خطوات تمثل أداء العبوة خلال العمر الاستخدامي.

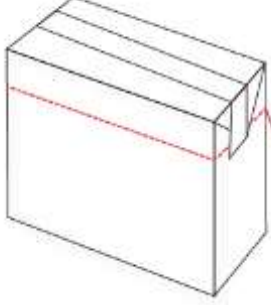
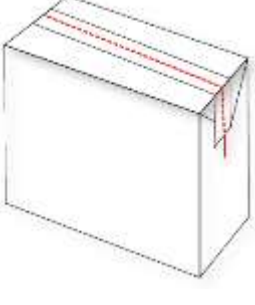
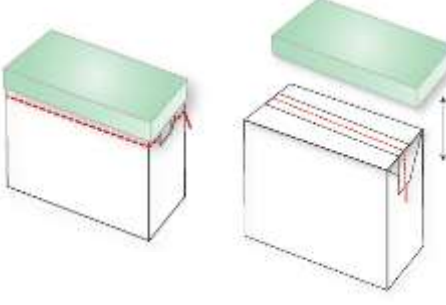
Table (4) Comparison of cheese packaging closing system performance:

خطوات فتح وغلق العبوة	العبوة الكرتونية متعددة الطبقات تتراباك	العبوة البلاستيكية
الفتح الاول	صعبة الفتح (تتطلب أداة)	Easy open (press and move upward) سهولة الفتح (اضغط وافتح بالاتجاه العلوي)
الاستخدام	تظل العبوة مفتوحة بعد الفتح الأول مما يعرضها للجفاف مما يتطلب نقلها في عبوة أخرى محكمة الغلق وإلا قد تتعرض لفقد الرطوبة والجفاف والنمو البكتيري	يمكن للغطاء القيام بدوره طوال عمر العبوة
الغلق	لا يمكن إعادة غلق العبوة	يمكن غلقها بإحكام ولكن بدون وجود الغشاء الداخلي
إعادة الفتح	تظل مفتوحة بدون غطاء	أداء جيد في عمليات إعادة الفتح للعبوة من خلال الغطاء
إعادة الاستخدام	-	غطاء بلاستيكي صلب يمكن استخدامه للفتح والغلق لمرات
إعادة الغلق	لا يمكن غلقها بعد الفتح الاول	يمكن تصميم الغطاء الصلب من عملية إعادة الغلق للعبوة بشكل متكرر
التخلص منها		

■ دراسة مقارنة لاتجاهات المستهلك والمصنع وتمت من خلال المقابلة الشخصية والاستبيان والتي أوضحت وجود تعارض فيما يفضله المستهلك وما يطرحه المصنع ويراها الأفضل من خلال اعتبارات أخرى.



- بعض الحلول والأفكار التصميمية لتطوير عبوات الجبن الأبيض وفقا لنتائج الدراسة

Attempted solution for easy – open/re-closable "tetra pack" cheese package		
		
عبوة كرتونية سهلة الفتح – يمكن من خلالها التخلص من صعوبة الفتح التي تواجه المستهلك عند فتحها		
الحل المقترح الأول لمشكلة فتح العبوة هو تقديم مناطق ضعف نقطية من خلال تنقيب طبقة الكرتون حول الجزء الأعلى لجوانب العبوة وباستخدام خيط مغزول داخل خامة العبوة فإن عملية فتح العبوة تكون أسهل.	المحاولة الثانية اقترح نفس الفكرة الأولى ولكن باستخدام الخيط المغزول ليس في جوانب العبوة في منطقة اللحم العلوي والذي يمكن ان يسهل عملية الفتح للعبوة.	يمكن إضافة سمة إعادة الغلق من خلال استخدام غطاء بلاستيكي (قد يكون بولي إيثيلين عالي الكثافة) يمكن إحاقها بالعبوة بعد الفتح. يتيح رفع الغطاء ليسمح بفتح العبوة من خلال استخدام الخيط المغزول واستخدام الغطاء مرة أخرى للغلق والاستخدام والفتح المتكرر وإعادة الغلق.

النتائج والتوصيات

- يفضل المستهلك عبوات الجبن سهلة الفتح والقابلة لإعادة الفتح والغلق.
- بالنسبة للمستهلك تعتبر عبوات الجبن الأبيض البلاستيكية ملائمة للاستخدام حيث تقدم الأمان في الاستخدام والحفاظ على المنتج بعد الفتح الأول من خلال غطاء يمكن من إعادة الغلق والفتح المتكرر وسهولة الوصول للمحتوى لكامل المحتوى.
- بالنسبة لمصنعي الجبن بالسوق المصري، تعتبر العبوات الكرتونية (تتراباك) هي العبوة المفضلة والتي تحقق الأمان للمنتج خلال النقل والتوزيع.
- هناك ضرورة لتطوير العبوات الكرتونية (تتراباك) لتطوير نظام الغلق والفتح للعبوة (سهولة الفتح – إعادة الفتح والغلق).
- لا تعتبر عبوات الجبن الرومي المقدمة بالسوق المصري ملائمة للاستخدام للمستهلك.
- هناك اتجاه للشركات المصنعة لتقديم عبوات جديدة ملائمة للجبن الرومي لمنع النمو البكتيري (أكياس قابلة للفتح والغلق).

1- Literature Review

Cheese making began about eight thousands years ago, today there are many kinds of cheese varieties worldwide, each is unique with respect to its flavor and form. (Robertson, GL. 2012)

Cheese is a common name for a group of fermented milk-based food products produced in at least five hundreds varieties throughout the world. With the exception of some soft cheese, most cheese types are not ready for consumption at the end of manufacture but undergo a period of ripening, which varies from about four weeks to more than two years.

The ripening time is mostly inversely linked to the moisture content of the cheese, although many types may be consumed at any of varied ripeness stage based on the flavor preferredredences of consumers. (Pantaleão, I. 2007)

In Egypt, cheese is the most important dairy products. White and Rumi "Egyptian Arabic" cheese, have a distinctive smell, and different degrees of salty taste according to the stage of aging. (iFood. 2012) Rumi cheese is an Egyptian cheese made from full cream cows' milk, or from a mixture of cow's and buffalo's milk. It is a hard cheese, which is believed to belong to the same family as Pecorino Romano and Manchego. (Fox, Patrick F 2004)

The taste and texture of Rumi differ according to the stage of aging. It has a slightly strong, salty and sharp flavor with pepper added to enhance the taste. This cheese is available at various stages in the market; unaged, medium and old aged. Rumi cheese is sold in the Egyptian market in slices in ready-to-used packages; Poly Styrene PS foam trays covered with Poly Ethylene PE tight stretch film.

Packaging is increasingly considered as a significant factor in protecting and controlling the quality and safety of cheese, as well as in addressing consumer issues. Cheese is an active product: it will continue to mature after packaging, and the packaging should ideally not interfere with the natural ripeness process, and at the same time, it should increase the cheese's shelf life. The balance between these two requirements, and the complicated naturally changing nature of the product, makes cheese packaging design a challenging task. (Robertson, GL. (2012)

A package is only good as its closure. Another general rule is; that the closure must be capable of sealing the pack under all normal conditions of use and storage.

Researchers have shown that if the consumers have difficulty in opening a pack, they will look elsewhere. (Winder,B.2009)

The paper study limits to white soft and Rumi Egyptian cheese packages in the Egyptian market, mainly tetra pack and rigid plastic tubs.

2- Cheese packaging Considerations

2-1 The requirements of cheese packaging according to the product properties have been summarized in the following points:

- Cheese is a sophisticated system where assorted reactions occur during the ripening and storage processes.
- The packaging system is used, with the objective of extending the shelf-life of the product; the ripening process has to be considered. Semi-hard cheese mostly have high water activities.
- It is found that the water content of cheese was linked to its salt content and storage conditions.
- In packaged cheese, water loss depends not only on the storage conditions, but also on the permeability (P) of the packaging material and closing system. (Pantaleão, I.2007)
- While the packaging will have no effect on the pH of the cheese, the water activity (aw) of the surface of the cheese will be influenced by the water vapor permeability of the packaging material.

- Two other key factors that must be considered in the packaging of cheese are the effect of light and O₂; Light initiates the oxidation of fats, even at temperatures found in refrigerated display cabinets, giving rise to off-flavors.
- In addition, the entry of O₂ molecular through the packaging film is unwanted because it will take part to fats oxidation and the undesirable mold growth.
- Subsequently, packaging films for cheese products must be impermeable to O₂ to prevent the oxidation of fats and growth of microorganisms. (Yam, KL. 2010)



Figure (1) Role of Packaging to preserve cheese from deterioration factors

2-2 Oxygen Permeability of Package

The package permeability based ultimately on; the materials, the tightness of closures or seals, and temperature. When the values of O₂ permeability are given, it is important to determine the measurement conditions, in specific temperature and relative humidity. The second is essential for hydrophilic materials, such as polyamide (PA) and ethylene-vinyl alcohol (EVOH), which O₂ barrier is highly affected by humidity.

The permeability also based on the temperature. This is important because, although the temperature has only a least effect on light-initiated lipid oxidation, packaging material permeability follows an Arrhenius-type dependence on temperature, permitting higher rates of O₂ entry at higher temperatures. Therefore, at higher temperatures, more O₂ will be available for oxidative processes. (Robertson, GL. (2012)

Packages that contained oxygen scavengers had less microorganisms' growth on hard (Rumi) cheese slices compared to packages without the oxygen scavengers over a 16 week refrigerated storage period. (Yam, KL. 2010)

2-3 Humidity and Moisture loss

Moisture is one of the essential considerations for the closure system. Moisture is present in the atmosphere with different degrees at varying times of the year. (Winder,B.2009)

Relative humidity has a direct impact on the weight loss as well as the texture of the cheese. In unpackaged cheese, the amount of moisture loss depends on the chemical properties of the cheese (particularly salt content) and on the storage conditions, temperature, and relative humidity. In packaged cheese, the amount of moisture loss depends not only on the chemical properties of the cheese but on the packaging material permeability as well. (Pantaleao et al., 2007)

2-4 The Role of closure

Preserving the cheese from chemical and physical deterioration is not the only role of packaging and its sealing/ closure system but is also important for consumer convenience. Researches had shown that if the consumers have difficulty in opening a pack, they will look elsewhere.




Openability and usability


- The use of packaging by the consumer goes through seven stages: initial opening, use, closure, re-opening, re-use, re-closure and disposal.
- Openability is known as a convenient packaging in terms of consumers that need to be able to open a packaged product without thinking about how to open it or even where to start opening it.
- Closures that can be opened within a reasonable time, using a tool; this is the real test of openability.
- Some of the most severe packaging accidents involve a tool, such as a knife, the best test for assessing openability with a focus group, or even by giving the consumer some samples 'to open in their own time' at home.
- The closure should maintain its role as long as the whole packaged product is consumed.
- The designer should have a logical and practical opening method in mind when designing the packaging. (Winder,B.2009)

3- Common Egyptian Cheese Packaging Types

There are four types of Egyptian cheese products packaging used commonly by dairy plants. Cardboard Tetra-Pak package, plastic tubs that are used in modern factories that replace tinsplate packaging that used to be the white cheese conventional package for years and lastly the PS foam trays.

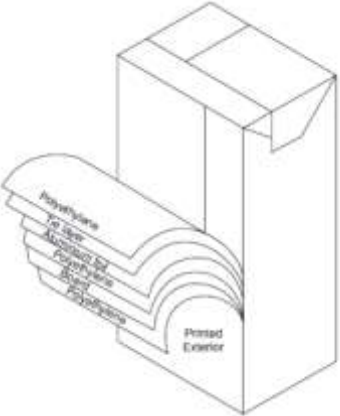

Table (1) gives an abbreviated description of the Egyptian Cheese packages and its development for the last ten years:

Cheese Package Type	Product Type	Specification	Representative Pict.
(a) Stainless containers or tinsplate packages.	It is suitable for soft cheese, which is stored in a salt solution. These packages are no longer used.	The length of storage may lead to varying situations, depending upon the resistance of the tin to rust and the storage.	
(b) The Multi-layered cardboard packaging (Tetra Pack)	Suitable for soft cheese (vita, Istanbul, and fridge white cheese)	Package sizes are ranged from 125 , 250 grams), (500 grams) and (1 kg)	
(c) The plastic tubs	This package type contain the white cheese in saline solution, it gains popularity in last few years.	Various sizes from one to twelve kg, has begun gradually to replace tin cans. It still has limitations that the natural storage of the plastic package lasts only for a short time.	

(e)Foam Plates	Used for hard shredded Rumi and soft white cheese of retail sale.	Ps foam trays are sealed with plastic LDPE film at purchase point.	
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3-2 Common Egyptian cheese packages structure

The structure and materials of the most common Egyptian cheese packaging; cardboard brick shaped package and plastic tub are described in Table (2)

Brick shaped cardboard package; Tetra pack	Represented figure
<ul style="list-style-type: none"> • in the first stage, a roll of two-side polyethylene-coated board is printed by a flexographic or rotogravure process and cut into blanks, with creases in the position of the eventual folds of the carton • The pack is formed from a pre-made sleeve. A laminate of polyethylene/ board/ polyethylene/aluminum foil/polyethylene for aseptic system.(Winder,B.2009) • A tie layer of ionomer resin may be included between the aluminum foil and the inner polyethylene. <p><input checked="" type="checkbox"/> The function of paperboard layer is to provide stiffness and mechanical strength to the pack.</p> <p><input checked="" type="checkbox"/> The tie layer to improve adhesion and resistance to aggressive products, such as essential oils.</p>	
Rigid Plastic Tub	Represented figure
<ul style="list-style-type: none"> • The material used for tubs include PVC, polystyrene, these materials are thermoformed although injection molded HDPE and PP are also used. It is heat sealed by a layer of aluminum foil or plastic laminate. • Injection-molded lids can also benefit from a process where the 'label' for the product is molded into the lid itself. 	

4- Analysis of the Egyptian Cheese Packaging Closing System

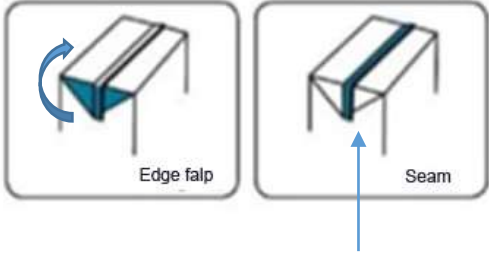
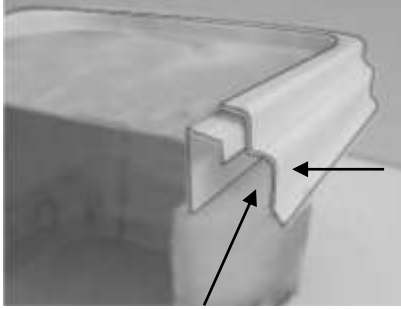
A qualitative analysis divided into two parts;

- The construction of the seam and closure of the two packages.
- The stages of opening packages through closure/seam.

4-1 Exploring the weakness of the two common White cheese packages in Egypt

Table (3) explore the weakness of the two common cheese packaging closing system in the Egyptian market; brick shaped cardboard (tetra pack) and rigid plastic tubs.

Table (3)

Tetra pack Top view	Plastic tub cross section/side view
	
<p>The traditional gable top made by folding the top down to make it flat to improve distribution. However, this created a problem at the consumer's end, as this made the packs more difficult to open, the side flaps have to be turned up and the tool is used to cut seam to open the package. This caused an uptake of consumer interest in plastic packages. (Winder,B.2009)</p>	<p>Cross section of a plastic tub with lid shows conforming the inner contours of the lid with the edge of package opening, with an outward recessed area that facilitates opening of the package, while might allow a very slight leakage. A sealing film is used to guarantee tight sealing until the initial opening.</p>
<p>☒ Hard to open package cannot be opened unless using a sharp tool.</p>	<p>☒ The prominent area of closure as in image shows weakness area (vertical loading and side friction)</p>

4-2 Closing System Performance Analysis

The use of packaging by the consumer goes through seven stages: initial opening, use, closure, re-opening, re-use, re-closure and disposal. (Winder,B.2009)

A qualitative analysis of tetra pack and plastic tub made to evaluate the closure performance. Performance evaluation of closing system through these seven stages are described in table below.

Table (4) Comparison of cheese packaging closing system performance:

Closure Opening Stages	Cardboard packaging; Tetra pack	Plastic tub
Initial Opening	Hard opening process (Need tool to open)	Easy open (press and move upward)
Use	Need to be placed in a closed container otherwise content will be susceptible to moisture loss and mold growth.	Can do its function until the whole product is consumed.
Closure	Cannot be reclosed	Can be closed without inner film sealing
Re-opening	Already opened	Good performance in reopening process.
Re-use	-	Rigid plastic lid can be used repeatedly
Re-closure	Cannot be re-closed	The rigid plastic lid can be closed several times.
DISPOSAL		

5- Comparative Assessment of the Egyptian cheese packaging

As the name suggests, this type of assessments involves comparing one type of package against another package: the type of question one would be expected to answer would be 'is sample A better than, equal to or worse than sample B?'

The assessment complemented by two methods an interview and a questionnaire.

First, a look at packaging closures from the consumer's and Producer perspective

Briefed overview of the two common white cheese packaging is describing only the major strength and weak points that might affect selecting one over another from two views; producer and consumer are summarized in Table (5)

Available Packages	Strength	Weakness	Shelf life
Tetra Pack	Good preservation especially in hard handling conditions	Not easy to open(need tool)	10 months to -1 year
Plastic Package Rigid	Easy to open reclosable	Susceptible to damage in some cases.	3 months

Second, an interview with one of the biggest cheese industry representative in Egypt "Domti" factory comparing plastic tubs and tetra pack; the results showed the following:

- Cardboard package "Tetra Pak" is considered the preferred package, which is produced more than the plastic tubs for different white cheese kinds, the reasons for preferring is; the tetra pack tight sealing which guarantee package safety especially with heavy handling conditions in the Egyptian governorates, which represents reasonable sales percentages, also longer shelf life.
- Moreover, various Tetra Pak sizes especially 125, 250 gm are preferred by fair sector of consumers.
- The convenient use for white cheese "tetra pack" package was discussed; easy opening and re-closable features, the interview revealed that research and R&D department is directed to find a solution with tetra pack Egypt to introduce easy open package, reclosing feature is not planned to be developed by the near future.
- As, for Rumi cheese package there is a future plan to introduce suitable vacuum package in the Egyptian market to maintain consistent product quality. The consumer cannot guarantee same cheese taste and quality from the same market for only two purchase.

Third, a Scaled questionnaire administered to eighty Families to explore consumer perspective of Egyptian cheese packaging, comparing the closing system for convenient use.

The results showed the followings:

- 1- Sixty-one percent found that tetra pack used for white cheese is the common package in their area, seventeen percent for plastic tubs and twenty-one percent for foam trays.

The common white cheese package in my area	Tetra pack	Plastic tubs	Foam tray
	61%	17.5%	21.5%

- 2- As for Rumi cheese, it is only purchased in foam trays and white wrapping paper ninety percent purchase it in foam trays with stretch plastic film and ten percent in wrap paper.

The common Rumi cheese package in my area	Wrap paper	Foam tray
	10%	90%

- 3- For Egyptian Rumi shredded ninety-five percent preferred PS foam trays, two percent preferred paper wrapping and three percent look forward better packaging format.

I preferred for Egyptian shredded Rumi cheese in	Foam tray	Paper wrapping	other easy open package	Hard to open
	95%	2%	3%	
I consider "tetra pack" for white cheese package				
				92.5%
				7.5%

- 4- Ninety-two point five percent of the sample found that cardboard "tetra pack" cheese package is hard to open package although seven point five percent found it is acceptable.

I prefer for Egyptian white cheese	Tetra pack	Plastic tubs	Foam tray/paper wrap
	3.75%	88.75%	7.5%

- 5- Eighty-eight point seventy-five percent preferred plastic tubs for white cheese package, seven point five percent preferred foam trays as a ready to use package for white cheese, only three point seventy-five percent preferred cardboard tetra pack package.
- 6- The reasons consumers referred to, for selection, plastic tubs: easy opening, good preservation, tight reclosing, reuse package after consuming in further usage and easy emptying of the whole content.

Do you consider reclosing feature on tetra pack a necessity?	yes	No
	95%	5%

- 7- Ninety-five percent showed that easy opening and reclosing for tetra pack cheese is a necessity that should be exited.

Do you transfer tetra pack content to another container after opening?	yes	No
	20%	80%

- 8- Twenty percent of Egyptian families sample transfer package content to another container for use but eighty percent do not.
- 9- After opening the package twenty-eight of sample consider tetra pack a convenient package for white cheese, seventy-two percent do not.

Do you consider "tetra pack" white cheese package a convenient package for use?	yes	No
	28%	72%

10- Ninety-one point twenty-five percent look forward easy opening/ re-closable convenient white cheese package in the next few years but Eight point seventy-five percent do not expect any change.

Do you expect a convenient alternative -easy open and re-closable white cheese package in next few years?	yes	No
	91.25%	8.75 %

6- Results and Discussion

The questionnaire results highlight the preference of the consumers for Egyptian white cheese packaging. The analysis of results strengthens the functional analysis of the closing system.

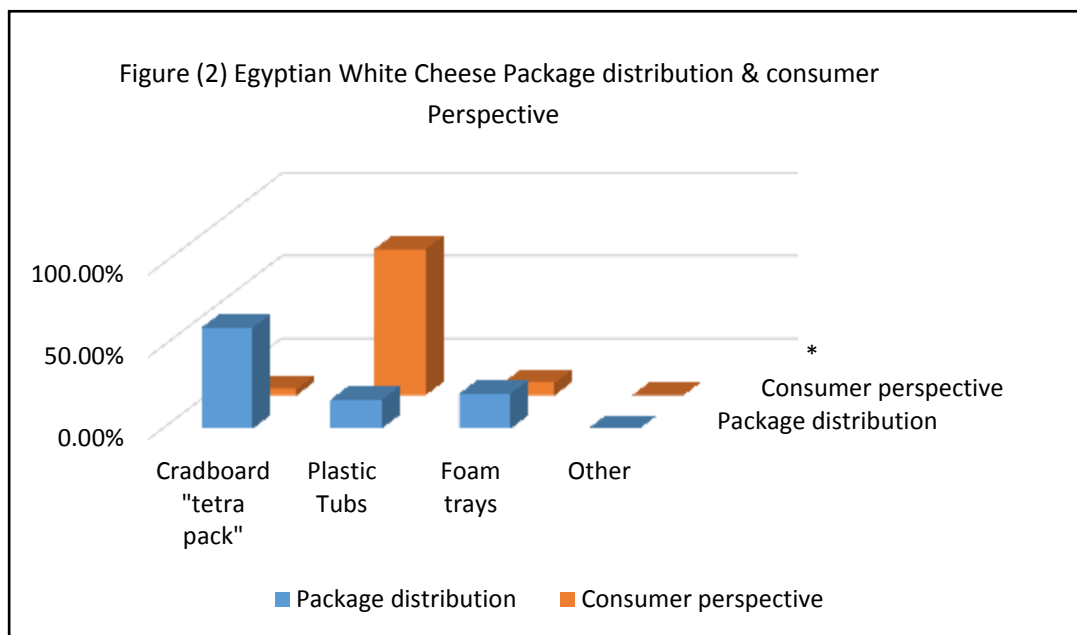


Figure (2) highlighted the conflicts between Package types which consumer prefers and what he can finds most in the market. Cardboard "tetra pack" is the most available although plastic tubs are the lowest availability.

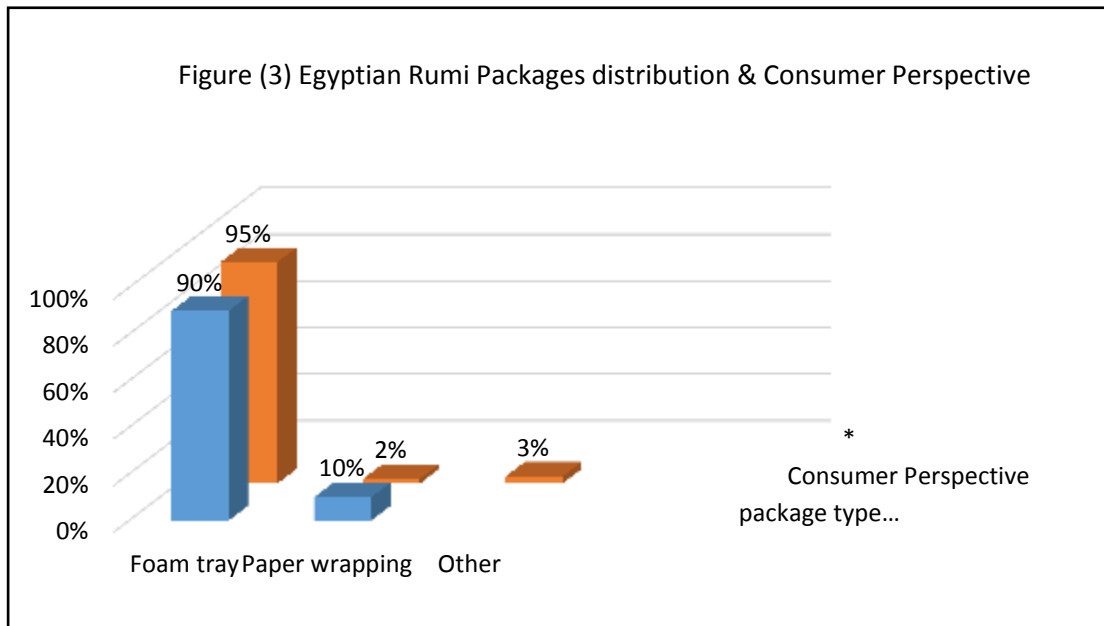
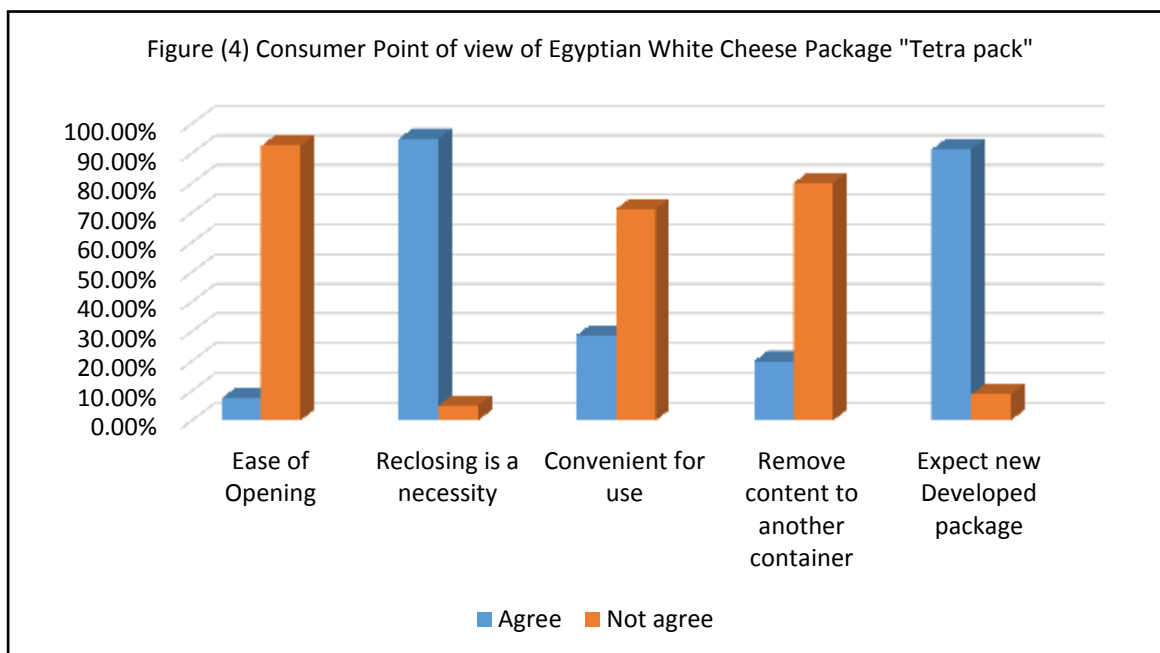


Figure (3) showed correlation between what consumers found in the Egyptian market for Packaged Rumi cheese and what they prefer. With no doubt that there is little percentage are not satisfied with both primitive package.



As for Fig. 4, it summarizes the evaluation of the white cheese package and the extent of customer satisfaction. The chart showed high need for easy open package as great percent found it's not easy open package. In addition, the highest percentage admitted that reclosing feature is a necessity. The largest proportion consider package as a container for use, only few remove content to another for use. This showed the high portion expect new convenient package format in the next few years.

The whole evaluation can be described using matrix (number of points can reflect the overall package assessment; five to ten point scale used to assess how each package fulfilled each item.

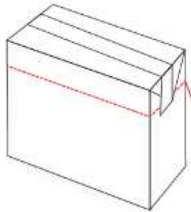
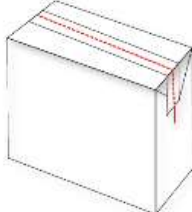
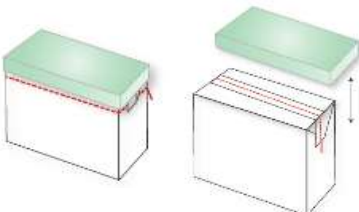
(● = 10 point; good, ○ = 5 point; Acceptable, × = 0)

Table (6) the assessment matrix used for comparing Egyptian cheese packages

Package overview	Cardboard pack	-tetra	Plastic Tubs	Foam tray	Plastic
Protective function	●●	√ better	●	○	less
Openability(6 stages)					
Initial opening	○	less	●	●	
use	×		●	○	
Close	×		●	×	
Re-open	×		●	×	
Re-use	×		●	×	
Re-close	×		●	×	
	○		●●●●●●	●○	
Consumer perspective	×		●		
Producer perspective	●				
Storage(shelf life)	●●●●	√ 3-4 better	●		
Overall scale	75%		90%	20%	

Suggested Improvement of cheese packages

Table (7) give suggested improvement ideas for new white cheese "tetra pack" package format.

Attempted solution for easy – open/re-closable "tetra pack" cheese package		
		
Easy-open/re-close brick shaped cardboard package, this can actually contribute to eliminate difficulties for consumers in opening them.		
The first attempted solution to this problem is to introduce lines of weakness by perforating the board layer by the carton along body sides. By using, a spun thread into package material, opening the package can be easier.	Second attempted suggested the solution is similar to the first one but not in package body sides, it could be along with top seam direction. Pulling spun thread might easy open the package.	Reclosing feature might be achieved by using rigid plastic lid (it could be high-density polyethylene) attached to the cheese package. The lid might be lifted to allow package opening through the spun thread and used to close the package; reopen- used –reclosed.

Rumi Cheese Packaging

Recently, aseptic packaging of dairy products has been complemented by ultra clean packaging on both preformed cup; deposit/fill/seal and thermoform/ fill/seal systems.

In recent years, shredded cheese have been popularized.

Results and Recommendations

- ☒ As for consumer; Plastic tubs is considered a convenient package for white cheese because it provides more functions along use and safety after opening; it can be opened and reclosed several times- easy use and content extraction till whole product consumed.
- ☒ Consumer prefers easy to open- use- close package.
- ☒ As for cheese industry; producers prefer tetra pack for white cheese package for assurance of food safety, avoid physical damage and loss of the product.
- ☒ The conflicts between consumer and producer demands might lead to easy open "tetra pack" package by the near future.
- ☒ Foam plates used as a retail sale package for Egyptian white and Rumi cheese but cannot be package for several use.
- ☒ There is a strong emphasis on easy open and re-closable features on cardboard white cheese package.
- ☒ Many products do not sustain a reasonable shelf life when cut, package suitability for not only sale but also convenient use should be studied.
- ☒ One feature of almost all shredded cheese- this could include Egyptian Rumi cheese packages- today is the zipper re-closure pouches.
- ☒ Shredded Rumi cheese have increased surface areas, which thereby increase the probability of microbiological growth. Gas packaging under carbon dioxide in gas barrier material pouches is mandatory. (Puniya, A. K. 2015)

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