

Comparing chemical and chemical-free crustacean products: hypothesis of price-quantity-periodicity of purchase (P-Q-P) by consumer types

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Abstract. Chemical-free preservative methods such as modified atmosphere packaging (MAP) involve the removal and/or replacing the atmosphere surrounding packaged product(s) with gas mixtures aimed at respectively improving and prolonging product development and shelf life. Moreover, chemicals are also applied to crustacean products to achieve similar goals. Nonetheless, there is evidence suggesting MAP crustacean products highly promising for the supermarket shelf. On this premise, considering these two abovementioned preservation methods and the fact that price differences could be rather thin comparing the resultant products, would this feat reflect on quantities of given frequency of purchase? In this communication therefore, a hypothesis of price-quantity-periodicities of purchase behaviour comparing chemical-treated and MAP crustacean product as a function of consumer types is presented.

Key Words: price of purchase, purchase periodicity and quantity, crustacean product, chemical-treated: chemical-free packaging, information.

Introduction. In this communication, a hypothesis about the price-quantity-periodicity of purchase as function of consumer types using comparisons of chemical and chemical-free crustacean product is presented. But prior to developing this hypothesis, it is important to underline how chemical and non-chemical crustacean product emanated by context. Among economically important seafood products, crustaceans are of nutritive value and rich in protein but inevitably deteriorate at postharvest to result in decline in quality (Benjakul et al 2006; Bono et al 2012a, b; Nirmal & Benjakul 2009; Okpala et al 2014; Okpala 2014a, b; Okpala 2015 a-c; Okpala & Bono 2015). Novel preservative treatments in this regard are therefore increasingly evolving to bring about improved product quality and food safety. Specific to the context of this contribution are two major preservative methods, namely: chemical and non-chemical approaches. Chemical approaches include synthetic substances such as 4-hexylresorcinol as well as sulphite agents etc. Consequently, chemical-free approach includes officinal plant extracts such as thymol, derivatives of green tea, oregano and halophytes (Nirmal & Benjakul 2011; Montero et al 2004; Thepnuan et al 2008; Messina et al 2015).

In recent decades, the chemical-free preservatives have been combined with non-thermal food processing methods with promising results (Gonçalves et al 2003; Bono & Badalucco 2012; Bono et al 2012a; Messina et al 2015). Concerning the application and improvement/preservation of food products, there is growing interest regarding high pressure processing (HPP), ozone treatment, pulsed electric field (PEF), ultrasonication, as well as modified atmosphere packaging (MAP) (Okpala et al 2009; Okpala et al 2010; Okpala 2014a, b; Okpala 2015a, b; Okpala et al 2015a, b; Bono & Badalucco 2012; Bono et al 2012a; Messina et al 2015), the latter being the focus of the present communication. Specifically, MAP involves the removal and/or replacement of headspace atmosphere of packaged product with gas mixtures aimed at improved product quality. By this approach, oxygen contents is significantly decreased to allow for increase of inert gases that facilitate the extension of shelf of seafood products even under cold/frozen conditions (Gonçalves et al 2003; Bono et al 2015; Lopez-Caballero et al 2002). This feat

in combination with other preservative methods is reported on a wide range of fishery products such as common dolphin - *Coryphaena hippurus* (Messina et al 2015), deep water rose shrimp - *Parapenaeus longirostris* (Lopez-Caballero et al 2002; Gonçalves et al 2003; Bono et al 2012a), giant red shrimp - *Aristaeomorpha foliacea* (Bono et al 2015), striped red mullet - *Mullus surmuletus* (Bono & Badalucco 2012) as well as Pacific white shrimp - *Litopenaeus vannamei* (Nirmal & Benjakul 2011).

Decision-taking process: 'consumers' versus 'chemical and chemical-free (MAP) crustacean product'. Among recent conducted researches at IAMC-CNR include qualitative studies delineating the willingness of two main consumer (usual and unusual) types to purchase chemical-free treated (MAP) crustacean product(s) (Okpala et al 2015b). Perchance consumers' favour chemical-free (MAP) crustacean product and in the situation where product price dramatically goes up, would consumers' tendency to be in favour continue? Putting this into context by comparisons of chemical and chemical-free treated product(s), some gap(s) between the eventual prices can be envisaged. Probably in such scenario, some pertinent questions can arise in the thoughts of targeted consumers. For example, would this perceived gap both either directly or indirectly impact on the purchased quantities at any given frequency of purchase or regardless? Likewise, the use of temporal and situational contexts can help in the understanding of food choices, in addition to its acceptability (Shepherd & Raats 2006). Feasibly, the variables that consumer types (usual and or unusual) would rely upon might vary that might depend on the nature as well as stage of consumers' decision-making process, which either could be at the point of purchase, immediately after purchase or time of consumption (Machín et al 2014; Giménez et al 2015).

To make food-related decisions henceforward, consumers have to consider factors that would either directly or indirectly influence them such as their attitudes and beliefs, past experiences as well as available information about the product (Giménez et al 2015). During decision-making process and prior to any given purchase, it is imperative that consumers ought to consider the different attributes that inform them as to whether or not to buy the desired product (Giménez et al 2015). Considering the discourse thus far argued, it is needful therefore to deliberate upon the price-quantity-periodicity of purchase particularly as it moves across consumer types. More so, it can apply to comparisons between chemical and chemical-free treated (MAP) crustacean product(s). Change agent could exemplify this, as they are equipped with knowledge about preservative methods of food products relevant for stakeholders (Figure 1).

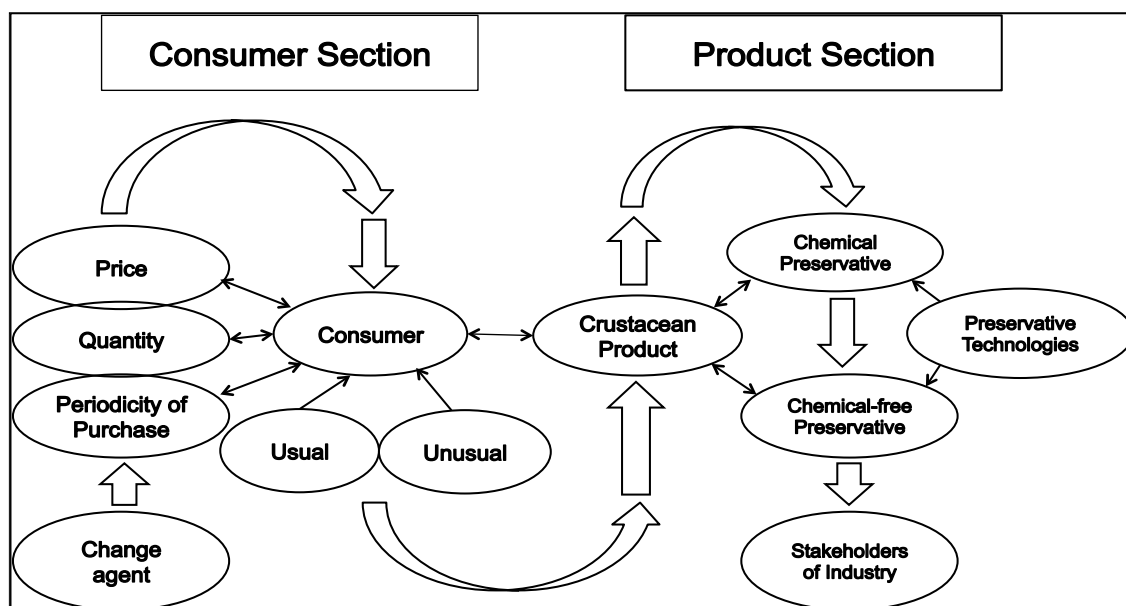


Figure 1. Change agent carry product information from consumer up to the industry.

Change agent, besides the function to carry (seafood) product information from consumer up to the industry, typically aware of how price, quantity and periodicity of purchase would interrelate with the consumers, should also have the capacity to incorporate information about crustacean product subject to both chemical and chemical-free preservative methods together as feedback package for relevant industry and stakeholders. This can principally pave a gateway that informs relevant stakeholders of seafood industry such as to improve their knowledge and understanding about potential interrelationships of price, quantity and periodicity of purchase by consumer types.

Hypothesis of price-quantity-periodicity of purchase as function of consumer types: using chemical and chemical-free crustacean product. Previous sections have built some foundation into the rationale for a hypothesis. But there is one more thing that must be reflected upon, and that is, if consumers were either made to know or become aware, particularly prior to purchase, that the crustacean products as in this instance had been subject to either chemical or chemical-free preservative methods, how would the customers' behave/respond? Would it be any different especially at the point of purchase of product(s)? Some authors opine that the choice as well as marketability of a given product is built-up by concepts of opportunism and rationality. Opportunism can refer to the possibilities that people act in their self-interest. Rationality can refer to the initial memories and cognitive processing power people have (Williamson 1981; Teo & Yu 2005).

Figure 2 schematically depicts the price-quantity-periodicity of purchase with respect to chemical and chemical-free treated (crustacean) product as function of consumer types. Specifically, these three components namely: price, quantities of crustacean product as well as periodicity of purchase are considered to deliver this hypothesis.

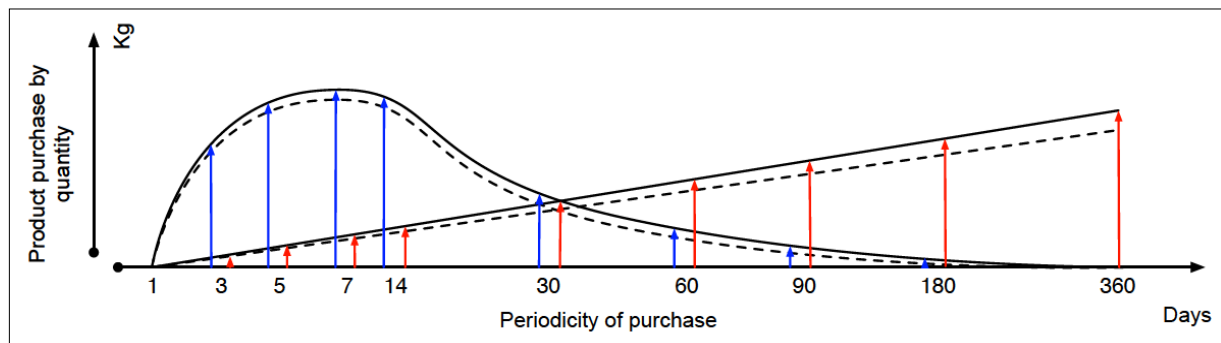


Figure 2. Schematic representation of price-quantity-periodicity of purchase (P-Q-P) as function of consumer types applicable to chemical versus chemical-free treated (crustacean) product(s).

Figure 2 showed that the product purchase by quantity axis is represented by "kilograms (kg)", and the periodicity of purchase axis is represented by 'Days'. Along the periodicity of purchase axis are two arrows faced up, left (blue) and right (red). The left represents the usual consumers. The right represents the unusual consumers. The continuous trend line represents the chemical-free treated product (as in this case is modified atmosphere packaging (MAP) crustacean product) whereas the dotted trend line represents the chemical treated ones. The periodicity of purchase in this context refer to the degree of frequency of purchase and as shown in Figure 2 is founded within the range of every day up to once every 360 days of assumed given period(s) involving two usual and unusual consumer types. Therefore, the desirable frequency of purchase could it be every day, every week, every month or two or three and so on? Henceforward, the argument that underpins this hypothesis is hereby presented as follows:

1) there is a high chance that no consumer would purchase crustacean everyday. Hence, no record is expected at this frequency (day 1);

2) at every 3 days, every 5 days, every 7 days, every 14 days approaching up to every 30 days, it appears highly that the usual consumers would quantitatively purchase crustacean more than the unusual;

3) within the abovementioned (refer to number two above) periodicities of purchase, usual consumers would start with increases followed by decreases in purchase of crustacean. On the other hand, the unusual apparently appear gradually but steadily with somewhat increases as it approaches to 30 days;

4) there could be somewhat meeting point between these two consumer types of usual and unusual, such as around the every 30 days periodicity of purchase, there may likely cross each other by quantities purchased. This would not necessarily imply a somewhat balance but rather indicate more of likely resemblances of probable purchased quantities between these two consumer types (usual and unusual);

5) with periodicities of purchase from every two months up to every year, quantities of purchase of the usual rapidly decline with increases at unusual consumers;

6) it can be assumed that price of chemical-free (MAP) crustacean product is higher compared with those of chemical-treated ones. Therefore, the upper and lower trend lines depict price margins between these two preservative methods (upper = chemical-free (MAP), lower = chemical-treated);

7) it can be assumed that the gap between the upper and lower trend lines would allow for possible fluctuations/variations in prices between these two product types;

8) it can be assumed that the differences in price comparisons of these two products would be somewhat *at par* regardless of increases and decreases in price;

9) the effect of price to enable the transaction of chemical-free (MAP) product between the buyer and seller can be assumed to be very high;

10) it can also be assumed that price of product can be subject to vary with product type as could be the scenario found in real-time for either chemical and chemical-free (MAP). On the other hand and most likely, the variations of one would push either up or down the price of the other corresponding product;

11) it can be that the regions of product quantity versus periodicity of purchase trends between usual and unusual consumers meet can be assumed at 30 days;

12) any increases in purchase quantity at any given time is assumed to bring about somewhat negligible effect on differences in price between the chemical- and chemical-free (MAP) crustacean product;

13) it can be assumed that the scene of this discourse quantifies both time frequencies and physical quantities in parallel;

14) information in its entirety is a very important aspect of any decision process required by consumers to help them know more about the crustacean (and non-crustacean) product they aim to purchase.

In its entirety, the availability of information about the desired products (and maybe services) is very crucial during the decision process as it is required by consumers to help them know more about the crustacean (and non-crustacean) product they aim to purchase. When consumers believe that (a) making the purchase is important/vital; (b) they need to learn more, as well as (c) they can with ease obtain additional information about the product, more search activity would then be required (Punj & Staelin 1983). As consumers' purchase a given chemical-free (MAP) product, which would typify a transaction, it will be without mince of words that the implementation of a constructive and useful transaction will require consumers (buyer) to have adequate information about the marketability of product (Teo & Yu 2005), and this can be achieved, for example, by comparisons between chemical and chemical-free crustacean product. Generally, people conduct transactions in the most economic way to maximise profit. Profit maximization therefore entails cost maximization (Williamson 1981; Teo & Yu 2005).

Any gap between the price(s) of above-highlighted chemical and chemical-free preserved products (Refer to Figure 2) may depend on allocations of capital, logistics, production as well as transaction. Moreover, any given market would always aim to minimize the prices allocated to transactions (Teo & Yu 2005). The length of time of any given transaction may produce a great deal of uncertainty. Both buyer and seller should thus be on guard. At such circumstance/situation consequently, prices of desired crustacean product (either chemical or chemical-free) might then increase and even much further.

Further exploration of this hypothesis by way of actual data generation is much warranted in order to establish whether the anticipated trend as depicted herein would apply at real-time process among any given frequency of purchase.

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