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Prediction of Consumer Acceptability of Flavoured Youghurts by Sensory Measures in Turkey

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Abstract: The aim of this study was to determine the Turkish consumer descriptive panel ratings for yoghurts with different added fruit, fruit syrup and herbal paste comparing to plain yoghurt. Two yoghurts were added two kinds of fruits: honey pumpkin (*Cucurbita mocshata*) and date plum (*Diospyros lotus L.*). One of the yoghurt was added pekmez (concentrated grape juice) and another was added a paste, made of herbs and sugar. Fourty two (n=42) university students tasted and rated on a five-point hedonic scale their degree of liking for five samples of yoghurt varying in added ingredients. Subjects were asked to complete a questioner about consumption of yoghurt in their daily life. Degree of liking differed significantly among samples and the samples best liked were those flavoured with pekmez (grape syrup) and honey pumpkin (*Cucurbita mocshata*). Degree of liking of yoghurts did not have a correlation with dairy products consumption.

Key words: Flavoured yoghurt, herb, grape syrup, pekmez, honey pumpkin

Introduction

Yoghurt plays a big role in Mediterranean diet. Based on stated nutritional and health benefits yoghurt sales increased over the last few decades, however several investigators reported that the consumption of yoghurt varies extensively (Kroger, 1973; O'Neil *et al*., 1979; Shanani *et al*., 1976). A contribution to this recent product success has been interest in yoghurt as a low calorie quick meal or snack as well as an assumption of provided benefits, including improvided intestinal health (Shahani *et al*., 1976; Van der Meer *et al*., 1998) and as an alternative dairy food for lactose malabsorbers (Martini *et al*., 1987; Savaiano *et al*., 1984). These studies also stated that varied source of fruit flavorings had an important effect.

Product quality and consumer satisfaction are important for increasing the sales of various types of yoghurt products. Some researchers relate consumer satisfaction of yoghurt by focusing on the effect of specific sensory attributes such as sweetness (McGregor and White, 1986) or texture (Modler *et al*., 1983; O'Neil *et al*., 1979). Yoghurt with no added flavour is predominantly sour due to the lactic acid produced during fermentation. For the acceptance of such yoghurts by the consumers fruit, flavorings and sweeteners have been added to improve the flavour balance or to mask partially the acetaldehyde flavour characteristics (Bills *et al*., 1972). At present there are many flavoured yoghurts or fruit yoghurts in the markets of many countries over the world and they show similarity in respect of flavours or fruits added. Studies done in the past showed that consumer acceptance was adversely affected by the product being either too sweet (Grieg, *et al*., 1985) or sweet enough and too sour (Barnes *et al*., 1991; Harper *et al*., 1991; Lindsay *et al*., 1981).

There have been some studies concerning the microbiologic quality of plain (Seker, 1980; Duru and Ozgunes, 1981; Akyuz and Coskun, 1990; Oz, 1990; Ergun *et al*., 1990; Yazici, 1991; Azgin, 1993; Tayar *et al*., 1993; Erkmen and Soylemez, 1994; Agaoglu *et al*., 1998; Elmali and Yaman, 2005) and flavoured or fruit yoghurts in Turkey (Uraltas and Nazli, 1998; Kiray, 1997; Sireli and Ozdemir, 1998; Sahan *et al*., 1999). However very few studies (Celik and Bakirci, 2003) have been done to address the question of consumer acceptance of distinctly flavoured yoghurts or various fruit yoghurts by Turkish customers.

The objective of this study were to determine how sensory attributes of sweetness and distinct fruits and herbs relate to the Turkish consumer over liking.

Materials and Methods

Plain and flavoured yoghurts were made in 3 kg quantities using same brand of UHT milk available in the market. A commercial natural yoghurt sample was used as yoghurt starter culture. Milk was inoculated with 2% (v/v) yoghurt culture and incubated at 42°C for 4 hours. All, the control (plain) and fruit/herbal paste added, yoghurts were stored at 4°C before serving to panelists. One of yoghurts was added 1 kg blended date plum (*Diospyros lotus L.*). Honey pumpkin (*Cucurbita mocshata*) (1 kg) was cooked in water by adding 300 gr granulated sugar and added into second yoghurt. Grape juice syrup (called pekmez)(500gr) was added into third yoghurt and the last one was added a paste (called Mesir paste/Power gum) (400 gr) made of herbal plants and sugar. Fruits and herbal paste were added into milk

Table 1: The distribution (n) of the ratings of panelists on a five-point hedonic scale

Yoghurts	Herbs (Mesir paste) flavoured	Honey pumpkin (*Cucurbita mocshata*) flavoured	Date plum (*Diospyros lotus L.*) flavoured	Grape syrup (Pekmez) flavoured	Plain (Natural) Yogurt
Scale	1- 2- 3- 4- 5	1- 2- 3- 4- 5	1- 2- 3- 4- 5	1- 2- 3- 4- 5	1- 2- 3- 4- 5
Colour					
Good	6- 1- 1- 7- 7	2- 0- 1- 5- 3	1- 1- 3- 1- 4	2- 1- 1- 5- 18	1- 1- 2- 3- 28
Not bad	2- 5- 2- 0- 1	3- 4- 9- 2- 2	1- 2- 8- 3- 2	1- 0- 6- 5- 1	0- 0- 1- 2- 4
Bad	6- 0- 1- 2- 1	3- 1- 0- 1- 1	5- 2- 1- 0- 8	0- 0- 0- 2- 0	0- 0- 0- 0- 0
Texture					
Watery	2- 2- 1- 0- 1	3- 2- 3- 4- 4	2- 0- 1- 0- 0	3- 0- 0- 6- 2	0- 0- 0- 1- 2
Runy	2- 1- 2- 1- 8	1- 2- 5- 5- 9	0- 0- 1- 1- 0	0- 2- 4- 5- 8	2- 0- 2- 6- 3
Granulated	3- 2- 5- 2- 4	0- 3- 0- 0- 0	1- 2- 6- 4- 7	0- 0- 1- 0- 0	0- 0- 1- 0- 0
Condense	3- 0- 1- 2- 0	0- 1- 0- 0- 0	1- 2- 4- 2- 0	1- 1- 4- 0- 2	1- 1- 6- 3- 7
Firm	0- 0- 0- 0- 0	0- 0- 0- 0- 1	1- 1- 3- 2- 1	1- 0- 0- 0- 2	0- 0- 5- 1- 1
Aroma					
Odourless	4- 0- 2- 1- 6	4- 3- 2- 1- 2	5- 0- 1- 5- 1	1- 0- 0- 7- 2	3- 1- 0- 2- 0
Milk flavoured	1- 1- 0- 1- 2	2- 1- 6- 6- 0	1- 1- 3- 1- 2	0- 0- 2- 2- 3	2- 1-10-5- 9
Fruit flavoured	3- 0- 2- 2- 6	0- 1- 2- 2- 1	3- 1- 2- 0- 4	0- 0- 0- 0- 2	0- 0- 1- 0- 0
Spice flavoured	0- 0- 2- 0- 0	0- 0- 1- 0- 0	0- 0- 1- 1- 1	2- 1- 2- 2- 3	0- 0- 1- 0- 0
Different-nice	1- 2- 1- 3- 0	1- 1- 2- 3- 0	1- 2- 1- 3- 0	0- 0- 2- 0-10	0- 2- 1- 0- 2
Different-bad	2- 0- 0- 0- 0	0- 1- 0- 0- 0	1- 0- 1- 0- 0	0- 0- 0- 0- 1	0- 0- 0- 0- 2
Taste					
Tasteless	0- 0- 0- 1- 0	0- 0- 0- 0- 0	0- 1- 1- 0- 2	0- 0- 0- 2- 0	0- 0- 2- 0- 3
Plain	0- 3- 1- 1- 1	2- 3- 3- 2- 1	0- 1- 0- 1- 3	0- 0- 1- 1- 3	1- 0- 2- 0- 3
Sweet	2- 1- 1- 1- 0	2- 1- 2- 1- 0	0- 0- 2- 2- 0	0- 0- 1- 3- 3	0- 1- 0- 1- 0
Rancid	0- 0- 1- 0- 0	0- 1- 1- 0- 0	0- 0- 1- 0- 0	0- 0- 1- 0- 0	0- 0- 0- 1- 0
Over heated	0- 1- 1- 0- 0	0- 0- 0- 0- 0	0- 2- 0- 0- 0	0- 0- 0- 1- 1	0- 1- 2- 1- 1
Sour	1- 1- 1- 1- 0	1- 3- 2- 0- 0	0- 0- 2- 1- 0	0- 1- 0- 0- 0	0- 1- 8- 1- 5
Fruity	2- 0- 1- 2- 1	0- 0- 0- 2- 2	1- 1- 1- 2- 3	0- 0- 2- 2- 3	0- 0- 0- 0- 0
Spicy	0- 0- 1- 1- 0	0- 0- 2- 1- 0	0- 0- 0- 2- 0	0- 0- 1- 4- 4	0- 0- 0- 0- 0
Mouldy	0- 0- 0- 0- 0	0- 0- 0- 1- 0	0- 0- 1- 0- 0	0- 0- 0- 0- 0	0- 0- 3- 0- 1
Acidic	1- 1- 0- 0- 0	0- 0- 0- 2- 0	0- 0- 1- 0- 0	1- 0- 0- 0- 1	0- 0- 1- 0- 0
Different-nice	2- 1- 0- 2- 5	1- 1- 1- 1- 3	1- 1- 2- 3- 2	1- 0- 1- 2- 2	0- 0- 1- 0- 1
Different-bad	2- 0- 0- 1- 0	0- 0- 0- 0- 0	1- 1- 0- 0- 0	0- 0- 0- 0- 0	0- 0- 1- 0- 0
Aroma left in mouth					
Yoghurt	1- 1- 3- 0- 3	0- 1- 4- 2- 3	0- 2- 2- 3- 2	0- 1- 1- 0- 2	0- 3- 2- 4-25
Fruit	5- 2- 3- 2- 2	1- 0- 3- 2- 2	0- 1- 1- 1- 7	0- 0- 2- 1- 5	0- 0- 1- 0- 1
Spice	0- 0- 1- 0- 0	0- 0- 1- 2- 0	0- 0- 1- 0- 0	2- 0- 2- 3- 4	0- 0- 1- 2- 0
Different-nice	1- 2- 2- 1- 7	1- 3- 2- 2- 5	2- 1- 4- 6- 2	1- 1- 3- 2- 6	1- 0- 0- 0- 1
Different-bad	1- 2- 1- 1- 1	3- 2- 1- 2- 0	2- 0- 2- 2- 1	3- 1- 1- 1- 0	0- 0- 0- 0- 1
Consistency					
Runy	2- 0- 0- 1- 2	1- 2- 1-10-15	0- 0- 1- 0- 1	0- 1- 1- 8- 24	0- 3- 1- 13-4
Smooth	0- 1- 1- 0- 0	0- 2- 1- 1- 4	0- 0- 2- 1- 0	0- 0- 3- 2- 1	0- 1- 1- 1- 13
Rough	1- 3- 1-12-13	0- 0- 0- 0- 1	0- 0- 3- 0-26	0- 1- 0- 0- 0	0- 0- 1- 0- 0
Granulated	1- 0- 0- 0- 1	0- 0- 0- 1- 1	0- 1- 0- 5- 1	0- 0- 0- 0- 0	0- 0- 0- 0- 0
Slimy	1- 0- 0- 1- 0	0- 0- 0- 0- 1	0- 0- 0- 0- 1	0- 1- 0- 0- 0	0- 0- 0- 0- 1
Solid	0- 0- 1- 0- 0	0- 0- 0- 0- 1	0- 0- 0- 0- 0	0- 0- 0- 0- 0	0- 1- 1- 1- 0

* 1=dislike, 3= neither like nor dislike, 5= like extremely

before the incubation but pekmez was added into yoghurt after fermentation. The herbal Mesir paste consists of *Eugenia caryphyllata*, *Zingiber officinale*, *Alpinia officinalis*, *Piper nigrum*, *Coriandrum sativum*, *Galanga officinalis*, *Piper cubeba*, *Myristica fragrance*, *Pimpinella anisum*, *Cassia fistula*, *Pistacia lentiscus*, *Crocus sativus*, *Brassica nigra*, *Citrus aurantium*, *Cinnamomi cassica*, *Glycyrrhiza glabra*, *Terminalia chebula*, *Cuminum cyminum*, *Curcuma longa*, *Cinnamomi cassica* flowers, *Besbase* (*Macis*),

Nigella sativa, *Rheum officinale*, *Eletteria cardamomum*, *Vanilla planifolia*, *Cyperus rotundus*, *Cassia, Smilax china* (*Liliaceae*), *Gummi myrrihae*, *Foeniculum vulgare*, *Isatic tinctoria*, *Creme tartare*, citric acid (Anonymous, 1995). Although it is known that Mesir paste is made from different herbal plants, the exact recipe is a closely guarded secret and therefore there is no information available about the quantities of the ingredients in the paste.

Fourty university students tasted and rated by using a 5-point hedonic scale (1 = dislike, 3 = neither like nor dislike, 5 = like extremely) their degree of liking for five yoghurts varying in added ingredients. Panelists evaluated liking of the appearance, overall product, flavour, sweetness and sourness. Panelists were at least 18 years old and over. The panelists were served 100 mL of samples in odourless plastic cups. Spring water was provided for rinsing between samples. Subjects were asked to complete a questioner about consumption of yoghurt in their daily life.

Results and Discussion

The marketing strategy of yoghurt has been partially based on stated nutritional benefits and the production of fruit yoghurt increases marketing options especially among young people. Some researchers (Kroger, 1973; O'Neil *et al.*, 1979; Richmond *et al.*, 1979) mentioned that varied sources of fruit flavorings were undoubtedly an important basis for the popularity of yoghurt. The sweetness in yoghurt is derived from the added fruit and flavor base, and yoghurt producers must work to achieve the most appropriate sweetness for general consumer acceptance. A relatively inexpensive method for determining sweetness and sourness is the use of a small descriptive panel, as Barnes *et al.* (1991) found that consumer overall liking ratings for the flavoured yoghurts did not relate to any of the analytical measures but it was highly related to sweetness intensity, but for unflavoured yoghurt, sweetness and sourness could not be used to predict consumer preferences. For rating sweetness and sourness, minimal training and testing might be required.

In this study, several differences were detected by the panelist between the flavoured yoghurts. The pH of flavoured yoghurts were 4.30 (herb flavoured), 4.93 (honey pumpkin flavoured), 4.16 (date plum flavoured), 4.11 (grape syrup flavoured), and 4.53 (plain yoghurt). Degree of liking differed among samples (Table 1) and in sensory preference, the samples best liked after plain yoghurt were those flavoured with pekmez, honey pumpkin (*Cucurbita mocshata*), date plum (*Diospyros lotus L.*), and Mesir paste, respectively indicating overall liking of panelists was based on fruit flavour, sweetness, and sourness liking. In sensory preference evaluation, pekmez and honey pumpkin (*Cucurbita mocshata)* flavoured yoghurts were liked by a relatively higher percentage of 23% and 21% of the taste panelists in orderly, comparing to date plum (*Diospyros lotus L.*), and Mesir paste flavoured yoghurts having 17% and 16% percentage of the taste panelists, respectively. Degree of liking of yoghurts did not have a correlation with dairy products consumption. Likewise, overall liking was not correlated with appearance liking among yoghurts.

The responses of panelists in this study may not directly enable yoghurt producers to change formulations readily; however, use of a trained descriptive panel provides some specific information on the characteristics of yoghurt. The panelists in this study recognized two basic groups of descriptors such as those associated with fruity and sweet character and those with plain yoghurt and sourness. This findings were in agreement with results reported by Barnes *et al.* (1991). Most consumers prefer samples high in fruity and sweet characters and if any yoghurt producer desires to produce a fruit flavoured yoghurt that could be given the highest overall liking ratings by consumers, the yoghurt requires an appropriate balance of sweetness and sourness.

The flavoured yoghurt must apparently have an acceptable flavour at sufficient intensity. Thus, choice of fruit (flavour) is also important. Based on findings in this study, it can be canceled that flavoured yoghurts with pekmez and honey pumpkin (*Cucurbita mocshata*) can be alternative flavoured yoghurt products for the Turkish costumers, and it may also be worth to try flavoured yoghurts with date plum (*Diospyros lotus L.*), and Mesir paste on a larger Turkish consumer population who are familiar with these products in their locations.

References

Agaoglu, S., Y.C. Sancak, E. Ekici and S. Alemdar, 1998. Chemical and microbiologic qualities of concentrated yoghurts sold in Van. J. Health Sci. Y. Y. Uni., 4: 1-2, 48-51.

Akyuz, N. and H. Coskun, 1990. Chemical, hygienic and microbiologic qualities of yoghurts sold in the markets of Van. J. Agri. Fac. Y. Y. Univ., 1: 71-80.

Anonymous, 1995. Mesir Festival, in Manisa (Book). Yavi, E., and Yavi, N. Y. (Eds)., pp: 290-292, Nesa Publishing, Izmir, Turkey.

Azgin, A., 1993. Investigations on the some qualities of yoghurts sold in the markets of Sivas. Msc Thesis. Applied Sci. Ins., Cumhuriyet Uni., Sivas, Turkey.

Barnes, D.L., S.J. Harper, F.W. Bodyfelt and M.R. McDaniel, 1991. Correlation of descriptive and consumer panel flavor ratings for commercial prestirred strawberry and lemon yogurts. J. Dairy Sci., 74: 2089.

Bills, D.D., C.S. Yang, M.E. Morgan and F.W. Bodyfelt, 1972. Effect of sucrose on the production of acetaldehyde and acids by yoghurt culture bacteria. J. Dairy Sci., 55: 1570.

Celik, S. and I. Bakirci, 2003. Some properties of yoghurt produced by adding mulberry pekmez (concentrated juice). Int. J. Dairy Tec., 56: 26-29.

Duru, S. and H. Ozgunes, 1981. Hygienic qualities of airan and yoghurt samples sold in the markets of Ankara, Gida, 6: 19-23.

Elmali, M. and H. Yaman, 2005. Microbiological Quality of Yoghurt Consumed in Kars. J. Istanbul Univ. Fac. Vet. 31:19-24.

Ergun, O., N. Bayraktar and K. Bostan, 1990. Investigations on the chemical and microbiologic qualities of yoghurts available in the markets. J. Turkish Microbial. Soc., 20: 160.

Erkmen, O. and Z. Soylemez, 1994. Chemical and microbiological analysis of yoghurts in Gaziantep. J. Turkish Hyg. and Experimental Biol., 51: 59-62.

Grieg, R.I., C.M. Bayley and K.A. Mansfield, 1985. Yogurt sweetness-is added sugar necessary? Dairy Industrial Int., 50: 15.

Harper, S.J., D.L. Barnes, F.W. Bodyfelt and M.R. McDaniel, 1991. Sensory attribute ratings of commercial plain yogurts by consumer and descriptive panels. J. Dairy Sci., 74: 2927.

Kiray, E., 1997. The technology of fruit yoghurt and determination of the microbiologic and chemical properties of fruit yoghurts. M. Sc. Thesis. Health Sci. Ins., Uludag Uni., Bursa, Turkey.

Kroger, M., 1973. Controlling the quality of yogurt. Dairy and Ice Cream Field, 158: 38.

Lindsay, R.C., S.M. Hargett, J.B. Wesson and R.L. Bradley, 1981. Evaluation of consumer preferences for yoghurt products. Cultured Dairy Products J., 16: 6.

Martini, M.C., D.E. Smith and D.A. Savaiano, 1987. Lactose digestion from flavored and frozen yogurts, ice milk, and ice cream by lactose-deficient persons. Am. J. Clin. Nutr., 46: 636.

McGregor, J.U. and C.H. White, 1986. Effect of sweeteners on the quality and acceptability of yogurt. J. Dairy Sci., 69: 698.

Modler, H.W., M.E. Larmond, C.S. Lin, D. Froehlich and D.B. Emmons, 1983. Physical and sensory properties of yogurt stabilized and with milk proteins. J. Dairy Sci., 66: 422.

O'Neil, J.M., D.H. Kleyn and B.L. Hare, 1979. Consistency and compositional characteristics of commercial yogurts. J. Dairy Sci., 62: 1032.

Oz, K., 1990. The quality of yoghurts sold in Konya. PhD Thesis. Health Sci. Ins., Selcuk Univ., Konya, Turkey.

Richmond, M.L., R.C. Chandan and C.M. Stine, 1979. Yogurt- a compositional survey in the Greater Lansing area. J. Food Prot., 42: 424.

Sahan, N., M.S. Akin and A. Konar, 1999. Organoleptic, chemical and microbiologic properties of fruit yoghurts and the effects of storage time on the composition of fruit yoghurts. J. Turkish Nature Agri. Fores., 23: 73-81.

Savaiano, D.A., A. Abou El Anouar, D.E. Smith and M.D. Levitt, 1984. Lactose malabsorption from yogurt, pasteurized yogurt, sweet *acidophilus* milk, and cultured milk in lactose-deficient individuals. Am. J. Clin. Nut., 40: 1219.

Seker, M., 1980. Investigations of yoghurts sold in the markets of Izmir. Graduation Thesis. Ege Univ., Agri. Fac., Dept. Dairy Tec., Izmir, Turkey.

Shanani, K.M., J.R. Vakil and A. Kilard, 1976. Natural antibiotic activity of *Lactobacillus acidohilus* and *bulgaricus*. Cultured Dairy Products J., 11: 14.

Sireli, T. and H. Ozdemir, 1998. Microbiologic quality of fruit yoghurts sold in Ankara. J. Vet. Fac. Ankara Univ., 45: 287-293.

Tayar, M., S. Anar and C. Sen, 1993. The quality of yoghurts sold in Bursa. Gida, 16: 173-182.

Uraltas, P. and B. Nazli, 1998. Hygienic quality of fruit yoghurts sold in the markets of Istanbul. J. Vet. Fac. Istanbul Univ., 24: 213-222.

Van der Meer, R., I.M.J. Bovee-Oudenhoven, A.L.A. Sesink and J.H. Kleibeuker, 1998. Milk products and intestinal health. Int. Dairy J., 8: 163-170.

Yazici, F., 1991. Organoleptic, chemical and microbiologic qualities of yoghurts sold in Samsun. Msc Thesis. Appl. Sci. Ins., Ondokuz Mayis Uni., Samsun, Turkey.