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Consumer Acceptance and Marketing of Date Syrup Ice Cream in United Arab Emirates University

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Abstract

Dates consumed as fruit or processed to produce many products including date syrup (DS). DS is a natural sweetener used to sweeten different food products. Ice cream sweetened with DS characterized with softer texture, browner color and date flavor. The aims of this study were to investigate consumers' liking, acceptability and marketability of DS-ice cream compared to ice cream sweetened with sucrose. Hundred consumers who consume ice cream at least once/week were selected. Most of the participates were females (87%), university students (96%), from United Arab Emirates (72%). DS-ice cream had similar degree of likeness and overall acceptance as regular ice cream. The consumers liked date's aroma. Sixty six percent of the consumers would be willing to buy DS-ice cream used in this study. Thirty eight percent were willing to pay the same price they were paying for regular ice cream however 41% were willing to pay at least 33% more than the price paid for the regular ice cream. Date syrup could be used successfully to produce acceptable ice cream with date aroma.

Keywords: *Ice cream, date syrup, degree of liking, acceptance, marketability*

1. Introduction

United Arab Emiratis produce 245 thousand tons of date (FAOSTAT 2015). Date fruit is consumed as fresh date or processed into different products including date syrup (DS). DS is produced commercially by extraction and concentration under vacuum. The quality and yield of DS can be improved by using pectinase/cellulase enzymes (Al-Hooti et al. 2002; Abbès 2011). DS contains 68-80% simple sugars (glucose and fructose) and other nutrients (proteins, lipids, pectin and minerals). The quality of DS varies depending on the date variety (Al-Hooti et.al. 2002; Gabsi et al. 2013 and Al-Farsi et. al. 2007). High fructose DS was produced by yeast fermentation (Putra et. al. 2014,) and DS powder of low caking property was produced successfully using maltodextrin (Farahnaky et. al. 2016). DS is used as natural sweetener to sweeten and flavor bread (Sidhu 2003); milk beverage (Keshtkaran et. al. 2013); yogurt (Milani and Koocheki, 2011) and dairy desserts (Jridi et. al. 2015).

Ice cream is a frozen dessert made by mixing milk, cream, milk solids nonfat (MSNF), sugar, stabilizers, emulsifiers, flavors and colorants. Composition of ice cream varies depending on markets and locations (Arbuckle, 2013). Cow's milk is usually used to produce ice cream, but goat milk (Pandya and Ghodke 2007; McGhee, Jones and Park 2015), buffalo milk (Minhas et. al. 2000; Minhas et. al., 2002), and camel milk (Ahmed and El Zubeir, 2015) were used. Fruits and fruit pastes/pulps (strawberries, apricot, pineapple and mango) are usually used in ice cream mixes plus fig (Murtaza et al., 2004); concentrated cactus pulp (El-Samahy, Youssef and.Moussa Ayoub, 2009); guava (Patel and Amin 2015); Blackthorn "Prunus Spinosa L." (Kavaz 2015). Fruit juices and fruit fibers were also added to ice cream mixes including grape juice (Soukoulis and Tzia 2010); kiwi juice (Sun-Waterhouse et al. 2013); citrus fiber (Dervisoglu and Yazici 2006) and date fiber (Yangilar, F. 2015).

Sucrose is the main sweetener used to produce ice cream, but alternative sweeteners were used to replace sucrose including corn syrup [20 and 40dextrose equivalent] and 42 fructose corn syrup (Hagiwara and Hartel, 1996); glucose, fructose, honey and sugar alcohols (Ozdemir et. al., 2008), dragon fruit oligosaccharide (Wichamanee, Acharaphan and Santad 2016) and stevia (Ozdemir et al. 2015). Ice cream sweetened with DS (at different levels substituting sucrose) were characterized with softer texture, browner color and date flavor (Alshamsi and Hashim, 2014). The objectives of this study were to evaluate sensory quality and consumer acceptance of ice cream sweetened with DS and investigate consumers' willingness to buy and pay for DS ice cream.

2. Materials and Methods

2.1 Materials:

Fresh whole cow milk (Al Ain Dairy), cream (Almarai), skim milk powder (Anchor®) and date syrup (Al Foah) were purchased from a local supermarket in Al Ain, UAE.

2.2 Ice cream Preparation

The ice cream samples were prepared in duplicate in the Pilot Plant of Food Science department, College of food and Agriculture, UAE University, Al-Ain, UAE. The fat content of the fresh whole cow milk was adjusted to 5% fat by adding milk fat/cream. Skim milk powder was added, mixed well with the milk then divided into two batches. One batch was used to make the control ice cream containing sucrose. The other batch was prepared by substituting sucrose with SD. To produce ice cream with similar sweetness value, the relative sweetness of fructose and glucose and water content

were considered during the calculation (fructose 1.7 and glucose 0.74 compared to sucrose 1.0). The mixtures were pasteurized at 72°C in hot oven for 30 min, cooled, stored at 4°C for 20 hours and whipped in the ice cream maker (Carpigiani Labo, Italy) for 15-20 min. The ice cream was collected and filled in small cups and stored at -18C till served for sensory analysis at the same day.

2.3 Consumer Acceptance Test

Consumers were recruited from Al Maqam Campus at UAE University including students enrolled on a general education course FDSC 250 "Contemporary Food Science and Nutrition", faculty and staff. They were selected based on ice consumption (regular consumers of ice cream, consume ice cream at least once per week) and not allergic to milk or dairy products. A sensory panel of 100 consumers filled and singed a consent form approved by the ethical committee at UAE University and answered a demographics and ice consumption habits questionnaire. Consumers were instructed on how to do the test. Consumers evaluated the sensory properties of DC ice cream and regular ice cream (control) at the sensory laboratory with separate booths under incandescent light. Panelists assessed the appearance, color, aroma, sweetness, flavor, texture, and overall acceptance of the DS and regular ice cream products using a 9-point hedonic scale (with 9= like extremely, 5= neither like nor dislike and 1= dislike extremely). Ice cream samples were presented to the panelists in plastic cups coded with 3 digit random numbers at 5-7°C. Water was provided for cleansing the palate between samples. Consumers answered questions concerning willingness to buy and amount to pay for DS ice cream if it was available.

3. Statistical Analysis

The data were analyzed using Statistical Program for Social Studies (SPSS version 20). Frequency was used to summarize the demographic information and t-test was used to analyze sensory data. Logit Model was used to regress consumers' willingness to buy DS ice cream against the survey respondents' socio-economic characteristics.

4. Results and Discussion

4.1 Demographic Characteristic of Participants

Most of the participants were females (87%), below 25 years of age (95%), undergraduate students (96%) and single (90%) [Table 1]. Consumers consisted of UAE nationals (72%) mainly from Abu Dhabi, Fujairah and Ras Al-Khaimah Emirates and UAE-residents from other countries. The median monthly income of panel was below 5,000 AED.

4.2 Participants'' Ice-cream and date syrup Consumption Habits

All participants consume ice-cream at least once a week and 47% of them consume ice cream 2 times or more per week. All participant consume flavored ice-cream. Forty percent of the participants consume chocolate ice cream; 43% consume vanilla ice cream and 15% consume strawberry ice cream. Only 60% of the participants consumed date syrup (Table 2).

4.3 Consumer Acceptance Test

Mean hedonic ratings for appearance, color, aroma, sweetness, flavor, texture and overall acceptance of DS ice cream and control regular ice cream are presented in Table 3. DS ice cream had similar hedonic ratings for all sensory attributes except aroma. DS ice cream had significantly higher aroma ratings compared to the regular ice cream. The consumers liked DS ice cream sensory properties.

4.4 Consumers' Willingness to Buy and Amount to Pay for DS ice cream

Sixty six percent of the participants would be willing to buy DS ice cream if it is available (Table 4). Thirty eight percent would be willing to pay the same price they were paying for regular ice cream however 41% were willing to pay at least 33% more than the price paid for the regular ice cream.

The consumers' willingness to buy DS ice cream was regressed against the survey respondents' socio-economic characteristics (Table 5). The dependent variable was a binary variable that takes 1 if the consumer is willing to buy the product and 0 if not. The appropriate model to represent such relationship is the Logit Model. Model R square using Cox & Snell measure of model fitness was found to be 0.519. Meanwhile, the modified R square measure by Nagelkerke (1991), when R square is divided by the upper bound was found to be 0.723. The results shows that the model fitness is acceptable in predicting the relationship between the dependent variable and the explanatory variables. Only respondent education and his/her overall acceptance for product date syrup ice cream were found to be significant explanatory variables. Regression results shows that when the respondents increase from lower to higher level of education, the likelihood of the respondent buying the date ice cream increases by 3.056 %. The results also shows that when the respondents level of overall acceptance increases from one level to the other his/her willingness would increase by 1.111%. Decision maker designing the marketing effort to expand market share of the date syrup ice cream should consider such results.

5. Conclusion

Ice cream sweetened with date syrup resulted in acceptable ice cream with similar sensory attributes and higher hedonic rating for the aroma. Sixty six percent of the consumers would be willingness to buy date syrup ice cream and 79% of them would be willing to pay the same price or a higher price for Date syrup ice cream.

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Annexure

Table 1. Demographics of consumers participated on ice cream study (n= 100)

		Frequency	Percent (%)
Gender	Female	87	87.0
Age	Below 25 More than 26 years	95 5	95.0 5.0
Material status	Single	90.0	90.0
Education	Under graduate Graduate degree	96 4	96.0 4.0
Income	≤ 5,000 5,000-14,999 15,000-24,999 ≥ 25,000	70 16 10 4	70.0 16.0 10.0 4.0
Occupation	University Student Government sector	96 4	96.0 4.0
Nationality	Emirati Other countries	72 28	72.0 28.0
Emirati (n=72)	Abu Dhabi Dubai Sharjah Ras Al-Khaimah Fujairah	49 3 3 9 8	68.0 4.0 4.0 13.0 11.0

Table 2. Ice cream and Date syrup consumption

		Frequency	Percent
Consumption of ice cream	5-4 times/week 3-2 times/week Once/week	7 40 53	7.0 40.0 53.0
Consumption of Flavored ice cream	Yes	100	100.0
Type of flavor	Strawberry Chocolate Vanilla Mango Others	15 40 34 7 4	15.0 40.0 34.0 7.0 4.0
Consumption of Date syrup	Yes No	60 40	60.0 40.0

Table 3. Sensory quality and consumer acceptance of regular & date syrup ice cream (n= 100)

Sample	Appearance	Color	Aroma	Sweetness	Flavor	Texture	Overall Acceptance
Regular Ice-cream	6.6±1.7*a*	7.5±1.5*a*	5.8±1.2 *a*	6.8±1.0 *a*	6.0±1.3 *a*	6.4±1.0 *a*	6.6±1.0 *a*
Date syrup Ice-cream	7.1±1.7*a*	7.5±1.6 *a*	6.5±1.0 *b*	6.3±1.1 *a*	6.2±1.3 *a*	6.8±1.0 *a*	6.5±1.0 *a*

Means with common letters in the same column indicate that there is not a significant difference between samples ($p \leq 0.05$) using t-test.

Table 4. Willingness to buy and pay for date syrup ice cream

*The price of regular ice cream

		Frequency	**Percent**
Willingness to buy date syrup ice cream	Yes	66	66.0
Price to pay of date syrup ice cream (66)	5Dhs 4Dhs 3Dhs* 2Dhs 1Dhs	10 17 25 11 3	15.0 26.0 38.0 17.0 5.0

Table 5. Willingness to Buy DS-ice Cream Logit Model results

Explanatory Variable	Beta Coefficient	Standard Error	Wald Test	Significance (P-Value)
Gender	2.16	1.748	1.528	0.216
Age	17.911	16465.058	0	0.999
Marital Status	1.485	1.702	0.761	0.383
Education	**3.056**	**1.647**	**3.444**	**0.063**
Income	-0.497	0.452	1.212	0.271
Occupation	0.737	19916.088	0	1
Nationality	-0.556	0.613	0.823	0.364
Emirate	-0.052	0.322	0.026	0.871
Ice cream Consumption	-1.138	0.769	2.189	0.139
Type of flavor	0.428	0.478	0.801	0.371
Dibs Consumption	-3.714	5.285	0.494	0.482
No of consumption	-1.065	1.761	0.366	0.545
Appearance	-0.178	0.397	0.202	0.653
Color	0.082	0.44	0.035	0.852
Aroma	0.027	0.274	0.01	0.921
Sweetness	0.393	0.301	1.712	0.191
Flavor	0.23	0.408	0.318	0.573
Texture	-0.461	0.379	1.478	0.224
Overall Acceptance	**1.111**	**0.587**	**3.587**	**0.058**
Constant	-26.563	11285.142	0	0.998