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PHYSICOCHEMICAL AND SENSORY PROPERTIES OF JAMEED ENRICHED WITH ORANGE ALBEDO AND APPLE PEEL POWDER

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ABSTRACT

Jameed is a dried fermented milk product with long shelf life and can be stored for several months at room temperature (15-30º C) without deterioration or affecting its functional, biological and nutritional values. Mansaf contains high amount of fat, which comes from the meat and ghee or oil, which is added to it. The aim of this study was to determine the effect of adding apple peel powder and orange albedo powder at different percentages (3%, 5% and 7%), as sources of dietary fiber, on physicochemical (protein, fiber, ash content and wettability, and separation layer content), and sensory properties of jameed. This is the first study that addresses adding fiber to jameed to reduce the risk of life-style diseases. The results showed that all treatments of apple peels and orange albedo used for jameed were effective in increasing the protein, fiber, ash content and wettability when compared with the control. The highest treatment that significantly increased these parameters was 7% for both apple peels and orange albedo treatments. All percentage concentrations of orange albedo and apple peel treatments significantly ($p \leq 0.05$) decreased the separation layer when compared to the control. The most effective treatment in decreasing the separation layer (20%) was the 7% apple peel treatment when compared to control. When comparing orange albedo treatments with apple peels treatments of jameed, results showed that orange albedo treatments at all levels increased the wettability better than apple peels. Sensorial characteristics of jameed treated with apple peels and orange albedo as sources of fiber were attractive to the consumers. The sensory attributes of jameed including appearance, color, flavor, taste, texture, consistency and overall acceptability were significantly improved ($p \leq 0.05$) by adding orange albedo and apple peel at different percentages (3%, 5%, and 7%). When comparing apple peel and orange albedo treatments for jameed in all scores, there were no significant differences in overall acceptability scores between them.

Key words: Jameed, Mansaf, orange albedo, apple peel, dietary fiber, wettability, separation layer

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INTRODUCTION

Jameed is a dried fermented milk product with long shelf life and can be stored for several months at room temperature (15-30º C) without deterioration or affecting its functional, biological and nutritional values [1]. It is used for cooking yoghurt-based traditional dishes in the Middle East in countries like Egypt, Syria and Jordan [2]. Jameed is processed primarily from milk obtained from camel, cow, goat and sheep milk [3]. Mansaf is a popular traditional dish in Palestine and Jordan and can also be found in Syria. It is made of meat cooked after soaking in jameed sauce and served with bulgur or rice. Mansaf contains high amount of fat, which comes from the meat and ghee or oil, which is added to it [4].

High consumption of lipids has been correlated with diabetes, obesity, hypertension, coronary heart disease and risk of developing some types of cancer [5]. Dietary fibers are plant foods that are not digested in the intestinal tract; they include gum, hemicellulose, cellulose, lignin and pectin.

Albedo is a white, cellulose tissue and spongy dietary fiber that is part of citrus peel. Albedo is one of the best types of dietary fibers because of the bioactive compounds such as vitamin C and flavonoids present in it, that have beneficial health effects [6]. Apple peels are by-products of apple juice and canned apple processing and they enhance health when consumed, because they also contain high dietary fiber [7].

Consumption of diets containing good fiber may prevent or decrease hypercholesterolemia hypertension, gastrointestinal disorders, obesity, cancer and coronary heart disease [8, 9]. Citrus albedo and apple peels are rich in pectin substances and important raw materials for pectin production worldwide [10]. Pectin has been used successfully for many years in the food and beverage industry as a thickening and gelling agent and for colloidal stability. Commercial pectin is almost exclusively derived from citrus or apple peel, both by-products from juice manufacturing. Apple and citrus peel contain 10%–15% and 20%–30% pectin, respectively, on a dry matter basis [11].

Therefore, the aim of this study was to analyze the effects of adding orange albedo and apple peel powder as sources of dietary fiber on chemical, physical and sensory properties of jameed. This is the first study that addresses adding fiber to jameed to reduce the risk of life-style diseases.

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MATERIALS AND METHODS

Preparation of orange albedo and apple peel powder

Oranges and apples were purchased from a local market and peeled. The orange albedo and apple peels were ground after drying at 40 °C in hot air oven (Memmert, 854 Schwapach, Germany) for 43 h. The powder was then sieved through a 150 µm sieve (Type ASTME 11 70, Mauer, Germany).

Preparation of jameed sample

Jameed was prepared from fat-free goat yogurt (fat free labaneh) purchased from a local market with 1.5% salt content, which was increased to 7% as preservative at room temperature.

Then, orange albedo and apple peel powder were added at different percentages (3%, 5%, and 7% (pre-treatment was done to choose an appropriate percentage)) to labaneh which is a traditional food in the middle east (thick yoghurt), shaped in slightly elongated 8–10 cm balls, and dried in a hot air oven (Memmert, 854 Schwapach, Germany) at 40 °C for 36 h.

Some of the jameed samples were stored in plastic bags until chemical analysis was done. Some of the samples (45 g) were soaked in water (315 ml for 24 h) for the wettability test. A part of soaked jameed samples (45 g) was mixed with water (315 ml) for 2 min using an electrical hand mixer (Hinari, model FM2, China). This mashed sample (jameed bouillon) was then cooked in hot water (500 ml) for 10 min for separation layer test and sensory evaluation. Control samples of jameed (without apple peel and orange albedo) were also prepared.

Sample analysis

Chemical methods

Samples were analyzed in triplicates, for moisture, protein, ash and fiber contents following methods described by Association of Official Analytical Chemists [12]. Salt determination was done according to Mohr's titration method, where 0.5–1.0 g of sample was diluted in distilled water, using potassium chromate as indicator. Salt was titrated against 0.1 M $AgNO_3$, and the percent of salt was expressed according to the following equation:

$$\text{Salt}\ (\%) = \frac{(250\ \text{ml})}{10\ \text{ml} \times 25\ \text{g}} \times (\text{S} - \text{B}) \times \text{F} \times 100$$

where S = Titration volume of sample (ml), B = Titration volume of blank (ml), and F = Conversion factor of 1 ml 0.1 N $AgNO_3$ to 0.005844 g NaCl

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Physical methods

Wettability test

Jameed sample weighing 45 g was cut from a whole jameed ball; 315 ml water was added to the piece placed in 500 ml cup and soaked for 24 h [13]. The excess free water was carefully decanted and weighed to calculate the soaked amount as follows:

$$\text{Wettability (\%)} = [(315 \text{ ml water} - \text{A}) \div \text{Weight of cubes in g}] \times 100$$

where A = the weight of excess water in g.

Separation layer (Syneresis) test

The soaked jameed sample (45 g) was mixed with 315 ml water for 2 min using electrical hand mixer (Hinari, model FM2, China) and this jameed bouillon was then cooked; 10 ml of cooked jameed was transferred to a 20 ml graduated cylinder and the clear layer was measured after 10 min [13]. Separation layer was calculated as follows:

$$\text{Separation layer (\%)} = (\text{A} \div \text{B}) \times 100$$

where A = the height of the clear layer and B = total height of jameed dispersion layer.

Sensory evaluation

Samples from each treatment were evaluated by 50 semi-trained panelists selected from staffs, undergraduates and engineers of the Department of Nutrition and Food Technology, Al-Balqa Applied University, Jordan. The panelists were of both sexes and of different age groups. Before evaluating the samples, they were familiar with the test technique and use of the score system. Each sample was assessed for appearance, color, flavor, taste, texture, consistency and overall acceptability, using a descriptive five-point hedonic scale on which 5 was “extremely like” and 1 was “extremely dislike.” Bread and little water were used to cleanse the palate between sample testing. All treatments were evaluated in separate sessions [14].

Statistical analysis

Statistical analysis of data was carried out using Statistical Package for the Social Sciences, version 19.0 [15]. The data obtained were analyzed using a completely randomized design to study the effect of treatments on the protein, fiber, ash,

moisture, wettability and separation layer%, and sensory scores. The significant difference of the mean was determined using Least Significant Difference (LSD) method.

RESULTS AND DISCUSSION

Table 1 shows the percentage contents of protein, fiber, moisture and ash in jameed treated with different percentages of apple peels and orange albedo powder. The data shows that all treatments of apple peels and orange albedo used were effective in increasing the protein, fiber and ash content and decreasing the moisture content when compared with control. The treatment of jameed with highest amount (7%) of apple peel and orange albedo powder resulted in significant increases in protein content (5.9% and 5.8%; $p \leq 0.05$), fiber content (1.95% and 1.89%; $p \leq 0.05$) and ash content (15.4% and 15.4%; $p \leq 0.05$), respectively.

Figure 1 shows wettability of jameed after 24 h of treatment. All the levels of orange albedo and apple peel treatments significantly increased ($p \leq 0.05$) the wettability.

The most effective treatment for increasing the wettability significantly was 7% orange albedo treatment (233%; $p \leq 0.05$). Previous studies by Quasem *et al.* [13] and Shaker *et al*. [16] reported that heating the churned yoghurt at 55^{o}C for 3 min to flocculate the casein resulted in improvement of jameed solubility (wettability of jameed and stability of its dispersion). Additionally, these results are comparable with Hamad *et al*. [17], who reported that adding whey protein to jameed enhanced wettability, which improved the properties of jameed and enhanced the solubility process. When comparing orange albedo treatments with apple peels treatments of jameed, results showed that orange albedo treatments at all levels increased the wettability better than apple peels.

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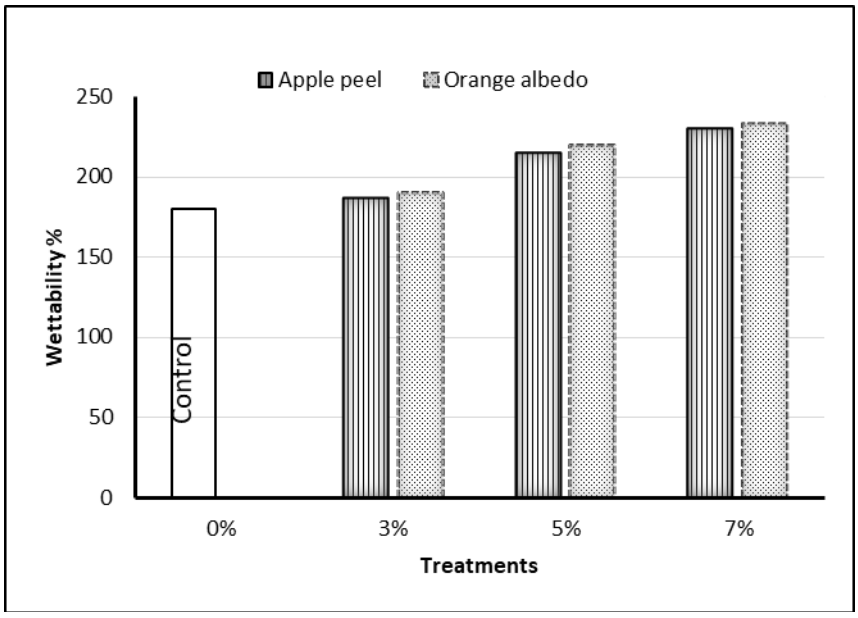

Figure 1: Wettability (after 24 h) of jameed treated with apple peels and orange albedo

Separation layer

Figure 2 shows the separation layer of jameed (after 10 min) treated with apple peels and orange albedo. All concentrations of orange albedo and apple peel significantly decreased ($p \leq 0.05$) the separation layer. The most effective treatment in decreasing the separation layer (20%) was 7% apple peel treatment. These results agree with those of a study by Quasem *et al*. [13] who reported that the addition of carrageenan (0.15%), Arabic gum (0.5%), or starch (1%) to the jameed paste reduces the separation layer of jameed. When comparing orange albedo treatments with apple peel treatments, results show that orange albedo treatments (3% and 5%) decreased the separation layer better than apple peel treatments (3% and 5%).

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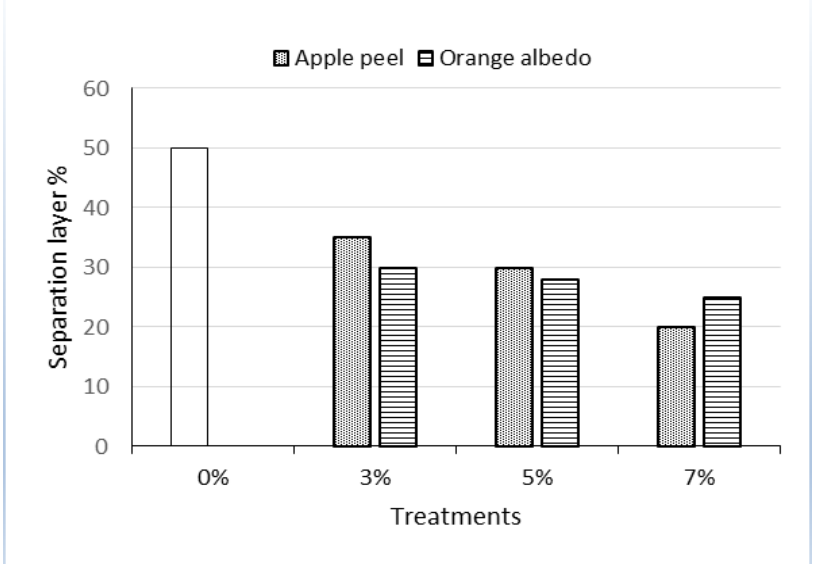

Figure 2: Separation layer (after 10 min) of jameed treated with apple peels and orange albedo

Table 2 shows the mean hedonic scores for appearance, color, flavor, taste, consistency and overall acceptability for jameed treated with different concentrations (3%, 5% and 7%) of apple peels and orange albedo. The panelists were of both sexes and of different age groups. The results showed that when compared to control, all treatment concentrations significantly improved ($p \leq 0.05$) scores for appearance, color, flavor, taste, consistency and overall acceptability. These results agree with those of a study by Angor [4] who concluded that when compared to control, using the fiber (barley and wheat bran) at different concentrations for jameed improved its sensory attributes. When comparing apple peel and orange albedo treatments for jameed in all scores, there were no significant differences in overall acceptability scores between them.

CONCLUSION

In conclusion, all treatments of apple peels and orange albedo used for jameed were effective in increasing the protein, fiber, ash content and wettability percentage when compared with control. The best treatment for increasing protein, fiber, ash and wettability percent was 7% for both apple peels and orange albedo. All treatments of orange albedo and apple peels decreased the separation layer percentage. The most effective treatment in decreasing the separation layer was 7% apple peel treatments.

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The sensory attributes including appearance, color, flavor, taste, texture, consistency and overall acceptability were improved by adding orange albedo and apple peels at different levels.

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Table 1: Effect of apple peel and orange albedo on the chemical composition of jameed

Treatments	Protein (g%)	Fiber (g%)	Moisture (g%)	Ash mg%)
Apple 3%	9.4^{b}	1.4^{b}	68.9^{a}	9.5^{c}
Apple 5%	5.5^{a}	1.8^{a}	61.3^{b}	14.6^{b}
Apple 7%	5.9^{a}	1.95^{a}	58^{c}	15.4^{a}
Control	2.5^{c}	0.2^{c}	70.0^{a}	8.3^{d}
Orange 3%	4.89^{b}	1.33^{c}	68.9^{a}	9.1^{c}
Orange 5%	5.02^{ab}	1.76^{b}	59.9^{b}	14.6^{b}
Orange 7%	5.8^{a}	1.89^{a}	59.3^{b}	15.4^{a}

Values are the means of four replicates, means with different letters within the same column are significantly (**; $^{2}p \leq 0.05$) different according to LSD

Table 2: Sensorial characteristics of jameed treated with different amounts of apple peels and orange albedo[1]

Treatments	Appearance	Color	Flavor	Taste	Consistency	Overall acceptability
Apple 3%	4^{b}	4.07^{b}	4.26^{ab}	4.29^{a}	4.09^{b}	4.14^{ab}
Apple 5%	4^{b}	4.02^{b}	4.51^{a}	4.48^{a}	4.23^{a}	4.3^{a}
Apple 7%	3.4^{c}	3.3^{c}	4.09^{b}	3.95^{b}	4.03^{b}	3.95^{b}
Control	3.19^{c}	3.2^{c}	3.2^{c}	3.13^{c}	3.17^{b}	3.31^{c}
Orange 3%	3.9^{b}	4.04^{b}	3.85^{c}	3.92^{b}	3.85^{c}	4.1^{b}
Orange 5%	4.56^{a}	4.16^{a}	4.17^{b}	4.24^{a}	4.20^{ab}	4.4^{a}
Orange 7%	4.65^{a}	4.31^{a}	4.24^{ab}	4.19^{ab}	4.26^{a}	4.2^{ab}

Each mean is the average of 50 panelists, where 5 refers to extremely like, either like or dislike and 1 refers to extremely dislike. Values within the same column followed by different letter are significantly (**; $p \leq 0.05$) different according to LSD

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