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Influence of Inulin Addition on Physical Properties and Sensory of 'Dadih'

[1]Ruzaina Ishak, [2]Shuhaimi Mustafa, [3]Abdullah Sipat,
[4]Sharifah Kharidah Syed Muhammad and [5]Mohd. Yazid Abd. Manap
[1]School of Health Sciences, University College of Technology and Management
Malaysia, 40100 Shah Alam, Selangor.
[2]Department of Microbiology, [3]Department of Biochemistry, Faculty of Biotechnology
and Biomolecular Sciences,
[4]Department of Food Science, [5]Department of Food Service and Management,
Faculty of Food Science and Technology, Universiti Putra Malaysia
43400 Serdang, Selangor, Malaysia

Abstract: The aim of this study was to evaluate the physical and organoleptic properties of 'dadih' supplemented with inulin among students and staffs in University Putra Malaysia during the year 2004. Supplementation of inulin was shown to increase hardness, fracturability and cohesiveness but decrease syneresis of the resulting 'dadih'. In addition, sensory evaluation showed that trained panelist judged 'dadih' made from skim milk and fresh milk as acceptable. The whole study indicates that inulin can be used as additives in 'dadih' making in order to improve the physical properties and sensory of 'dadih' product.

Key words: 'Dadih', inulin, physical properties, sensory

INTRODUCTION

'Dadih' is a traditional food normally consumed as a dessert in the northern region of Peninsular Malaysia (Hamzah, 1983) . Physically, it is a soft solid with a fine texture resembling custard and does not break easily when scoop. Despite the fact that 'dadih' has been consumed for decades, information on its chemistry and development technology is rather scarce. However, consumers are reluctant to accept product with textural properties and flavors different from traditional ones. As a result, producing a high quality 'dadih' is a challenge for the food industry.

Szczesniak (1987) emphasized the significance of texture such as hardness was measured as the peak compression force (N) during the penetration of the samples, fracturability as the force (N) at the first significant break in the TPA curve, cohesiveness as the ratio of the positive force area during the second compression to that during the first compression and syneresis is a process in which gel shrinks and expels liquid on consumer acceptance, especially when the expectations are not met by product quality. In this respect inulin is able to fulfil the role of physical properties and sensory modifier. Inulin, a nondigestible carbohydrate containing naturally occurring fructo-oligosaccharides, possesses some characteristics of dietary fibers and such is of particular interest for its metabolic properties (Anonymous, 1999)

Fiber may interact with other components of the food during processing. These interactions may lead to changes in bioavailability of nutrients, texture or flavor of the product (Fernández-García and McGregor, 1997). The fat substituting property of inulin is based on its ability to stabilize the structure of the aqueous phase, which creates an improved 'creaminess' mouth feel (Blosma, 1997). Another benefit of inulin is its prebiotic function. Inulin stimulates the growth of *Bifidobacterium* spp. which helps in increasing the population of good bacteria in the colon (Havenaar *et al*., 1999). The aim of this study was to examine the physical properties and sensory characteristics of 'dadih' desserts with added inulin.

MATERIALS AND METHODS

Production of 'Dadih': The study was conducted at Processing Laboratory, Food Technology Department, University Putra Malaysia during the year 2004. 12.5% of skim milk powder was mixed with 15% of sugar, 0.1% salt and 6 mM $CaCl_2$. Each mix was pasteurized (80-90°C, 10

Corresponding Author: Dr. Shuhamini Mustafa, Department of Microbiology, Faculty of Biotechnology and Biomolecular Sciences, Universiti Putra Malaysia 43400, Serdang, Selangor, Malaysia

min) after incorporating with 0, 5, 7 and 9% of inulin, cooled to 70°C, inoculated with kesinai (*Streblus asper*) enzyme in a ratio of 1:10 and stirred. The mixed was filled 15 mL into 30 mL containers, incubated (70°C) until coagulate, cooled and chill stored (4°C). The production of 'dadih' was repeated with fresh milk sample.

Texture analysis: Texture analysis was conducted using a TA.XT2 Texture Analyser (Stable Micro System), fitted with a 5 mm diameter probe, set up to record the force used to penetrate the sample to a depth of 35 mm at a speed of 2.0 mm/s (Anonymous, 1999) at 28±2°C. Hardness was measured as the peak compression force (N) during the penetration of the samples, fracturability as the force (N) at the first significant break in the TPA curve and cohesiveness as the ratio of the positive force area during the second compression to that during the first compression.

Determination of Syneresis: To determine syneresis, 15 mL of 'dadih' sample were placed in a funnel filter with filter paper and store at 4°C for 2. The volume of whey (pure, natural, high quality protein from milk) was measured. The syneresis index (%) is measured as mL of whey per 15 mL of initial sample. All measurements were performed in triplicate.

Sensory assessment: Sensory evaluation was conducted by a trained panel (seven judges) at the Sensory Laboratory, Universiti Putra Malaysia during the year 2004, according to IDF (International Dairy Federation, 1997) and BSI Standards ISO 5929 (British Standard Institute, 1986) and using a variation of the Quantitative Descriptive Analysis (QDA) method (Stone and Sidel, 1993). Initially judges developed a list of terms describing the texture attributes of 'dadih' using commercial samples. Definitions were developed for each of the five terms chosen (creaminess, sweetness, bitterness, firmness and total acceptance). A 16.5 cm line scale, anchored with the words low and high 2 cm from each end, was used to rate intensity of the attributes. The samples store at 4°C, were removed from the freezer and tempered for 8 min at 22°C prior to sensory testing (Chantal *et al*., 1996). The 'dadih' were presented with a 3-digit code and testing was conducted in separated booths.

RESULTS AND DISCUSSION

The result shows that the addition of inulin alters the texture of 'dadih' samples. Hardness of 'dadih' was observed to be considerably lower 18.13% for fresh milk and 14.53% for skim milk, respectively compared to the control (Table 1), whilst the addition of 5% inulin to the 'dadih' base reduced the overall hardness of the product. However, this was not observed at higher inulin additions after 10 min tempering. The addition of inulin up to 9% increased the overall hardness of the products by 28.31% for fresh milk and 5.69% for skim milk (Table 1). The increased stickiness observed within inulin enriched samples can be related to the formation of a viscous gel matrix (El-Nagar *et al*., 2002). These observations are consistent with Chang and Carpenter (1997) which stated that inulin (soluble fiber) could be more suitable than other soluble fibers studied such as oat fiber, that considerably increases the hardness of the product.

The addition of 5% inulin also slightly reduced the fracturability of 'dadih' by 23.93% for fresh milk and 7.87% for skim milk, respectively in comparison to standard product (Table 2). However, this was not observed at higher inulin additions after 10 min tempering.

Table 1: 'Dadih' hardness as determined using a Texture Analyzer expressed as peak positive force (values represent means±SD)

	Hardness (N)			
Inulin (%)	Fresh milk	SD	Skim milk	SD
0	16.99	±0.42	±17.55	±0.71
5	13.91	±0.99	±15.00	±0.64
7	18.67	±0.35	±16.13	±0.79
9	21.80	±0.29	±18.55	±0.20

*Control was 0% of inulin. Values are mean±SD of triplicate measurements

Table 2: 'Dadih' fracturability as determined using a Texture Analyze expressed as peak positive force (values represent means±SD)

	Fracturability (N)			
Inulin (%)	Fresh milk	SD	Skim milk	SD
0	16.88	±0.36	15.51	±0.53
5	12.84	±0.95	14.29	±0.26
7	13.81	±0.69	15.48	±0.68
9	14.54	±0.29	16.46	±0.10

*Control was 0% of inulin. Values are mean±SD of triplicate measurements

Table 3: 'Dadih' cohesiveness as determined using a Texture Analyzer expressed as peak positive force (values represent means±SD)

	Cohesiveness (N)			
Inulin (%)	Fresh milk	SD	Skim milk	SD
0	0.52	±0.00	0.57	±0.01
5	0.82	±0.13	0.58	±0.01
7	0.97	±0.04	0.59	±0.02
9	1.03	±0.02	0.60	±0.01

*Control was 0% of inulin. Values are mean±SD of triplicate measurements

Table 4: 'Dadih' syneresis as determined using a Texture Analyzer expressed as peak positive force (values represent means±SD)

	Syneresis (N)			
Inulin (%)	Fresh milk	SD	Skim milk	SD
0	31.02	±0.93	37.33	±1.07
5	28.16	±0.64	33.83	±0.52
7	26.12	±0.49	29.7	±0.07
9	25.14	±0.38	25.6	±0.72

*Control was 0% of inulin. Values are mean±SD of triplicate measurements

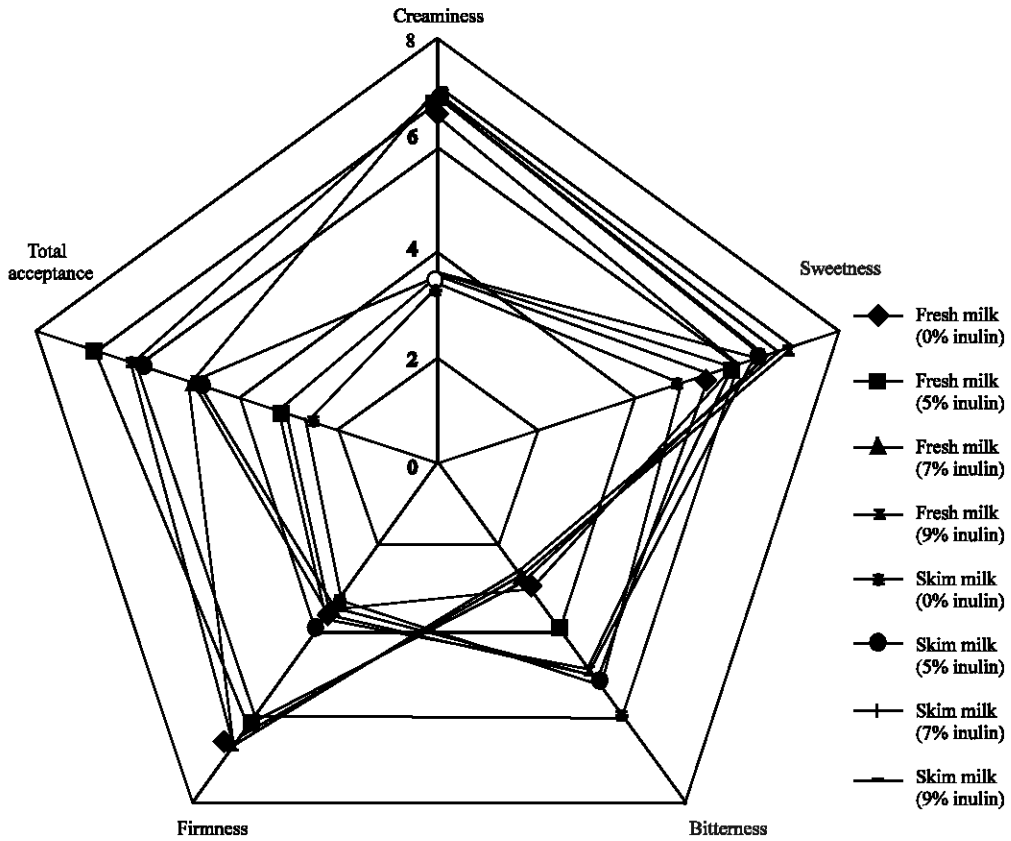

Fig. 1: Sensory attributes for 'dadih' as determined by trained sensory analysis panel

El-Nagar *et al.* (2002) reported that the melting and softening rate is reduced in relation to increasing inulin concentration. Above 50% concentration, the gels retain their fat-like texture as they become firmer. The presence of other hydro colloids and processing conditions, such as temperature and mixing shear, affect the gel formation characteristics (Pszczola, 1997).

Result for cohesiveness of both 'dadih' samples (Table 3) indicates that the addition with 5, 7 and 9% of inulin increased overall cohesiveness of the products by 57.69, 86.54, 98.08% for fresh milk and 1.75, 3.51, 5.26% for skim milk (El-Nagar *et al*, 2002). Inulin has traditionally been used as a fat replacer in dairy foods and has been shown to have positive effects on the rheology and stability of products(El-Nagar *et al*, 2002). This is consistent with previous knowledge indicating that stabilizers enhance the formation of a cohesive network (Andersen and Nielsen, 1998) and can contribute to the formation of gel-matrix which in turn results in a more stable product (Robinson, 1997).

Inulin's solubility in water depends on temperature: at 10°C, the solubility is about 6% and at 90°C, it is approximately 35%. It has water binding capacity of about 2: 1 (Silva, 1996). Table 4 shows syneresis of 'dadih' reduced by 59.14% for fresh milk and 7.87% for skim milk with the additional of inulin up to 9%. This result agreed with Tudorica *et al*. (2002) which stated that being highly hydrophilic, it is likely that the inulin preferentially absorbs the water, inhibiting starch swelling and absorption of water, which in turn may alter the structure of the pasta produced. The gelling properties of inulin improving the consistency of the mix together with the increased water binding (El-Nagar, 2002). This result also incorporated by personal communication with Dr. Daniel Jim, Purdue University which stated that increasing inulin concentration at constant starch concentration decreases drainage.

Sensory attributes of the texture of 'dadih' is profiled in Fig. 1. Sensory descriptions of the 'dadih' (skim milk) sample were creaminess, sweetness, bitterness, firmness and total acceptance while the 'dadih' (fresh milk) were perceived more positively, with a softer and smoother texture. Addition of inulin to the 'dadih' (skim milk) improved the sensory characteristics of the samples with the rating of the 'dadih' resembling that of the 'dadih' (fresh milk). The improved mouth feel of the

samples containing inulin may be associated with decreased meltability. Although samples containing inulin were significantly different from the control, changes in inulin concentrations appeared not to affect the texture characteristic (in the range used). Inulin is used either as a macro nutrient substitute to replace fat or as a supplement to foods, added mainly for its nutritional properties. It is combined with water to produce the same texture and mouth feel as fat in water-based foods such as dairy products and table spreads, as well as baked goods, fillings, frozen desserts and dressings (Schaller-Povolny and Smith, 1999).

In conclusion, the addition of inulin improved Malaysian traditional dessert to be more acceptable and functional product for consumers.

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