Effect of different processing treatments on physicochemical and syneresis of rose flavour oil incorporated soy yoghurts during storage

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ABSTRACT

The present study aimed to study effect of autoclaving, microwave, and roasted treatments on physico chemical and syneresis of rose flavour oil incorporated soy yoghurt during storage. The moisture content of the yogurt samples ranged from 94.68% to 83.3 %. The highest percent moisture was observed in yogurt control (YO) due to the absence of essence. The values obtained for ash content of the yogurt samples varied between 1.33% to 1.66%. Addition of rose essence significantly affect the ash content of yogurt samples. There was a significant variation in the percent fat content. The highest average fat content is 1.16% while the lowest fat content is 1.03 %. Due to the addition of essence there was little effect on fat content. The incorporation of essence significantly increased the pH value of yoghurt samples. However, increase in essence concentration also showed a non-significant effect on pH of yoghurt samples. The pH value of yogurt samples decreased as the storage time increased, Acidity showed an inverse trend to pH. Syneresis value of control yogurt (YO) was 12 %, while for autoclave treated, microwave, roasted treated soy yogurt without addition of flavours syneresis was 12.66%,12.66% and 11%. On storage the syneresis increased by higher whey formation.

Keywords: soy yoghurt, processing treatments, moisture, pH, syneresis.

1. INTRODUCTION.

Soybean, (Glycine max) (L) Merr.is economically the most important bean in the world, providing vegetable protein for millions of people and ingredients for hundrends of chemical products and a potential source of bio- active peptides [1]. On average, soybean contains about 40% protein [**2**].Soy also contains carbohydrates, phytochemicals, saponins, phytic acid and fiber, all thought to provide health benefits. Phytochemicals include the isoflavones (genistein, daidzein and glycitein), phytic acid and saponins. Soy protein has been investigated for benefit in terms of other cardiovascular disease risk factors, reducing menopausal symptoms, weight loss, arthritis, brain function, and exercise performance enhancement. Saponins in Soy enhance immune function and bind to cholesterol to limit its absorption in the intestine [**3**]. Soy milkis considered as a suitable economical substitute for cow’s milk and an ideal nutritional supplement for lactose-intolerant population [4] It naturally has about the same amount of protein (though not the same amino acid profile) as cow’s milk.

Soy fortified yoghurt is a nutraceutical food. Yoghurts with 5% added soy protein concentrate qualify for the FDA-approved soy health claim of “cholesterol reducing” and also contain sufficient fiber to provide 1 g of dietary fiber per serving [5]. For a potential therapeutic effect, probiotic organisms need to be delivered in the active form. Dairy and soy foods may serve as the ideal systems for the delivery of probiotic bacteria to the human gastro intestinal tract (GIT), since they may pro- vide a favorable environment, which promotes growth and enhances viability of these microorganisms. In dairy and soy applications, probiotic organisms are delivered with different fermented dairy and soy products, most notable yoghurt and soy yoghurt. Incorporation of probiotic organisms such as *Lactobacillus acidophilus*, *Bifidobacterium* sp. and *L. casei* in fermented products provides a potential to improve the quality of the product and the health status of consumers. Dairy and soy foods may serve as the ideal system for delivery of probiotic bacteria to the human gastrointestinal tract (GIT) due to provision of a favorable environment and enhances the viability of these microorganasims . They play crucial roles in the fermentation of milk, soy and meat products, and vegetables such as cabbage. During the bacterial fermentation, major constituents including lactose and milk proteins, soy proteins, raffinose, stachyose and other soy carbohydrates are utilized for the bacterial growth, which results in the conversion of fermentable materials into a range of products such as lactic acid, acetic acid, peptides, amino acids and different vitamins.

Soymilk has a high amount of protein, iron, unsaturated fatty acids and niacin, but it is low in fat, carbohydrates, calcium. It has little saturated fat and no cholesterol; hence it is known to reduce the risk of heart disease [**6]**. It is safe for people with lactose intolerance or milk allergy and for children with galactosemia. However, the beany flavor due to the presence of aldehydes and alcohols and flatulence caused by indigestible oligosaccharides limit the widespread consumption of soymilk [7][. Fermentation improves the bioavailability of isoflavones, assists in digestion of protein, provides more soluble calcium, enhances intestinal health, and supports immune system. However, soymilk is the aqueous extract of whole soybeans (Glycine max). Soymilk is considered as a suitable economical substitute for cow’s milk and an ideal nutritional supplement for lactose-intolerant population [8].

Different treatments have been given to soybeans for extraction of soymilk, for example microwave, autoclaving andRoasting.It was found that by giving these treatments there were little variations on some properties of soygurt. Due to the great variety of foods obtained from soybeans, different processing methods are required. Traditional methods include two types of processes: (1) fermentation, to produce fermented products; and (2) soaking and grinding of the soybeans to make soymilk. During fermentation, protein is digested into peptides and later into amino acids for increasing digestibility of protein by the human body. Soaking and grinding are usually combined with thermal treatment to inactivate biologically active compounds such as trypsin inhibitors, lipoxygenase, and hemaglutinins, while increasing digestibility of proteins. In addition, thermal treatment (continued steaming) helps to diminish the characteristic beany flavor of raw soy products due to the volatilization of monocarbonyl compounds, which results from oxidation of fatty acids by the enzyme lipoxygenase. However, excessive heating may destroy certain amino acids that are sensitive to heat such as lysine, with losses of possibly more than 50% [9]. Until recently, little research was being done on the effects of autoclaving on soybean grains and their sub-products. This is because of the recent interest in the use of autoclave as a potential technology to improve the quality of cereals and textured products. These studies include reduction in the microbial population of soymilk to obtain a product with longer shelf life and to avoid

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secondary contamination. The solubilization of protein from whole soybean grains subjected to different treatments of pressure, time, and temperature was also reported. Additional information is available in a more extensive context about the effects of this technology on the inactivation of pure soybean lipoxygenase and lipoxygenase from some legumes [10].

The present study aimed to study effect of autoclaving, microwave, and roasted treatments on physicochemical and syneresis properties of rose flavour oil incorporated soy yoghurt during storage.

II. MATERIALS AND METHODS

2.1 Raw materials:

The soybeans were brought from the local market of Hazratbal Srinagar- J&K.All reagents used in the study were of analytical grade.

2.2 Methodology:

2.2.1 Determination of moisture content:

The moisture content was determined according to AOAC (2000) in this regard, the sample material were taken in a flat-bottom dish (pre-weighed) and kept at 3 hour in an oven at 100 to 110 °C and weighed. The loss in weight was regarded as a measure of moisture content which was calculated by the following formula.

$$\text{Moisture (\%)} = \frac{\text{weight of fresh sample} - \text{weight of dry sample}}{\text{Weight of fresh sample}}$$

2.2.2 Determination of Ash content

The Ash content of each of yogurt samples was determined at 550°C according to the AOAC (1995) method. The ash content is expressed as the inorganic residue left as a percentage of the total weight of yogurt incinerated.

Ash(%)=weight of ash/weight of sample×100

2.2.4 Determination of Fat

Extraction of fat from yoghurt samples was conducted by soxhlet apparatus, using solvent petroleum ether at 92ºC. This method involves following steps:

Three grams of sample were placed inside thimbles and a cotton plug was placed on them. The weight of empty canisters was noted and was filled with 60ml of petroleum ether each. The apparatus was started. Boiling was conducted at 92°C for 30 minutes, followed by rinsing 15 minutes and finally solvent recovery for 10 minutes. After the completion of the process, the canisters were taken out and placed inside an oven so that solvent is fully evaporated. The weight of canisters along with residue was taken and following formula was applied for

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the calculation of fat content;

Fat% = W2-W1/Ws×100

Where, W1 = initial weight of canisters

W2 = final weight of canisters and

Ws = weight of sample

2.2.5 Determination of titratable acidity

Titratable acidity as tartaric acid was determined according to the method of AOAC(2000). Each sample f the products was treated with 0.1NNaOH solution using titration flask of which three to five drops of phenolphthalein indicator were used. The volume of alkali used was noted and calculated using following formula.

$$\text{Titrable acidity (\%)} = 1 \text{ x } \frac{\text{Eq. wt of acid x normality of NaoH x Titer}}{\text{10 x weight of sample}} \text{x 100}$$

2.2.6 Determination of pH

For determination of pH (Hydrogen ion conc.) in the products, a method of AOAC(2000) was adopted and digital pH meter was used. Sample solution was taken in the beaker and directly inserted the electrode into the solution. When the first reading was completed, the electrode was wiped with distilled water and dried up with tissue paper. Similarly, as a continue series, all other samples were determined accordingly.

2.2.7 Determination of Syneresis (whey separation)

Syneresis (%) expressed as volume of separated whey per 100mL of yogurt was determined in a triplicate by taking homogenous five mL of yogurt in a test tube, centrifugation (5000rpm for 20 min at 4 ^{0}C) and measurement of whey separated 1 min after centrifugation [11].

III. RESULT AND DISCUSSION

3.1 Physiochemical composition of soyyogurt

As shown in Table 1 the moisture content of the yogurt samples ranged from 94.68% to 83.3 %. The highest percent moisture was observed in yogurt control (YO) due to the absence of essence. Moisture was observed decrease in fortified yogurt due to the incorporation of rose flavor. The values obtained for ash content of the yogurt samples varied between 1.33% to1.66%.Addition of rose essence significantly affect the ash content of yogurt samples. It was observed that due to addition of essence ash content increased. The ash content of yogurt fortified carrot juice and stabilizer was reported to be 0.65% to 0.90% [12]. There was a significant variation in the percent fat content. The highest average fat content is 1.16% while the lowest fat content is 1.03 %. Due to the addition of essence there was little effect on fat content . As we know that there is

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not much presence of fat in rose essence,that is why there was not that much effect on fat content by addition of thisflavours. The percent fat content of yogurt fortified with omega 3 fatty acid was reported to be 3.18% [13]. Fortified yogurts compared with control yogurt (YO) showed changes mostly related to fat, moisture and ash content due to addition of essence. No significant changes were observed in the protein content of fortified yoghurts. According to the USDA (2001), yogurt with less than 0.5% fat content should be labeled as not fat yogurt, those with fat content within the range of 0.5-2.0% before the addition of bulky should be labeled low fat yogurt and those with fat content above 3.25% should be labeled as yogurt.pH and acidity are inversely proportional to each other. Negative logarithm of the hydrogen ion concentration is pH. It is more authentic means of measurement than titratable acidity. The titratable acidity provides a measurement of quantity of acid present whereas pH gives the measurement of potency of that acid. The results in table (1) control yogurt (YO) showed lowest values of pH while incorporation of essence significantly increased the pH value of yoghurt samples. However, increase in essence concentration also showed a non-significant effect on pH of yoghurt samples. A non-significant change in pH values of yoghurt sample incorporated with different concentrations of essence was reported [14]. The pH value of yogurt samples decreased as the storage time increased, which could be due to conversion of lactose to lactic acid. pH of plain yogurt and yogurt containing flavours was reported to be 4.43 to 4.46[15]. Acidity showed an inverse trend to pH. The results in table 1 shows that acidity of fortified yogurt sample is significantly affected due to incorporation of essence. Control (YO) showed highest value for acidity which decreased with incorporation of essence. Incorporation of essence at various concentrations had a non-significant on acidity value of yoghurt samples. A similar trend for acidity of yoghurt samples fortified with essence(flavour) was reported [16]. This decrease in acidity can be due to presence of oil in yoghurt samples that can hinder growth of lactic acid producing bacteria.But here we introduced flavour so it doesnot effect acidity that much,it almost shows the same value of acidity as in controlled yogurt.

The aim of giving such treatments like autoclaving is to inactivate the enzymes like urease and proteolytic enzymes, and microwave treatment also inactivates the urease and trypsin inhibitors.

Table:1.Changes in physico chemical properties of soy yogurt with different treatments during storage.

	Moisture	Ash	Acidity	Fat	pH
T1	94.6±1.05	1.33±0.05	0.004±0.00	1.1±0.14.43±0.057	
T2	95.5±1.02	2.13s±0.51	0.003±0.00	1.06±0.054.4±0.01	
T3	86.6±0.99^{b}	1.42±0.28	0.003±0.001	1.033±0.284.43±0.05	
T4	87.7±1.05^{c}	2.61±0.90	0.006±0.001	1.066±0.114.36±0.05	
T5	88.74±1.03	1.99±0.40	0.005±0.00	1.1±0.14.43±0.05	
T6	89.75±1.01	1.38±0.05	0.002±0.001	1.16±0.15	4.5±0.1
T7	87.62±1.30^{d}	1.25±0.06	0.003±0.001	1.033±0.57	4.4±0.1
T8	83.73±1.01^{a}	1.16±0.05	0.004±0.001	1.1±0.1	4.46±0.

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T1(controlled),T2(roasted),T3(autoclave),T4(microwave),T5(C+Essence),T6(R+essence),T7(autoclave+essence),T8(MW+essence)

Values are the mean of three replicated trials=standard deviation

3.2 SYNERESIS.

Syneresis or spontaneous whey separation on the surface of yogurt is considered a defect [17], and addition of flavour in yogurt could have effects on the thickening and gelling properties of the product [18, 19]. Syneresis value of control yogurt (YO) was 12 %., whereas for autoclave treated,microwave, roasted treated soy yogurt without addition of flvours syneresis values are 12.66%,12.66%,11%. These results were in fair agreement with previously reported values. Incorporation of oil(essence) in yoghurt samples significantly increased syneresis than control [19]. It is well known that the addition of essence decreases the amount of water released from yogurt [20]. A decrease in syneresis at higher essence concentration was reported [21, 22, 23]. The decrease in the percent of whey separation may be attributed to that at lower temperature the bonds between the particles of the gel are stronger or their members are greater. Presumably, this is because the particles are more swollen and thereby connected to each other over a larger area [24, 25. 26]. Yogurts containing EPS-producing cultures had better water holding capacity, which increased during storage [27, 28, 29] and thereby lower whey separation [30, 31, 32, 33].On storage the syneresis gets increased by higher whey formation,as shown in table 2.

Table:2Changes in Syneresis of soy yogurt with different treatments during storage.

Syneresis	DAY0	DAY5	DAY10	DAY15
T1	12±1	22.6±2.08	28±1	30.66±0.57
T2	12.66±2.08	15.33±1.5	23.6±1.5	29±1
T3	12.66±2.08	15.33±1.5	23.6±1.52	29±1
T4	11±1	16±1	21.6±1.527	26.6±1.5
T5	12±2	17.33±1.5	24±2	31±1
T6	12±1	19.33±1.1	24±2	32±1
T7	13.33±1.52	18.33±1.52	22.3±1.52	31.3±1.52
T8	10.66±1.15	16.33±1.52	24±1	30±1

T1(controlled),T2(roasted),T3(autoclave),T4(microwave),T5(C+Essence),T6(R+essence),T7(autoclave+essence),T8(MW+essence). Values are the mean of three replicated trials=standard deviation

IV. CONCLUSION.

This study was aimed to study effect of autoclaving, microwave, and roasted treatments on physico chemical and syneresis of rose flavour oil incorporated soy yoghurt during storage. The moisture content of the yogurt samples ranged from 94.68% to 83.3 %. The highest percent moisture was observed in yogurt control (YO) due to the absence of essence. The values obtained for ash content of the yogurt samples varied between 1.33% to 1.66%. Addition of rose essence significantly affect the ash content of yogurt samples. There was a significant variation in the percent fat content. The highest average fat content is 1.16% while the lowest fat content is 1.03 %. Due to the addition of essence there was little effect on fat content. The incorporation of essence significantly increased the pH value of yoghurt samples. However, increase in essence concentration also showed a non-significant effect on pH of yoghurt samples. The pH value of yogurt samples decreased as the storage time increased, Acidity showed an inverse trend to pH. Syneresis value of control yogurt (YO) was 12 %, while for autoclave treated, microwave, roasted treated soy yogurt without addition of flvours syneresis was 12.66%,12.66% and 11%. On storage the syneresis increased by higher whey formation. However, the nutritional and sensory properties and the microbiological quality of the foods made from soaked roasted soybean flour need to be investigated.

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