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Study of Physicochemical Properties of Fermented Wheat Flour (*Sheera*)

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Abstract—*There are so many health benefits of fermented food, therefore fermented food taking worldwide attention nowadays. Fermented wheat flour (seera) is a traditional fermented product, which is more common in hilly and distant area of Himachal Pradesh. The seera is generally produced by natural fermentation process by soaking, crushing, and fermenting of the wheat grains. Fermentation of wheat is occurred by natural microflora mainly include Saccharomyces cerevisiae, Cryptococcus laurentii and Torulosporadelbrueckii among yeasts and Lactobacillus amylovorus, Bacillus sp., and Leuconostoc sp. among bacteria. In the present study bulk density analysis, water absorption capacity,starch pasting property and proximate analysis of seera and wheat flourwere evaluated. Paste clarity and color of seerawere also evaluated Results revealed that bulk density and water holding capacity of seerawas significantly higher as compared to wheat flour. Pasting properties of seera were greatly affected as compared to wheat flour because of breakdown of starch chain during fermentation process.*

Keywords: *Fermented wheat flour (Seera), Wheat flour and Physicochemical properties.*

1. Introduction

Fermented wheat flour (*Seera*) is a traditional fermented product, which is more common in hilly and distant area of Himachal Pradesh. It is produced by fermentation of wheat flour. There are so many health benefits of fermented food. Now a days fermented food taking worldwide attention. Besides the health benefits of *seera*, it also plays a very important role in the enhancement of flavour, nutritional value and increased storage stability with reduced cooking time. In India several varieties of cereal and legume- based fermented food namely bread, *idli*, *dhokla*, *pinni, dosa, papad* etc. are recognized, however, there are no many information found about similar food like *seera*. There are so many microflora present in *seera*, which are responsible for the fermentation process namely *Saccharomycescerevisae*, *Cryptococcuslaurentii* and *Torulosporadelbrukeckii* among yeasts and *Lactobacillusamylovorus*, *Bacillus* sp. and *Leuconostoc* sp. among bacteria (Ahamad et al., 2017).

Seera is generally produced by natural fermentation process by soaking, crushing, and fermenting the wheat grains. The grains are immersed in water for 2-3 days to allow fermentation to occur by natural microflora. After 2-3 days grains are ground and soaking is completed to allow the starch grains and some proteins to get down and bran is removed. The solids material, which are settled down are sun dried and this dried material is called *Seera* (Thakur et al., 2004). It looks like a white and shiny appearance, when it remains fresh. Its appearance resembles like that of semolina *halva* but its texture having more softness and smoothness (Ahamad et al., 2017). For making the *Seera*, the dried material are taken and immersed in to the water which is then poured in to hot ghee, sugar is added with the required amount and make slurry then served (Thakur et al., 2004). *Seera* is a very nutritious food, sometimes for the purpose of increasing its nutritious value it mixed with other grains like buckwheat, millet, barley. *Seera*, bhaturu, bari, jhol, chhang etc., are quitepopular traditional fermented food products containing probiotics. These foods are not only traditionally fermented but are also functional foods therefore it contributing the more health benefits not only in the state but also in the other parts of the country (Sherma et al., 2013). In the village based markets of Himachal Pradesh it is available in the small packets and serves as a source of income for rural people. It provides lots of health and economic benefits to the villagers. It recommended to the jaundice and hepatitis people. It is also recommended for postnatal women (Ahamad et al., 2017). The information illustrates that the pregnant mothers in the Himachal Pradesh serves the food preparation along with *Seera* with a view to control abortion (Kanwar and Sharma, 2011).

Many researchers extracted the starch from different sources for examples, pearl millets flours (Suma and Urooj, 2015) taro (Colocasiaesculenta), barley and oat (Šubarić1 et al., 2011), wet milled rice flour (Lumdubwong and Seib, 1999) and wheat flour (Blazek and Copeland, 2007). But, when the starch is extracted from fermented cereals that enhanced the properties of starch such as paste clarity, water absorption capacity and solubility (Juliantiet al., 2011), that may be used in the preparation of different food products.

Such development process will increase the understanding of the functionality of fermented wheat flour. Therefore the present investigation was based on different objectives such as to prepare the fermented wheat flour (*Seera*) by traditional method andcompare the physical and functional properties between *seera* and wheat flour.

2. Materials and methods

2.1 Materials

Wheat grain was purchased from the local market of Kanpur. All the chemicals, organic solvents and acids were used for analytical grade.

2.2 Preparation of fermented wheat flour

Fermented wheat flour (Seera) was prepared with the help of method given byAhmad et al.(2017).

2.3 Bulk density analysis

The bulk density (BD) was determined by filling the starch into 10 mL measuring cylinder and gently tapping on a cloth. The values were recorded and BD was expressed as mL/g (Suma and Urooj, 2015).

2.4 Water absorption capacity analysis

Water holding capacity was determined by transferring the flour into 25 mL of centrifuge tubes. The dispersions was stirred for 30 min at room temperature and then centrifuged at 3000 X *g* for 15 min. The supernatant was decanted, excess moisture was removed by draining and the centrifuge tubes containing sample was reweighed. The gain in weight was be expressed as gram (g) of water absorbed per gram (g) of sample (Babu and Parimalavalli,2014).

2.5 Starch pasting properties analysis

Pasting properties of the starch samples was analysed using a Rapid Visco Analyser (Newport Scientific, Australia). Standard profile was supplied with the instrument was used with 3 g of starch with 25 ml of deionized water. Peak viscosity, viscosity at trough and final viscosity was recorded (Blazek and Copeland, 2008).

2.6 Paste clarity analysis

Paste clarity was measured according to the method described by Babu and Parimalavalli (2014). Starch (0.05 g) was suspended in distilled water (5 ml) in a glass tapered tube and heated at 95^{o}C for 30 min with shaking every 5 min. After cooling, the starch clarity was measured in terms of % transmittance on a spectrophotometer (LAB UV 3000plus Double beam Spectrophotometer, LABINDIA, India) at 650 nm against water blank.

2.7 Color analysis

Color of the samples was evaluated using a handheld colorimeter (Chroma meter, CR-400, Konica Minolta Optics, Japan). CIE L* represents lightness, a* represents redness, and b* represents yellowness were evaluated (Benítez et al., 2015).

2.8 Statistical analysis

All experiments were performed in triplicatee and values are mentioned in mean and standard deviation by using the statistical program SPSS (version 24) (Kumar et al., 2019).

3. Results and Discussion

3.1 Development of fermented wheat flour (*seera*)

In the fermentation process, wheat was immersed in the tap water and kept in an incubator at 30 ± 0.5°C for 96 hours. The water was drained after 12 hour of soaking and new water was added immediately. After soaking, the softened wheat was grounded in the grinder and the wheat bran was remove by filtering through muslin cloth and the batter was obtained, and it was placed in refrigerator so that starch settles down and the supernatant was discarded. The batter was sun dried to form fermented wheat flour, which is also called *Seera*. The whole method has illustrated in Figure 1.

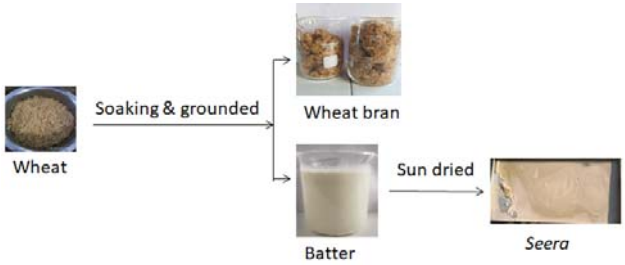

Fig. 1 Preparation method of *Seera*

3.2 Bulk density analysis

Bulk density of *seera* is lower than the wheat flour (Table 1). The decrease in bulk density of *Seera* may be due to broken down of starch by the action of microorganism during fermentation. Similar result was observed by Ikujenlola et al. (2008) and Ahmad et al. (2017).

Table 1: Bulk density of flours

S. No.	Sample	Bulk Density g/ml
1	Seera	561.3 ± 0.565
2	Wheat flour	593.7 ± 0.591

Values are in mean ± SD, where n=3

3.3 Water holding capacity analysis

Water holding capacity is related to the particle size of components. WHC was found higher in *Seera* while slightly lower in wheat flour as mentioned in Table 2. It may occur because of smaller particles absorb more water as compared to larger particle.

Table 2.Water holding capacity of flours

S. No.	Sample	Water holding capacity
1	Wheat flour	1.13±0.06
2	Seera	1.35 ± 0.02

Values are in mean ± SD, where n=3

3.4 Starch pasting properties analysis

The pasting properties of a food refer to the changes that occur in the food as a result of application of heat in the presence of water. These changes affect texture, digestibility, and end use of the food product. Table 3 shows the effect of fermentation on the pasting profile of *seera* and wheat flour. Pasting temperature of *seera* was higher than wheat flour. Peak viscosity was increased significantly from2060 cP to 4100 cPin *seera*as compared to wheat flour. Reduction in peak viscosity in wheat flour may be due to the low concentration of starch as compared to *seera* as well asweak interactions between the starch and protein that is present in wheat flour. While *Seera* contain 85-90% of only starch and during preparation of *seera* most of the protein content washout and bran removed therefore *seera* has higher peak viscosity as compared to Wheat flour. Peak viscosity has been reported to be correlated with water binding capacity of starch which takes place at equilibrium point between swelling which causes an increase in viscosity while rupturing and realignment cause its reduction. Hold viscosity and final viscosity were also followed the similar trend (Ocheme et al., 2018).

Table 3: Starch pasting properties of flours

S. No.	Parameter	Wheat Flour	Seera
1	Pasting Temperature (°C)	77.40 ± 0.6263	83.90 ± 0.95
2	Peak Viscosity (cP)	2060.00 ± 0.863	4100.00 ± 0.725
3	Hold Viscosity (cP)	1375.00 ± 1.256	2545.00 ± 0.932
4	Final Viscosity (cP)	2657.00 ± 0.875	4140.00 ± 1.235

Values are in mean ± SD, where n=3

3.5 Paste clarity analysis

Paste clarity is a much desirable functionality of starch for its utilization in food industries, since it directly influences brightness and opacity in foods that contain it as thickener. Paste clarity in *Seera* was obtained in range of 61.34. More clarity of the paste in *Seera* might be due to the small particle size of starch molecule. Similar result was obtained by Julianti et al.(2011) in fermented cassava flour.

3.6 Color analysis

The data obtained from Table 4, revealed that color observed in *seera* and wheat flour in terms of lightness (L*), yellowness (b*) and redness (b*). The L*, a* and b* values of the *seera* were found to be90.2, 0.953 and 8.52 respectively whereas L*, a* and b* values of the *wheat flour* were found to be 89.6, 0.965 and 8.92.For L* values is because of the presence of starch as a principle component, as verified by the proximate composition. The a* and b* values decreased for seera samples (Ahmad et al., 2017).ΔE represented the overall change in the color of sample. Overall changes in wheat flour sample were more as compared to *seera*.

Table 4: Color properties of flours

S. No.	Sample	L*	a*	b*	ΔE
1	Seera	90.21 ± 0.374	0.953 ±0.070	8.52 ± 0.592	6.696 ± 0.176
2	Wheat flour	89.60 ±0.057	0.965±0.3166	8.92±0.020	6.849±0.137

Values are in mean ± SD, where n=3

Conclusions

The results showed that the benefits of traditional preparation of fermented wheat flour (*seera*).The functional properties water holding capacity and Bulk density of the *seera* were enhanced. Pasting property of *Seera* was increased as compared to wheat flour that may affect the texture, digestibility and end use of the food product that may be used in the production of bakery products. Due to separation of bran its lightness was increased where as a* and b* value was found lower. Enhanced paste clarity was found in *seera*.*Seera* is not only traditionally fermented food but it is also containing several functional properties therefore it may contribute in improving the several health problems.

Declaration of conflict of interest

Authors declare no conflict of interests.

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