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EFFECT OF TRADITIONALLY TREATED WHEAT ON BREAD MAKING QUALITIES

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ABSTRACT: This paper represents the work on bread qualities baked from traditionally treated wheat. Increases in gluten content associated with increases in bread height were directly proportional to the decreases in bread weight, WAC, FBC, SIG, and LARC. Bread made from 20 min fried wheat (4.5 cm), 20 min parboiled wheat (4.3 cm), 12hr soaked + 20 min parboiled wheat (4.4 cm) possessing lowest bread height with absence of gluten with increased WAC, FBC, SIG, and LARC responsible for poor bread qualities. In comparison height of the bread prepared in 12 hr soaked wheat (6.5 cm), raw wheat (5.6 cm), 12 hr soaked+ 12 hr sprouted wheat (5.5 cm), possessing good bread height with high gluten content, decreased WAC, FBC, SIG, and LARC. Moreover, prolonged sprouting condition like 12 hr soaked + 24 sprouted wheat (4.3 cm) consisting highest bread height with lower gluten level (5.02 g) than all traditionally treated wheat may be recommended for gluten less bread, gluten free cakes and biscuits preparations. Further studies needed to carry out on prolonged wheat sprouting more than 12 hr + 24 hr sprouting on gluten level and its disulphide chemical bonding structure.

KEYWORDS: Wheat, Traditional treatment, Bread making, Gluten, Bread height.

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1. INTRODUCTION

Bread-making is a traditional fermentation technology mostly produced from wheat flour, water, yeast, sugar, and salt by a series of process involves mixing, kneading, proofing, shaping, and baking [1]. Bread is viewed globally as a staple high energy convenient food with lower glycemic index, calorie, B-vitamins, vitamin E, and minerals. In ill person bread plays an important role and

assisting with their treatment because of their nutrient dense protein and fiber content [2]. In 2017 US data census survey reports about 319.24 million Americans consumed bread [3]. Wheat is a principal cereal containing elastic gluten network linked by disulphide bonds shapes the bread baking. Gluten is a macropolymer stabilized by more than 100 heterogeneous polypeptides mainly consist of elastic polymeric glutenins and viscous monomeric gliadins utilized as an ingredient in infant food, fast foods, snack items and pasta, bread and bakery items [4], [22]. Gluten consumption raised the incidence of non-communicable diseases such as diabetes, cancer, heart diseases, and intestinal abnormalities. Furthermore, human pathologies such as food allergy, celiac disease, and gluten sensitivity raised epidemically in recent days due to intake of gluten containing cereals in diet [4]. Gluten free diet improves gut health, reduces the incidence of gluten related disorders like osteoporosis, irritable bowel disease, inflammatory bowel disease, anemia, cancer, fatigue, cancer sores, rheumatoid arthritis, lupus, multiple sclerosis, autoimmune diseases and also psychiatric, neurological diseases, anxiety, epilepsy, neuropathy, autism [5]. Traditional treatment of wheat like prolonged sprouting enhances the digestive enzyme activities and inhibits the enzyme inhibitors makes available of all essential aminoacids, vitamins, proteins, low sodium and free in tans fatty acid and cholesterol and reduces the antinurtient factors may reduces the incidence of many gluten related disorders [6]. In present investigation work was carried out to determine the bread qualities like bread weight, length, width, height and related parameters such as WAC, FBC, SIG, and LARC on all traditionally treated wheat. This study add benefits to the gluten related disorder and diabetic patients to take limited level of gluten free food with fortified nutrients.

2. MATERIALS AND METHODS

2.1. Raw material

The traditional treatment was divided into seven groups each group contains two and a half kilograms of cleaned wheat procured from Neyveli main bazaar market, Tamilnadu, India.

2.2. Experimental work

2.2.1. Raw wheat: The sun dried wheat seeds without any treatment**. 2.2.2. Parboiled wheat 20 min:** The wheat sample pressure cooked for 20 minutes and after rinsed with clean water, sundried for 3 days. **2.2.3. Fried wheat 20 min:** The wheat sample was allowed to fry for 20 minutes and cooled at room temperature. **2.2.4. 12 hr soaked wheat:** The wheat sample was allowed to soak for 12 hours, rinsed with distilled water and sundried. **2.2.5. 12 hr soaked + 20 min parboiled wheat:** After 12 hr soaking wheat sample was pressure cooked for 20 minutes and sun dried for 3 days. **2.2.6. 12 hr soaked + 12 hr Sprouted wheat:** After 12 hr soaking wheat sample was covered in a cotton cloth and left for 12 hours sprouting with keep wet by spraying water for every 4 hours and sun dried for 3 days. **2.2.7. 12 hr soaked + 24 hr sprouted wheat:** After 12 hr soaking wheat sample was covered in cotton cloth and left for 24 hours sprouting with keep wet by spraying water for every 4 hours and sun dried for 3 days.

2.3. Milling

All the sun dried treated samples from each group were milled into a fine powder by using madras standard grinding mill fitted with < 0.5 mm sieve. Avoiding the contamination or mixing of each sample, the mill was cleaned and then ½ kg of wheat samples from each group was grinded separately and discarded. Then the fine wheat flour was cooled at room temperature by spreading the wheat flour thinly on clean paper sheet with marking each wheat sample separately. After cooling wheat flour was stored in airtight plastic container and stored at 4°C for further analysis.

2.4. Determinations

2.4.1. Determination of water absorption capacity of wheat [7]. 2.4.2. Determination of fat binding capacity (FBC) of wheat [8]. 2.4.3. Determination of swelling index of glutenin (SIG) of wheat [9]. 2.4.4. Determination of lactic acid retention capacity (LARC) of wheat [10]. 2.4.5. Determination of gluten content in wheat flour - hand washing method [11]. 2.4.6. Determination of Bread making: weigh about 300 grams of wheat flour. Add 5 gram sugar (or 5 gram salt for salt bread), 5 grams of baker's yeast and 5 grams of oil. Mix well and left for 30 min. Add 300 ml of water for dough consistency. The prepared dough was placed in the baking pans and left for 1 hour. The pans were transferred to preheated oven at 180 °C – 250 °C and baked for 1 hour. Then the baked breads were taken out and left to cool at room temperature. The baked breads were measured for bread volumes such as weight, length, width, height of breads [12].

2.5. Statistical Analysis

The experiment was analyzed with three replications. The statistical analysis was done for all the data by using statistical analysis tool SPSS 17.0 with the significant of $P < 0.05$. The results were presented as mean ± standard deviation.

3. RESULTS AND DISCUSSION

3.1. Effect of traditionally treated wheat on bread making qualities like water absorption capacity, fat binding capacity, Swelling index of glutenin, lactic acid retention capacity, gluten content, bread weight, bread length, bread width, and bread height.

In the present study, gluten free and gluten less good quality bread baked from all traditionally treated wheat like raw wheat, 20 min parboiled wheat, 20 min fried wheat, 12 hr soaked wheat, 12 hr soaked wheat + 12 hr sprouted wheat, 12 hr soaked + 24 hr sprouted wheat. The results of bread making parameters were tabulated in table1, table 2 and the bread height differences among treated wheat were shown in figure 1.

3.1.1. Effect of traditionally treated wheat on water absorption capacity.

The highest WAC results in decreasing order observed in 20 min parboiled wheat (3.62 g), 20 min fried wheat (2.58 g), 12 hr soaked + 20 min parboiled wheat (2.49 g) respectively. Lowest WAC in increasing order observed in12 hr soaked wheat (1.84 g), 12 hr soaked + 24 hr sprouted wheat (1.86 g), raw wheat (2.10 g), 12 hr soaked + 12 hr sprouted wheat (2.43 g) respectively. The water

absorption of flours depends on technological quality of protein, processing and composition [13]. The Water absorption capacity is the ability of proteins in flour to absorb water, ability to retain gas, increases the bread volume swell under conditions and improved consistency in food [14]. Water absorption capacity is desirable in bulking, consistency of product, baking application [15]. The water absorption capacity varied among flours because of protein concentration, degree of interaction with water. The lower water absorption capacity is due to lower protein content, loss of less starch structure such as amylase and amylopectin less availability of polar amino acids in flour. High water absorption capacity is an indicative of higher protein content, loss of more starch polymers [16], [25]. WAC increased after soaking, germination, and heating. WAC of germinated grains increased due to increased protein content during germination [17].

Table 1: Effect of traditionally treated wheat on water absorption capacity (WAC), Fat binding capacity (FBC), swelling index of glutenin (SIG), Lactic acid retention capacity (LARC), and gluten content

Groups	WAC (g)	FBC (%)	SIG (%)	LARC (%)	Gluten (g)
Group 1	2.10 ± 0.02^{b}	5.03 ± 0.02^{c}	2.02 ± 0.00^{b}	117.8 ± 0.05^{d}	6.88 ± 0.01^{b}
Group 2	3.62 ± 0.03^{e}	6.66 ± 0.03^{g}	3.37 ± 0.01^{g}	301.3 ± 0.05^{g}	--
Group 3	2.58 ± 0.01^{f}	5.23 ± 0.03^{d}	2.72 ± 0.02^{e}	158.0 ± 0.05^{f}	--
Group 4	1.84 ± 0.01^{a}	4.76 ± 0.02^{b}	2.20 ± 0.00^{c}	86.3 ± 0.05^{a}	9.35 ± 0.01^{d}
Group 5	2.49 ± 0.01^{d}	5.93 ± 0.01^{f}	2.80 ± 0.00^{f}	132.2 ± 0.05^{e}	--
Group 6	2.43 ± 0.00^{c}	5.65 ± 0.01^{e}	2.30 ± 0.00^{d}	109.2 ± 0.05^{c}	9.12 ± 0.01^{c}
Group 7	1.86 ± 0.01^{a}	4.36 ± 0.02^{a}	2.0 ± 0.00^{a}	94.9 ± 0.05^{b}	5.02 ± 0.01^{a}

Group 1: Raw wheat; **Group 2:** Parboiled wheat 20 min; **Group 3:** Fried wheat 20 min; **Group 4:** 12 hr Soaked wheat; **Group 5:** 12 hr Soaked + 20 min Parboiled; **Group 6:** 12 hr Soaked + 12 hr Sprouted wheat; **Group 7:** 12 hr Soaked + 24 hr Sprouted wheat.

3.1.2. Effect of traditionally treated wheat on fat binding capacity.

Traditionally treated wheat like 20 min parboiled wheat (6.66 %), 20 min fried wheat (5.23 %), 12 hr soaked + 20 min parboiled wheat (5.93 %) have increased fat binding capacities represented in decreasing order. Decreased fat binding capacities in increasing order observed in 12 hr soaked + 24 hr sprouted wheat (4.36 %), 12 hr soaked wheat (4.76 %), 12 hr soaked + 12 sprouted wheat (5.65 %). In raw wheat possessing (5.03 %) of FBC respectively. Fat binding is an entrapment of oil or binding of fat by nonpolar side chains. The ability of food components, in proteins and carbohydrates influences the textural, retains the flavor and quality of the food [18], [15]. The lower fat binding capacity is due to low hydrophobic proteins which show superior binding of lipids [19]. The relatively high fat binding capacity is an indication of the rate at which the protein binds to fat in food formulations where fat holding capacity is needed in sausage and bakery products [20].

3.1.3. Effect of traditionally treated wheat on swelling index of glutenin.

In raw wheat SIG results in (2.02 %). SIG was increased in 20 min parboiled wheat (3.37 %), 12 hr soaked + 20 min parboiled wheat (2.80 %), 20 min fried wheat (2.72 %) and decreased SIG observed in 12 hr + 24 hr sprouted wheat (2.0 %), 12 hr soaked wheat (2.20 %), 12 hr + 12hr sprouted wheat (2.30 %) respectively. Swelling index of glutenin (SIG) is a rapid and convenient method to predict wheat flour qualities like gluten strength, dough extensibility and pasta making [9].

3.1.4. Effect of traditionally treated wheat on lactic acid retention capacity.

Traditional treatment of wheat study showed that 20 min parboiled wheat having (301.3%), 20 min fried wheat (158%), 12 hr Soaked + 20 min Parboiled wheat treatment (132.2 %) has the highest Lactic acid retention capacity (LARC) than 12 hr soaked + 12 hr sprouted wheat (109.2 %), 12 hr soaked + 24hr sprouted wheat (94.9 %) and very lowest LARC in 12 hr soaked wheat (86.3 %) and LARC of raw wheat possessing (117.8 %) respectively. LARC is simpler to screen gluten quality, dough strength, bread loaf volume [21].

3.1.5. Effect of traditionally treated wheat on gluten content.

Among all traditionally treated wheat higher gluten content is observed in 12 hr soaked wheat about (9.35 g) and next in 12 hr soaked + 12 hr sprouted wheat treatment (9.12 g). Gluten degradation notified in 12 hr soaked + 24 sprouted wheat (5.02 g) having very low gluten content. In 20 min parboiled wheat, 20 min fried wheat, 12 hr soaked + 20 min parboiled wheat has no gluten content isolated in grams. Wheat gluten degradation is directly proportional to the sprouting time. Fermentation increases the acidity results in production of amylases and proteases. Short time fermentation is not efficient in degradation of gluten content when compared with raw wheat holding (6.88 g). Proteolyses of glutenin subunit was more eminent after 24 hr fermentation [22].

3.1.6. Effect of traditionally treated wheat on bread weight, bread length, bread width and bread height.

Table 2: Effect of traditionally treated wheat on bread weight, bread length, bread width, and bread height.

Groups	Bread weight (g)	Bread length (cm)	Bread width (cm)	Bread height (cm)
Group 1	505.74 ± 0.01^{c}	18.0 ± 0.05^{a}	8.3 ± 0.05^{b}	5.6 ± 0.05^{c}
Group 2	686.69 ± 0.01^{g}	18.3 ± 0.05^{d}	8.0 ± 0.05^{a}	4.5 ± 0.05^{b}
Group 3	593.46 ± 0.01^{e}	18.3 ± 0.05^{d}	8.3 ± 0.05^{b}	4.3 ± 0.05^{a}
Group 4	483.27 ± 0.00^{a}	18.2 ± 0.05^{bc}	8.6 ± 0.00^{d}	6.5 ± 0.05^{d}
Group 5	599.08 ± 0.05^{f}	18.2 ± 0.05^{bc}	8.4 ± 0.05^{c}	4.4 ± 0.05^{ab}
Group 6	511.02 ± 0.02^{d}	18.3 ± 0.00^{cd}	8.7 ± 0.00^{e}	5.5 ± 0.05^{c}
Group 7	492.85 ± 0.01^{b}	18.2 ± 0.00^{b}	8.5 ± 0.05^{d}	4.3 ± 0.05^{a}

Group 1: Raw wheat; **Group 2:** Parboiled wheat 20 min; **Group 3:** Fried wheat 20 min; **Group 4:** 12 hr Soaked wheat; **Group 5:** 12 hr Soaked + 20 min Parboiled; **Group 6:** 12 hr Soaked + 12 hr Sprouted wheat; **Group 7:** 12 hr Soaked + 24 hr Sprouted wheat.

The highest bread weight measured in 20 min parboiled wheat having (686.69 g) with lowest bread height (4.5 cm), bread length (18.3 cm), bread width (8.0 cm). In 12 hr soaked + 20 min parboiled wheat treatment possessing the bread weight of (599.08 g), bread length (18.2 cm), bread width (8.4 cm), height (4.4 cm). In 20 min fried wheat bread weight shows (593.46 g), bread length (18.3 cm), bread width (8.3 cm) and bread height (4.3 cm) respectively. The lowest bread weight (483.27 g) with highest bread height (6.5 g), bread length (18.2 cm), bread width (8.6 cm) measured in 12 hr soaked wheat. In 12 hr soaked + 12 hr sprouted wheat treatment bread weight measured were (511.02 g), bread length (18.3 cm), bread width (8.7 cm), and bread height having (5.5 cm). In 12 soaked + 24 hr sprouted wheat treatment bread weight (492.85 g), bread length (18.2 cm), bread width (8.5 cm), and bread height having (4.3 cm) when compared with raw wheat bread weight having (505.74 g), bread length (18.0 cm), bread width (8.3 cm), bread height (5.6 cm) respectively. Wheat flour containing total gluten network confers expansion of bread height. The high yield breads depend on increased protein and damaged starch granules. Absence of gluten content reflects lowest bread height [23]. The importance of protein level was due to its gluten fraction in gluten was responsible for the elasticity of dough by causing it to extend and trap the carbondioxide generated by yeast during fermentation [24]. Temperature increase makes greater loss in bread making qualities like edge region (crust), baking size, surface area, gluten percentage (Table 2).

Figure1. Bread prepared from traditionally treated wheat.

4. CONCLUSION

Wheat (*Triticum aestivum*) based food particularly bread consumption is probably increased epidemically all over the world [25]. In some individuals wheat induced gluten related disorder might occur due to gluten toxic proteins. Much research publication pointed that traditional treatment could reduce the wheat intolerance and toxicity. This work concludes that among the

seven treatments the wheat flour from 20 min parboiled, 20 min fried, and 12 hr soaked + 20 min parboiled wheat treatment affects the bread making qualities such as weight, length, width, height and makes absence of gluten content may recommended for many other healthy food preparations. In 12 hr soaked + 12 hr sprouted wheat results in good bread qualities with little reduction in gluten level than 12 hr soaked wheat. Moreover, prolonged treatment time 12 hr + 24 hr sprouted wheat has higher reduction in gluten level with good bread qualities in comparison with raw wheat bread. All these traditionally treated wheat are recommended for different varieties of healthy food preparations once again to retain our olden way of living and their health impacts in this modern life style world due to the increasing incidence of human disorder, and diseases.

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CONFLICT OF INTEREST

The author declares no conflict of interest.

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