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The Effect of Chemical Characteristics of Wheat Variety on Loaf Volume of Bread

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ABSTRACT

Nutritional education has triggered change in bakery industry forcing manufacturers to switch from refined flour to whole wheat flour for production of bakery products. Bread prepared from whole wheat flour is gaining more importance due to its good nutritive value and constipation avoiding properties. Chemical parameters vary from one variety to another which directly affect baking property of product. In present study different wheat variety samples were procured from various wheat research centres, milled into flour having particle size of 180 µm. This whole wheat flour was analysed for different chemical parameters viz. moisture content, protein content, ash content, sedimentation volume and dry gluten content. Breads were prepared from these flour and final products (bread) were evaluated for physical parameters i.e. loaf volume expressed in cm3/g. Interrelation could be clearly established between chemical parameter of flour and loaf volume of bread. Results revealed that wheat variety WH 1021 had average moisture content 13.2 %, low ash content 0.61, good sedimentation volume 64 mL and dry gluten content of 10.9 % producing good loaf volume of 3.4 cm3/g as compared to other wheat verities like HD 2967, PBW 550, Sonalika and HW 2004

Keywords: *Whole wheat flour, loaf volume, sedimentation volume.*

1. INTRODUCTION

History of bread can be mapped from 8000 BC where mixed grains were hand ponded to flour on pestle and mortar to produce flour, flour kneaded and baked to produce bread similar to Indian bread. Gradual evaluation in bread making processing led to adding of leavening agents like yeast to this kneaded flour causing rising of bread during baking making it softer and more nutritious.Wheat *(Triticum aestivum)* is major cereal crop round the world where major population consumes it as staple food. This dominant cereal thrives well in temperate climatic countries and is widely used for human and animal consumption where major portion is processed to refined wheat flour which forms basic raw material of bakery industry (Khatkar *et al.*, 2016). Green revolution has given birth to many new varieties of wheat suitable for cultivation in different climatic condition and geographical areas having good nutritive value. (Yadav *et al.*, 2006) Modern milling techniques, improved wheat verities are setting new mile stones for improving quality of bakery products (Mohan *et al.*, 2009). Research carried out at finer scale report difference in nutritional and chemical composition of wheat from one variety to another which directly affect baking property of developed product (Ktenioudaki *et al.*, 2010). Changing life style and modern eating habits have been linked to many diseases and disorders. Awareness among consumers regarding consumption of fibre rich, whole grain diet is forcing bakery product manufacturers to switch from use of refined wheat flour to whole wheat flour. (Monasterio and Graham, 2000)

2. MATERIAL AND METHODS

Multiple wheat samples of five different varieties were collected from different agricultural research stations viz: HD 2967, PBW 550, Sonalika, WH 1021 and HW 2004. Collected samples were cleaned and condensed to 15% moisture content for period of 48 h and milled into flour having particle size of 180 µm. Flour samples were further analysed for parameters like % moisture content, % ash content, sedimentation volume, gluten index and % dry gluten content using standard method (AACC, 2000) and mean value of same varieties were noted. **Table 1.** Flour obtained was used to prepare bread using 2.5 % baker's yeast, proofing at 90^0 F at 75% Relative Humidity for period 2 h and finally baking at 180^0 C for period of 30 minutes **Fig-1**. After cooling loaf volume of baked bread was measured. SPSS software version 16.0 (SPSS Inc.) was used for statistical analysis of data. Duncan's multiple range test was used for comparison of mean and the statistical significance was observed at $p < 0.05$.

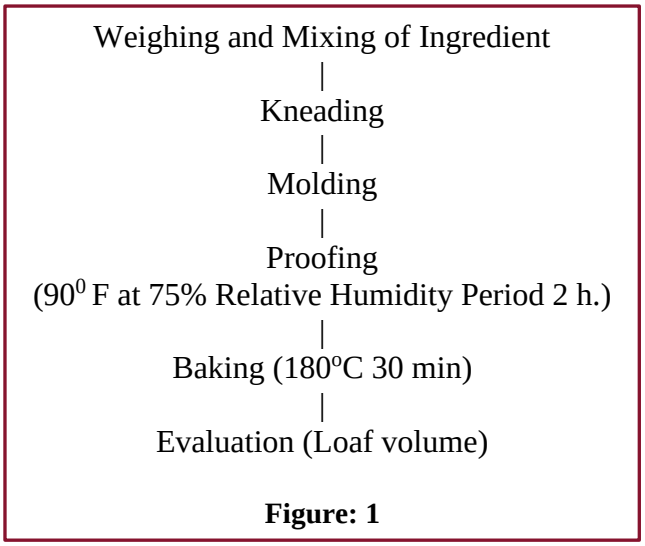

Figure: 1

3. RESULTS AND DISCUSSION

Physiochemical analysis data of wheat flour sample reveled in Table I. Moisture content in flour of Sonalika wheat was maximum 13.5 % and that of HW 2004 was minimum 12.6%. Moisture content of PBW 550 and WH 1021 was 13.3 and 13.2. Similar readings were note by Mohan *et al.,* 2013. Maximum dry gluten content of 10.9 % was found in WH 1021 followed by PBW 550 10.3 %. Sonalika flour recorded least count of dry gluten content of 8.7 %. Ash content in HD 2967 flour was found to be maximum chronologically followed by Sonalika, HW 2004, PBW 550 (0.79%, 0.76%,0.70%,0.67), comparatively very less ash content was found in WH 1021 (0.61). Gluten Index (GI) score was maximum in WH 1021 (97.1) and lowest in Sonalika (70.3). Sedimentation volume was found maximum in WH 1021 (64 mL) followed by PBW 550 (60 mL), low counts were recorded by Sonalika and HD 2967 (41 mL and 48 mL). Loaf volume of bread prepared from different variety revealed that maximum loaf volume was produced by WH 1021 3.8 cm^3/g followed by PBW 550 3.4 cm^3/g, minimum value was of 2.9 cm^3/g of HD 2967.

Table I: Physiochemical characteristics of wheat flour and loaf volume of bread developed from them

Variety	**% Moisture**	**% Dry Gluten**	**% Ash**	**GI**	**SV (mL)**	**Loaf volume cm^3/g**
HD 2967	12.9^b	8.8^b	0.79^e	73.1^b	48^b	2.9^b
PBW 550	13.3^c	10.3^d	0.67^b	96.3^d	64^d	3.4^d
Sonalika	13.5^d	8.7^a	0.76^d	70.3^a	41^a	2.6^a
WH 1021	13.2^c	10.9^e	0.61^a	97.1^e	60^e	3.8^e
HW 2004	12.6^a	9.0^c	0.70^c	83.3^c	51^c	3.1^c

SV- Sedimentation volume and GI- Gluten index.

*Mean values followed by different letters within a same column (variety) differ significantly ($p < 0.05$)

4. CONCLUSION

Result concluded that inter relation can be established between loaf volume of bread and other parameters like % Moisture content, % Ash, % Dry gluten, Gluten Index (GI) and Sedimentation Volume. Wheat variety WH 1021 produced good loaf volume as it had low Ash % content of 0.61 which was related to comparatively low fibre content in that variety. Similar interrelation of ash content to loaf volume was noted by Tomasz *et al.,* 2020. Sedimentation volume is also related to loaf

volume of bread (Bradford *et al.*, 2012), data revelled that sedimentation volume of PBW 550 flour was 64 mL producing good loaf volume of 3.4 cm^3 and that of HD 2967 was 48 mL producing low loaf volume of 2.9 cm^3. Good gluten content and good gluten index flour produce good loaf volume in bread (Desimir *et al.*, 2024), Variety WH 1021 and PBW 550 have both and hence found to produce good loaf volume of bread.

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