

Effect of Different Gums on the Quality and Shelf Life of Bread

M.S. BUTT, F.M. ANJUM, A. SAMAD, T. KAUSAR AND M. TAUSEEF MUKHTAR
Department of Food Technology, University of Agriculture, Faisalabad-38040, Pakistan

ABSTRACT

The bread loaves were prepared from wheat flour by adding different levels/types of gums i.e. guar-gum, carboxymethylcellulose (CMC) and sodium (Na) alginate. The prepared breads were evaluated for sensory characteristics during storage for successive intervals of 0, 24, 48, 72 and 96 h. Wheat flour comprised of 12.01% moisture, 10.25% crude protein, 1.07% fat, 0.55% ash, 0.68% crude fibre and 75.44% nitrogen free extract. It was found that treatment containing 1% guar-gum, 0.25% CMC and 0.25% Na alginate proved to be the most effective treatment for the control of fungus. Sensory evaluation of bread was conducted and maximum scores were recorded by treatment having 0.25% CMC, 1% guar-gum and 0.25% Na alginate followed by treatments having 0.25% CMC, 0.75% guar-gum and 0.50% Na alginate for the external and internal characteristics of bread. Use of gums showed larger volume, good crumb, better texture and improved appearance of the finished product as a result of good symmetry and golden brown appearance.

Key Words: Guar-gum; CMC; Sodium alginate; Bread; Fungi

INTRODUCTION

Bread is a perishable commodity having very short shelf life. The major type of microbial spoilage of baked bread is usually moldiness and ropiness. There are many additives, which have been used to improve quality and shelf life of bread. The use of different types of stabilizers is an important development in the baking industry. Carboxymethylcellulose (CMC) is obtained by the action of monochloroacetic acid on cellulose. In bread industry, the term cellulose gum is used to designate purified CMC, suitable for edible purposes (Khundkar & Bhattacharjee, 1965).

The guar-gum is a complex carbohydrate produced from legume crop, which is widely grown in Pakistan and India. It is also being used for therapeutic measures having various types of supplementary dietary fiber such as bran, alpha cellulose and guar-gum (Rutenberg & Monlar, 1981). Guar bread is more chewy and is more acceptable as a replacement for alginate or CMC bread. Light toasting makes guar bread more palatable (Apling *et al.*, 1977).

The present study was undertaken to explore the possibility of using stabilizers like CMC, guar-gum and sodium alginate, alone or in combination to improve the quality of bread.

MATERIALS AND METHODS

Wheat flour, stabilizers i.e. CMC, guar-gum and sodium (Na) alginate were purchased from the local market. Representative sample of wheat flour was analyzed for moisture, crude protein, crude fibre, crude fat, nitrogen free extracts and total ash according to the methods described in AACC (1983). The bread was prepared from flour samples by using straight dough bread baking method No. 10-09

with some modifications in method described in AACC (1983). Table I indicates different treatments used for preparation of bread. Counting and identifications of molds in bread after 0, 24, 48, 72 and 96 h of storage were made by agar plate technique using saboraaud agar medium (Baneke, 1962). The prepared bread loaves were sensory evaluated by a panel of judges at 0, 24, 48, 72 and 96 h of storage for external and internal characteristics.

Table I. Different treatments used for preparation of bread

Treatments	CMC %	Guar-gum %	Na-alginate %
T ₁	1.5	-	-
T ₂	-	1.5	-
T ₃	-	-	1.5
T ₄	1.00	0.25	0.25
T ₅	0.75	0.50	0.25
T ₆	0.50	0.75	0.25
T ₇	0.25	1.00	0.25
T ₈	0.25	0.25	1.00
T ₉	0.25	0.50	0.75
T ₁₀	0.25	0.75	0.50
T ₁₁	0.50	0.25	0.75
T ₁₂	0.75	0.25	0.50
T ₀	-	-	-

Data obtained for various parameters were statistically analyzed by using analysis of variance technique and the treatment means were compared by using Duncan's Multiple Range Test at 0.05% probability level (Steel & Torrie, 1980).

RESULTS AND DISCUSSION

The chemical analysis of flour showed that moisture, ash, crude protein, crude fat, crude fiber and nitrogen free extract were 12.01, 0.55, 10.25, 1.07, 0.68 and 75.44%, respectively.

Maximum number 5×10^2 CFU/gram of colonies were observed in T₀ (control) after 72 h storage (Table II). In this treatment, first colony 2×10^2 CFU/gram was present at 0 h storage. T₇ proved to be most effective treatment against control of fungus. First colony appeared after 72 h storage and after 96 h storage, it was 4×10^2 CFU/gram.

The combination at the level of 1% guar-gum, 0.25% CMC, 0.25% Na alginate in wheat flour gave bread with more volume as compared to the breads prepared without or with gums at different levels. As far as colour of bread crust is concerned (Table III), the results were highly significant. T₇ obtained maximum score (6.48) while minimum score was that of T₈ (3.24). Maximum scores were observed for symmetry of form (4.45) for T₇. The maximum score was 3.47 obtained by T₁₀ after 96 h time interval for character of crust of bread by judges. Maximum mean score was obtained by T₇ (2.56) for evenness of bake. The samples were taken for the evaluation of aroma during storage. In case of 96 h storage time, maximum score (9.40) was observed in T₇ and minimum score (7.36) obtained by T₀ and T₃ (7.40). While in case of internal characteristics of bread, the analysis of variance regarding grain revealed (Table IV) that this character was significantly affected by gums in the wheat flour at various levels. Maximum mean scores were obtained by T₇ (13.28). The results regarding colour of crumb indicated that T₇ for 96 h storage interval scored best with mean value (8.60) followed by T₁₀, T₂ and T₁. The least suitable color of crumb was found to be 5.64 by T₀. The effect of gums on the taste of bread during storage up to 96 h was recorded and maximum score was obtained by T₇ (16.96) and minimum (14.50) was obtained by T₀. The studies on the texture of bread during storage for 96 h were conducted and maximum mean score was found by T₇ (13.58) and minimum mean score (10.60) by T₀.

CONCLUSION

It is concluded that good quality bread can be prepared by T₇ having 0.25% CMC, 1% guar-gum and 0.25% Na alginate. This treatment also performs better control against microbial load. So, the use of treatment T₇ as a stabilizer in bread formulation has great value for improving the over all bread making quality.

REFERENCES

AACC, 1983. Approved Methods of American Association of Cereal Chemists. *Am. Assoc. Cereal Chem. Inc.*, St. Paul, Minnesota.
 Apling, E.C., A.R.L. Leeds, T.M.S. Wolever and D.J.A. Jenkins, 1977. How to make guar bread? *Lancet*, 2: 975.
 Baneke, E.S., 1962. *Medical Mycology: Laboratory Manual*. Burgess Pub. Co., Minneapolis, Minnesota.
 Khundkar, M.H. and A.K. Bhattacharjee, 1965. Studies on carboxy methyl cellulose; preparation of a nontoxic emulsifying agent from jute cellulose. *Pakistan Sci. Ind. Res.*, 10: 89-94.

Table II. Variable fungus count at different storage intervals

Treatments	0 h	24 h	48 h	72 h	96 h
T ₁	-	-	-	4×10^2	4×10^2
T ₂	-	-	-	3×10^2	4×10^2
T ₃	-	2×10^2	4×10^2	5×10^2	6×10^2
T ₄	2×10^2	3×10^2	3×10^2	4×10^2	4×10^2
T ₅	-	-	2×10^2	3×10^2	3×10^2
T ₆	-	-	1×10^2	2×10^2	3×10^2
T ₇	-	-	-	2×10^2	4×10^2
T ₈	2×10^2	2×10^2	3×10^2	4×10^2	4×10^2
T ₉	-	2×10^2	2×10^2	3×10^2	5×10^2
T ₁₀	-	-	-	3×10^2	5×10^2
T ₁₁	2×10^2	3×10^2	3×10^2	4×10^2	5×10^2
T ₁₂	-	2×10^2	2×10^2	3×10^2	5×10^2
T ₀	2×10^2	3×10^2	4×10^2	5×10^2	5×10^2

Table III. Effect of gums on external characteristics of bread after 96 h storage

Treat.	Volume	Color of Crust	Symmetry of form	Character of crust	Evenness of bake	Aroma
T ₁	7.04 c	5.73 d	3.70 d	3.20 c	2.24	8.60 d
T ₂	7.00 c	5.85 c	3.84 c	3.40 ab	2.52	9.00 c
T ₃	4.10 h	3.39 k	3.26 f	2.86 g	1.80	7.40 k
T ₄	4.90 fg	4.53 f	3.29 f	3.04 d	2.06	8.08 g
T ₅	5.95 e	5.22 e	3.42 e	2.99 def	2.06	8.20 f
T ₆	6.48 d	5.26 e	3.66 d	3.00 de	2.16	8.30 e
T ₇	8.39 a	6.48 a	4.45 a	3.33 b	2.56	9.40 a
T ₈	4.70 g	3.24 l	2.65 h	2.75 h	1.74	7.58 j
T ₉	5.00 f	4.13 h	3.10 g	2.91 efg	1.92	7.83 h
T ₁₀	7.50 b	6.20 b	4.18 b	3.47 a	2.62	9.20 b
T ₁₁	4.65 g	3.96 l	3.09 g	2.90 fg	1.90	7.72 i
T ₁₂	5.10 f	3.69 j	3.28 f	2.81 gh	1.86	8.00 g
T ₀	4.21 h	4.29 g	3.32 f	2.96 def	1.75	7.36 k

Table IV. Effect of gums on internal characteristic of bread after 96 h storage

Treatments	Grain	Color of crumb	Taste	Texture
T ₁	11.92 d	7.62 d	16.00 d	12.72 c
T ₂	12.20 c	7.84 c	16.42 c	13.18 b
T ₃	9.02 l	5.78 k	14.70 l	10.76 k
T ₄	10.90 g	7.18 f	15.40 f	12.00 e
T ₅	11.58 e	7.14 f	15.30 g	11.77 f
T ₆	11.44 f	7.50 e	15.60 e	12.22 d
T ₇	13.28 a	8.60 a	16.96 a	13.58 a
T ₈	9.608 j	6.11 l	14.66 j	11.05 j
T ₉	10.50 h	6.22 h	14.90 i	11.35 h
T ₁₀	13.06 b	8.26 b	16.80 b	13.52 a
T ₁₁	10.18 l	6.01 j	14.72 j	11.18 i
T ₁₂	10.96 g	6.60 g	15.10 h	11.49 g
T ₀	9.31 k	5.64 l	14.50 k	10.60 l

Rutenberg, M. and T.R. Monlar, 1981. Preparation of guar-gum. United states Patent U 269 975 (FSTA 14(1): 1127, 1982).
 Steel, R. G. D. and J. H. Torrie, 1980. *Principles and Procedures of Statistics*. McGraw Hill Book Co., Inc., New York.

(Received 11 August 2001; Accepted 10 September 2001)