

Effect of Different Malt Flour Doses on the Quality of Burger Buns

M.S. BUTT, F.M. ANJUM, N. SHAHZADI AND G. MUSTAFA

Department of Food Technology, University of Agriculture, Faisalabad-38040, Pakistan

ABSTRACT

Effect of different malt flour doses (0.025, 0.05, 0.075 & 0.1%) on the quality of burger buns was studied by using wheat variety (Shahkar 95), two wheat lines (94091 & 94105), barley varieties (Jau 87 & Haider 93) and one Huskless barley line. The highest values for physical characteristics i.e. test weight (76.17 kg/hl), 1000 kernel weight (41.59 g), particle size index (12.04) were recorded in the wheat line 94105. The chemical characteristics like moisture contents ranged from 11.08–12.04% and ash 0.38–0.48% in the wheat variety/lines. The wet and dry gluten was found to be significantly the highest in wheat line 94091. Wide variation was observed in the physical dough properties of different wheat varieties/lines. The whole flours showed highest peak height that reduced significantly by the use of malt flour. Sensory characteristics showed that wheat line 94105 got significantly highest score for texture (7.13), grain (6.96), volume (7.27) and taste (7.28) of burger bun. The comparison of doses showed that malt dose @ 0.05% exhibited significantly better effect on texture, grain, volume and taste while supplementation of malt did not significantly effect the colour of burger bun. The present study revealed that wheat flour must be blended with malt flour in order to get the burger buns of optimum quality.

Key Words: Malt flour; Burger bun; Physical and chemical characteristics

INTRODUCTION

The main ingredients used in the production of burger buns are wheat flour, sugar, salt, yeast, vegetable oil, dough improver and preservatives. In burger buns, wheat flour is one of the major ingredients that plays a significant role to govern the quality of burger buns. The commercial wheat varieties grown in Pakistan are generally low in amylase activity especially in alpha amylase. The cereal technologists have recommended the use of diastase enzyme for bread production (Anjum, 1991; Butt 1997). In dough, amylase activity could be enhanced by the use of malt flour in order to get the burger buns of good quality (Joseph, 1983). Due to the lack of amylase activity in wheat varieties grown commercially in Pakistan, the quality of burger bun is affected. This paper describes the variation in the physico-chemical properties of wheat variety/lines; effects of the supplementation of the malt flours in different proportion, on the quality of burger buns, and evaluation of suitable wheat variety/lines for the preparation of high quality bun.

MATERIALS AND METHODS

One wheat variety namely Shahkar 95 and two promising wheat lines 94091, 94105 and two barley varieties Jau 87, Haider 93 and one Huskless barley line were procured from Wheat Research Institute, Faisalabad. The wheat variety/lines were tested for 1000 kernel weight, test weight and particle size index. Each wheat sample was milled by tempering at 15.5%

moisture content through Quadrumate Senior Mill, according to the method described by Williams *et al.* (1986). Malt sample is prepared by steeping till the grains attain the moisture content 45%, germinated at 60-70°F for 72 hours and then dried at low temperature until the moisture in grains is reduced to 11%. The whole germinated barley grains were ground to the finest particle size by Udy Cyclone Sample Mill.

Chemical analysis of wheat flour. The representative samples of wheat flour were analyzed for moisture, crude protein, and total ash; and wet and dry gluten determined following the method of AACC (1983).

Physical dough characteristics. Rheological studies were carried out by running flour samples through Brabender farinograph, mixograph (National Manufacturing Co.) and Amylograph according to their respective methods given in AACC (1983).

Preparation of Burger Buns. The buns were prepared from the flour of each wheat variety/lines samples alone and in combination with 0.025, 0.05, 0.075 and 0.1% malt flour of each barley varieties/line with some modification according to the recipe given by Pylar (1988).

Sensory Evaluation of Burger Buns. Burger buns were evaluated for external and internal characteristics as described by Matz (1972).

Statistical Analysis. The data obtained from different physico-chemical parameters and sensory characteristics of burger buns were subjected to statistical analysis according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

Physio-Chemical Characteristics. Analysis of variance revealed that test weight, 1000 kernel weight and particle size index were effected significantly ($P \leq 0.01$) due to difference in wheat variety/lines. The highest test weight was recorded (76.17 kg/hl) in wheat line 94105 and Shahkar (75.50); while significantly the lowest value for test weight was recorded in case of wheat line 94091 (Table I). It is obvious from the results that 1000 kernel weight was significantly the highest in wheat line 94105 and the lowest in wheat line 94091. The particle size index of different wheat variety/lines showed the highest value (12.04%) in case of wheat line 94105 and significantly lowest PSI (11.08%) was observed in wheat variety Shahkar (Table I).

Table I. Test weight, 1000 kernel weight and particle size index of wheat and barley varieties/lines

Variety/lines	Test wt. (kg/hl)	1000 kernel wt. (g)	Particle size index
94091	73.17b	37.39c	11.65b
94105	76.17a	41.59a	12.04a
Shahkar	75.50a	38.58b	11.08c

Halverson and Zeleney (1988) observed that the test weight is not controlled genetically alone but it is also affected by the environmental factors. Test weight is an important criterion in all wheat grading system. The test weight above 73.4 kg/hl has relatively little influence on flour yield but lower test weight then this decrease (straight grade flour) milling yield. The results for 1000 kernel weight observed in the present study are in agreement with the findings of Finney *et al.* (1973) who previously observed that 1000 kernel weight ranged from 28 to 52.30 g and 29 to 44.5 g in Indian and Mexican wheat varieties, respectively. The variation in results regarding grain hardness based on particle size index is due to the difference in genetic make up of the wheat varieties. The results are corroborated with the findings of Wrigley (1972) who conducted that grain

hardness is controlled genetically.

The moisture content and ash content differed significantly between wheat varieties/lines, while the protein content showed non-significant differences (Table II). The moisture and ash content were found to be significantly highest in the wheat line 94105. The variation in ash content was found from 0.38 to 0.48%. The dry and wet gluten between wheat varieties/lines differed significantly. The highest dry and wet gluten was observed in the wheat line 94091 i.e. 11.99 and 35.43%, respectively (Table II). The significant variation observed in the gluten content among wheat variety/lines may be attributed to the differences in genetic make up of different wheat varieties tested in this study. The findings are also consistent with those of Peterson *et al.* (1992) who reported that the genotype, environment and interaction affect the variation in quality parameters including protein.

Rheological Properties. The farinographic water absorption ranged from 53.00 to 56.70% (Table III). The farinograph dough development time, dough stability of line 94105 was found to be highest i.e. 4.5 min and 8 min, respectively. The variation in the farinographic characteristics of different wheat variety/lines were due to difference in gluten content and quality (Hoseney, 1986; Finney *et al.*, 1987)

It is evident from Table III that mixograph dough development time varied from 3.5–5.2 minutes among different wheat variety/lines. Both peak height (48%) and dough development time (5.2 min) were maximum in wheat line 94105. The measurement of time to peak development of dough enable the predication of optimum dough mixing conditions as described by Batey *et al.* (1989). Laeeq (1996) found mixing time variation from 3.0 to 6.0 min and peak height 60 to 70% of different Pakistani wheat flour and these results are in line with the finding of present study.

In case of amylograms, the time to reach the peak viscosity height was identical for all flour (44 min). The viscosity height ranged from 890 to 1860 BU for flour of different wheat varieties as shown in Table III. The

Table II. Moisture, ash, protein, wet and dry gluten of wheat variety/lines

Variety/lines	Moisture (%)	Ash (%)	Protein (%)	Wet gluten (%)	Dry gluten (%)
94091	11.65b	0.40b	12.83a	35.43a	11.99a
94105	12.04a	0.48a	12.76a	30.37c	10.63c
Shahkar	11.08c	0.38c	12.93a	34.04b	11.53b

Table III. Rheological properties of wheat varieties/lines

Variety/lines	W.A. (%)	Farinographic characteristics		Mixographic characteristics		Amylographic characteristics	
		D.D.T (min)	D.S (min.)	Mixing time (min.)	Peak height (%)	Time (min.)	Viscosity height (BU)
94091	53	3.5	7.5	4.0	45	44	890
94105	56.7	4.5	8.0	5.2	48	44	1860
Shahkar	56	4.0	7.7	3.5	42	44	1790

Table IV. Score for texture, grain and volume of the burger buns at different doses of malt with wheat variety/lines

Barley varieties	Doses	Wheat varieties/lines											
		Texture				Grain				Volume			
		Shahkar	94091	94105	Mean	Shahkar	94091	94105	Mean	Shahkar	94091	94105	Mean
Jau 87	0.000	6.00	7.00	7.00	6.66	6.16	7.00	6.33	6.50	5.00	6.00	6.66	5.89fg
Jau 87	0.025	6.00	6.00	7.00	6.33	5.33	6.00	6.66	6.00	7.33	7.00	7.33	7.22cd
Jau 87	0.050	6.00	8.00	8.00	7.33	7.00	6.00	7.66	6.88	7.67	8.00	8.67	8.11ab
Jau 87	0.075	5.00	7.00	6.00	6.00	5.00	7.00	7.00	6.33	6.67	7.00	6.67	6.78de
Jau 87	0.100	5.00	7.00	7.00	6.33	5.00	6.00	6.66	5.88	4.67	6.33	6.67	5.89fg
Haider 93	0.000	6.00	7.00	7.00	6.66	6.00	7.00	6.33	6.44	5.00	6.00	6.67	5.89fg
Haider 93	0.025	6.00	7.00	7.00	6.66	5.00	8.00	7.66	6.88	8.00	8.33	8.67	8.33a
Haider 93	0.050	8.00	7.00	8.00	7.66	7.00	6.00	7.33	6.77	6.67	7.33	7.33	7.11cde
Haider 93	0.075	6.00	6.00	7.00	6.33	6.00	7.00	6.66	6.55	5.67	6.67	7.00	6.44ef
Haider 93	0.100	6.00	6.00	6.00	6.00	5.00	7.00	6.33	6.11	4.67	5.67	5.67	5.33g
Huskless	0.000	6.00	7.00	7.00	6.66	6.00	7.00	6.66	6.55	5.00	6.00	6.67	5.89fg
Huskless	0.025	7.00	6.00	7.00	6.66	6.00	7.00	6.33	6.11	6.67	7.00	7.33	7.00cd
Huskless	0.050	7.00	7.00	7.00	7.00	7.00	8.00	6.66	7.22	7.33	7.33	7.33	7.33cd
Huskless	0.075	7.00	7.00	8.00	7.33	7.00	7.00	8.00	7.33	8.33	8.67	8.68	8.56a
Huskless	0.100	6.00	8.00	8.00	7.33	6.00	6.00	6.66	6.22	7.67	7.33	7.67	7.56bc
		6.20c	6.86b	7.13a		5.96b	6.90a	6.96a		6.42c	6.98b	7.27a	

maximum viscosity height (1860 BU) was observed in the line 94105.

Sensory Evaluation

Texture. The texture of buns was affected significantly by the wheat variety/lines, barley varieties, interaction between wheat and barley varieties, malt doses and interaction of barley varieties with malt doses. The interaction of wheat variety/lines with malt doses and wheat variety/lines with barley varieties and malt doses exhibited non-significant differences. The mean values for texture scores of burger buns from flours blended with different doses of malt in wheat variety/lines have been shown in Table IV. The malt level 0.05% showed the highest score for texture (7.33) followed by malt level 0.00% having texture score (6.66). The results showed that the wheat line 94105 when combined with Huskless barley gave better score for texture (7.40); while wheat variety Shahkar combined with Jau 87 showed the lowest score for texture (5.60). The present results are quite comparable with Swaranjeet *et al.* (1982) who observed that texture was improved due to the

supplementation of alpha amylase.

Grain. The mean values for the scores of the grains of the burger buns at different doses of malt with different wheat flour have been presented in Table IV. The wheat lines 94105 and 94091 got higher scores (6.96 & 6.90) for grain than the wheat variety Shahkar (5.96). The malt level 0.05% exhibited the highest grain score, followed by the malt level 0.075% (6.74). Significantly, the lowest scores (6.07) for the grain of the burger buns was given when malt level 0.1% was used. Huskless barley @ 0.075 got maximum score (7.33).

The results of the present study confirm the findings of Zawistowska *et al.* (1988) who observed that wheat flours containing high alpha amylase were prepared by adding an appropriate amount of malted barley flour to the commercial flour and concluded that the flour with high alpha amylase could be used to produce a good quality bread, buns and rolls.

Volume. The mean values for the volume of the burger buns prepared from flours blended with different doses of malt have been shown in Table IV.

Table V. Score for colour and taste of the burger buns at different doses of malt with wheat variety/lines

Barley varieties	Doses	Wheat varieties/lines									
		Colour					Taste				
		Shahkar	94091	94105	Mean	Shahkar	94091	94105	Mean		
Jau 87	0.000	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Jau 87	0.025	7.00	7.00	7.00	7.00	7.00	7.00	6.00	7.33	6.77	6.77
Jau 87	0.050	7.00	7.00	7.00	7.00	7.00	7.00	7.00	8.00	7.33	7.33
Jau 87	0.075	7.00	8.00	7.66	7.55	7.00	8.00	8.00	8.00	7.66	7.66
Jau 87	0.100	8.00	7.00	8.00	7.66	6.00	7.00	7.00	7.00	6.66	6.66
Haider 93	0.000	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Haider 93	0.025	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Haider 93	0.050	7.00	7.00	7.00	7.00	8.00	8.00	8.00	8.00	8.00	8.00
Haider 93	0.075	8.00	7.00	7.00	7.33	7.00	6.00	7.00	7.00	6.66	6.66
Haider 93	0.100	7.00	8.00	7.33	7.44	7.00	6.00	7.00	7.00	6.66	6.66
Huskless	0.000	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Huskless	0.025	7.00	7.00	7.00	7.00	6.00	7.00	7.00	7.00	6.66	6.66
Huskless	0.050	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00
Huskless	0.075	7.00	7.00	7.00	7.00	7.00	7.00	7.00	8.00	7.33	7.33
Huskless	0.100	7.00	7.00	7.00	7.00	6.00	8.00	7.00	7.00	7.00	7.00
		7.13a	7.13a	7.13a		6.86b	7.00ab	7.28a			

Huskless barley malt when blended at 0.075% level in flour of different wheat variety/lines got significantly the highest score (8.56) for the volume of burger. When Haider 93 malt flour was blended at 0.025%, it also improved the volume of burger buns. The use of malt of Jau 87 (0.05%) in flour of different wheat variety/lines showed a significant improvement in the score (8.11) of the volume of buns. Significantly the lowest scores for volume was observed when 0.1% malt flour of Haider 93 was blended in the flour of different wheat variety/lines. On overall basis, the malt level 0.05% and 0.025% exhibited the highest score for volume (7.52). The flour of wheat line 94105 got the highest scores for volume, while the buns of wheat variety Shahkar was related to the lowest volume score. The malt of Huskless barley variety yielded better results in the improvement of volume than malt flour of other barley varieties. According to Hickenbottom (1983) the use of malt in buns and rolls gave better volume and these results are in agreement with the findings of present study because the improvement in the volume of buns was observed by the supplementation of malt flour. The results showed that when malt dose exceeded 0.075% the bun volume was depressed.

Colour and Taste. The colour of burger buns showed non-significant differences due to wheat variety/lines, barley varieties, doses of malt and their interactions. It is obvious from the results of Table V that the supplementation of malt didn't significantly affect the colour of the burger buns. The taste varied significantly due to wheat variety/lines and different doses of malt. The highest score (7.28) for taste was achieved by the wheat line 94105 followed by the wheat line 94091 (7.00). The malt level 0.05% showed highest score (7.44) for the taste of the burger buns while the lowest score for the taste was recorded at a level of 0.025% (Table V). Pylar (1988) found the similar results in the enhancement for the taste of burger buns.

REFERENCES

AACC, 1983. Approved Methods of American Association of Cereal Chemists. American Assoc. Cereal Chem. Inc., St. Paul, Minnesota.

- Anjum, F.M., 1991. Electrophoretic Identification and Technological Characterization of Pakistani Wheats. Ph.D. Dissertation, Deptt. Grain Science and Industry, Kansas State University, Manhattan, U.S.A.
- Batey, I.L., C.W. Wrigley and P.W. Gras, 1989. Novel Approaches to Grain Quality and Process control. In: *Wheat is Unique*. Y. Pomeranz (ed.), American Assoc. Cereal Chem. Inc., St. Paul, Minnesota, pp: 161-71.
- Butt, M.S., 1997. Physico-chemical and Protein Composition of Spring Wheats in Relation to End Use Quality. Ph.D. Dissertation, Deptt. Food Technology, University of Agriculture, Faisalabad.
- Finney, K.F., W.T. Yamazaki, V.L. Youngs and G.L. Rubenthaler, 1973. Quality of Indian wheats. *Cereal Sci. Today*, 18: 392.
- Finney, K.F., W.T. Yamazaki, V.L. Youngs and G.L. Rubenthaler, 1987. Quality of hard, soft and durum wheat. Heyene, E.G. (ed.), Agronomy Monograph No. 13. 2nd ed., Madison, WI.676.
- Halverson, J. and L. Zeleny, 1988. Criteria of Wheat Quality. In: *Wheat Chemistry and Technology*. Y. Pomeranz (ed.), American Assoc. Cereal Chem. Inc., St. Paul, Minnesota, pp:15-46.
- Hickenbottom, J.W., 1983. Malts in Bakery Foods. *American Inst. Baking, Tech. Bull.*, 5: 1-8.
- Hoseney, R.C., 1986. Yeast Leavened Products. In: *Principles of Cereal Science and Technology*. American Assoc. Cereal Chem. Inc., St. Paul, Minnesota, p. 203.
- Joseph, W.H., 1983. Malts in Bakery Foods. *AIB Tech. Bull.*, 5: 1-8.
- Laeq, A.G., 1996. Effect of Blending of Imported Wheat on Milling and Baking Quality of Indigenous Wheat. M.Sc. Thesis, Deptt. of Food Technology, University of Agriculture, Faisalabad.
- Matz, S.A., 1972. Bakery Technology and Engineering. 2nd ed. The AVI Publishing Co. Inc., West Port, Connecticut.
- Peterson, C.J., R.A. Graybosch, P.S. Baenziger and A.W. Grombacher, 1992. Genotype and environmental effect on quality characteristics of hard red winter wheat. *Crop Sci.*, 32: 98-100.
- Pylar, E.J., 1988. Baking Science and Technology. Sosland Publishing Co. Merriam, Kansas.
- Steel, R.G.D. and J.H. Torrie, 1980. Principles and Procedure of Statistics. McGraw Hill Book Co. Inc., New York.
- Swaranjeet, K., K. Maninder and G.S. Bains, 1982. Chapaties with leavening and supplements: changes in texture, residual sugars and phosphoric acid. *Cereal Chem.*, 59: 367-72.
- Williams, R., El-Haramein, F.J., Nakkoul, H. and S. Rihawi, 1986. Corp Quality Evaluation Methods and Guide-Lines: Technical Manual No. 16 Inter. Cen. Agri. Res. in the Dry Areas. P.O. Box. 5466, Aleppo Syria.
- Wrigley, C.W., 1972. The biochemistry of wheat protein complex and its genetic control. *Cereal Sci. Today*, 17: 370-3.
- Zawistowska, U., J. Langstaff and W. Bushuk, 1988. Improving effect of material alpha amylase inhibitor on the baking quality of flour containing malted barley flour. *Cereal Sci.*, 8: 207-9.

(Received 15 September 1999; Accepted 15 January 2000)