DEVELOPMENT AND EVALUATION OF A COMPOSITE IMPROVER FOR BREAD PRODUCTION

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Four different composite improvers namely A, B, C and D comprising different proportions of maize starch, maize gluten, malt, soybean, NFDM, ascorbic acid, potassium iodate and ammonium chloride were prepared for use in better bread production. The chemical analysis revealed significant differences in moisture, ash, protein, fat and fibre contents between different improvers. The composite improvers possessed significantly higher values for these characteristics as compared to the commercial improver TOUPAN. The addition of composite improver increased the mixing time with lower peak height than the flour sample containing TOUPAN. The bread containing improver D (1%) showed baking quality score and loaf volume similar to the bread prepared from flour containing TOUPAN·(0.5%). The bread containing improver D retained significantly higher moisture up to 72 hours storage time. The moisture in bread decreases significantly as a function of storage interval. The bread containing improver D showed superiority in the chemical characteristics such as ash, protein, fat and fibre as compared to the bread having TOUPAN. The improver D was also tested on commercial scale by Vita Industries, Faisalabad. They reported to have bread of better quality characteristics as compared to that obtained with TOUPAN improver. Improver D also costs less than the commercial improver TOUPAN. It is recommended that the composite improver D (1.0%) may be used commercially by the baking industry, since it will help save the foreign exchange as well as improve the bread quality.

Key words: bread production, composite improver , mixographic properties

INTRODUCTION

Among cereals, wheat occupies unique position in respect to its area of cultivation and production. Wheat is not only a staple food for over half of the global population but also a principal source of calories and protein. It provides more .than 60% protein and calories in total daily body requirements.

The rapid growth in population and mechanization of food industry has increased the demand of pan bread rapidly day by day. In 1947, there were only a few baking plants in Pakistan, however, now more than 40 commercial baking plants have been established producing bread as one of their main products (Chaudhary, 1991). The bread has a very short storage life, ranging from 12-72 hours hence a substantial loss is borne by the producers for unsold loaves.

The bread improvers are a group of substances that are added to get excellent bread with extended shelf life. The dough improvers affect crumb softness, texture brightness with an extended shelf life of pan bread. The improvers being used in baking industry in Pakistan are usually imported and substantial amount of foreign exchange is spent for their import. Therefore, it is imperative to develop an improver based on ingredients locally available to save foreign exchange and to further improve the bread quality.

The objectives of the present studies are twofold, firstly to prepare a composite improver comprising different additives available locally and possessing multifunctional properties i.e. dough strengthening, dough softening, bleaching and extension in shelf life, and secondly to work out optimum dose level of the developed composite bread improver.

MATERIALS AND METHODS

Straight-grade flour was purchased from local market. Soybean and barley grains were procured from the Ayub Agriculture Research Institute, Faisalabad. Maize starch and maize gluten were obtained from Rafhan Maize Products, Faisalabad. The soybean was given wet heat treatment to inactivate trypsin inhibitor by boiling the soybean grains in hot water at 100°C for 30 minutes and its husk was removed. Thereafter, soybean was dried at room temperature and milled through Udy Cyclone Sample Mill to get soyflour. Malted barley flour was prepared in the laboratory and then ground by Udy Cyclone Mill. The amount of each ingredient used in different bread improvers formulation is given in Table 1.

The samples of wheat flour, improver and bread were tested for moisture content, total ash, crude protein, crude fat and crude fibre content according to their respective methods given in AACC (1983). Rheological properties (mixograph) of wheat flour containing different bread improvers were also determined by following the respective procedure

Table 1. Formulation of different bread improvers

Ingredients	Percentage composition of improvers			
	A	B	C	D
Wheat flour	58.00	49,45	40.15	0.00
Maize starch	25.00	21,20	26.75	32.90
Maize gluten	0.80	1,50	1,35	5.00
Ascorbic acid	0.80	1,30	1,00	1,00
Ammonium chloride	1,25	2.80	1,65	1,00
NFDM	' 1,65	2.25	2.00	0.00
Soybean flour	8.30	14.15	20.15	30.00
Malted flour	4.10	7.00	6.69	30.00
Potassium iodate	0.10	0.35	0.26	0.10

given in AACC (1983). The breads were prepared containing improver A, Band C @ 0.2, 0.25 ,0.3%, while improver D was used @ 0.5, 0.75 and 1.0 % level by using straight dough method according to AACC (1983). Standard TOUPAN improver, being commercial1y employed in bread industry, was used @ 0.5 %, while one flour sample was without improver. Baking quality score was determined according to Blish et al. (1928). The weight of each bread loaf was measured at 12 and 72 hour intervals of storage at room temperature respectively. Statistical analysis was carried out according to Steel and Torrie (1980).

RESULTS AND DISCUSSION

Chemical Analysis: The moisture, ash, crude protein, crude fat and crude fibre contents varied significantly between bread improvers and wheat flour without improver (Table 2). The moisture content was found to be lower than 12%, being within the safe limits of storage (British Standards Institution, 1980). Significantly higher ash contents in local improver indirectly' reflect higher amounts of minerals in it as compared to TOUPAN. The improver D led to higher protein content (20.02%) in bread. High protein content improves the nutritive value of the product (Branlard and Dardevet, 1985), which may be attributed to the presence of soyflour because of its quality protein content (Finney, 1975). The higher amount of fat content in the local improver may be ascribed to the addition of full fat soyflour. The improver D possessing substantially higher fibre contents will be ultimately beneficial for the consumer since fibre lowers the blood pressure and controls the blood sugar besides overcoming the constipation problems (Wichmann and Schildback, 1987).

Table 2. Percentage composition of different bread improvers, wheat flour and breads

Improver	Moisture	Ash	Crude protein	Crude lat	Crude libre
A	10.29 b	1;03 d	13.95 e	2.88b	0,701
B	9,62c	1,37 c	17.93 b	2.34d	0.80e
C	10,12 b	1.75a	17,42 c	2.56c	1,21 b
D	9.76c	1.66 b	20.02 a	2,40 a	3.06 a
TOUPAN	10,14 b	0.82e	15.61 d	0.981	1,19 c
Flour without improver	10.72 a	0.53e	11.59 l	1.50e	0,89d
Dl.O% (Bread)	-	1.65	10.54	1;94	1,47
TOUPAN 0.5% (Bread)	-	1;62	9.20	1.33	0.98

Mixographic Studies: There was a substantial increase in the mixing time in the dough of flours containing improver A, B and C (Table 3), whereas the mixing time was relatively short in case of dough of flours containing improver D and improver TOUPAN than the control dough of wheat flour containing no improver. The dough of flours supplemented with different improvers exhibited peak height less than the dough of control wheat flour. Since the mixographic properties in all samples were measured at a constant water rate i.e. at 60% absorption, .therefore the variation in the results in the present instance may be ascribed to the addition of improvers. These results are in line with Latif (1994) who concluded that the bread improver improves the rheological characteristics of dough.

Baking Quality: The results indicated that baking quality scores varied from 84.32 to 93,45 in different bread samples. The least baking quality score was obtained in case of bread prepared from the wheat flour containing no improver (Table 4). The weight of fresh loaves varied from 143-161g. The highest bread weight was recorded by using the improver C (@O.3%) but it exhibited the lowest weight to volume ratio i.e. 3.88. The loaf volume increased progressively by the addition of different improvers as compared to bread from control, without any improver. With respect to loaf volume, the improvers A, B and C added @0.25 %

Table 3. Mixograpbic properties of wheat flour containing different bread improvers

Improver	Dose (%)	Mixing* time (min.)	Peak height* (%)
A	0.25	5.5	45
B	0.25	6.5	35
C	0.25	5.0	45
D	1,00	4.5	47
TOUPAN	0.50	4.2	48
Wheat flour without improver	0.00	4.8	55

* Average ofthree samples.

Table 4. Effect of various levels of bread improvers on volume (CC), weight, weight: volume ratio and baking quality score of (BQS) bread

Improver	Volume	Weight ~g~	W:V	BQS
0.20 A	691	149	4.63	90.74
0.25 A	693	151	4.58	89.63
0.30 A	652	152	4.28	85.84
0.20B	657	146	4.56	85.35
0.25B	662	148	4,47	87.17
0.30B	642	143	4.48	86.51
0.20C	667	154	4.38	88.25
0.25C	667	157	4.31	89.35
0.30C	625	161	3.88	87.15
0.50D	690	158	4.36	91,65
0.75D	687	157	4.37	91,35
1,00 D	698	159	4.38	93,45
TOUPAN 0.50	697	151	4.61	93.35
Wheat flour without improver	646	143	4.47	84.32

to flour gave bread with higher loaf volume compared to the bread prepared from the same improver with higher doses. It is obvious that the improver D used @ 1.00% gave the highest values for loaf volume (698 cc) and baking quality score (93.45) (Table 4). Earlier findings of Finney et al. (1950) indicated that soyflour improved the loaf volume. These results conform to those of Hafeez (1974).

Weight Loss and Moisture Retention Capacity of Breads: Weight loss and moisture retention capacity of breads (storage intervals pooled) was significantly affected due to storage intervals as well as improvers and their interaction. The results given in Table 5 showed that the lowest weight was recorded in case of bread prepared from flour without improver and bread containing improver Bused @ 0.2%. The remaining breads were found to have the lowest loss in weight than the bread prepared from control wheat flour without improver. The moisture retention was significantly higher in breads prepared from improver D (0.75% and 1.00%) as compared to other breads. The bread prepared from control wheat flour showed the lowest value for moisture retention. The moisture in breads significantly decreased with

Table 5. Mean values for weight and moisture retention of bread prepared using different improvers (storage intervals pooled)

0.20 A	141,06 g	31,55 cd
0.25A	143.39 f	32.61 b
0.30A	145.07 e	30.73 d
0.20B	135.90 i	29.54 e
0.25B	141,0 g	32.32 be
0.30B	137.0 h	31,31 cd
0.20C	147.08 d	31,41 cd
0.25C	150.20 c	33.20 ab
0.30C	154.24 a	31,58 cd
0.50D	153.59 b	32.95 ab
0.75D	153.56 a	33.74 a
1,00 D	153.11 b	33.71 a
TOUPANO.50	145.46 e	28.90 ef
Wheattlour without improver	135.43 i	28.08f

progressive increase in the storage intervals. The highest weight loss was observed after 72 hours storage (Table 6). The results regarding water retention of bread showed that the addition of improver D @ 0.75 and 1.00% gave the bread that retained more moisture for a longer period. This indicates that the breads with more water retention may remain fresh for a longer period (Warchalewski et al., 1989).

Table 6. Weight and moisture retention of bread loaves after different storage intervals (treatments pooled)

Interval (hours)	Weight (g)	Moisture (%)
0	152.02 a	34.12 a
12	145.96 b	-
24	145.04 c	32.32 b
36	144.06 c	-
48	144.08 d	30,44 c
60	143.67 d	-
72	143.15 e	29.30 b

Table 7. Comparison of price of local improver D and commercial improver TOUPAN

Improver	Dose (flour wt.basis)	Pricell00 kg batch (Rs.)
D	1.0	22
TOUPAN	0.5	100

Chemical Analysis of Bread: The bread containing improver D showed superior chemical characteristics than that prepared with commercial improver TOUPAN (Table 2). The improver D was also tested for commercial manufacturing of bread at a large scale at Vita Bread Plant, Faisalabad. The bread prepared using this improver was superior in all respects than the bread containing TOUPAN. Economic comparison also indicated that the cost of improver D is less than one-fourth of that of commercial improver - TOUPAN (Table 7).

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