PRODUCTION OF BAKERY PRODUCTS FROM WHOLE WHEAT MEAL

BOTHYNA M. ABD EL-LATEEF
AND AFAF A.ATTIA

Food Technology Research Institute , Agricultural Research Centre , Giza , Egypt.

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Abstract

Three kinds of improvers; pectin, GMS and a commercial emulsifier Advitacel 1614 were used to evaluate their effect on the rheological properties of pan bread and macaroni products produced from whole wheat. The improvers were used in the ratios 1, 2 and 3% for pectin and Avitacel 1614 and 1, 1.5 and 2 for GMS. Whole wheat pan bread with good freshness, excellent crumb grain and highly acceptability was produced using 2% level of pectin; 1% of GMS and 1% level of advitacel. 1614. Also, a good cooking quality of macroni with excellent appearance, texture and general acceptance was produced by using 2% level of pectin. The resuls suggested pectin and emulsifiers can be used as improvers contributing to optimum functional properties of whole wheat pan bread and macaroni.

INTRODUCTION

The effect of emulsifiers and hydrocolloids on the function properties of wheat bread had been investigated (Lagendijk and Pennings 1970; Joensson and Toernaes 1987; Knightly, 1988; Krog *et al.*, 1989; Mettler 1990; Mettler and Seibel 1993)

The use of whole wheat bread had increased considerably during the last few years because of its better nutritional image and an increasing perference for its better nutritional image. Whole wheat bread contains all bran of wheat grain which is an important source of dietary fibers and rich in soluble and insoluble fibers (Pomeranz 1977; Rogers and Hoseney 1983).

Lai *et al.* (1989) mentioned that good quality of whole wheat bread can be pro-

duced using 0.5% level of surfactant which increased the tolerance for high absorption and also improved bread loaf volume and dough handling properties.

Famentation stability is affected by emulsifiers. It increases the final proof time which leads to increase fermentation stability. Increasing concentrations of hydrocolloids decreases dough elasticity only slightly (Mettler 1990; Mettler and Seibel 1993).

Water-soluble gums as plant extracts including pectins are widely used in food industry. It serves as adhesive, emulsifiers, water-binders and lubricants. Gums consist mainly of soluble dietary fiber and are metabolized primarily in the cecum or large intestine and do not materially contribute as a nutrient source (Ward and Andon 1993).

The present study was designed to examine the effect of pectin and two kinds of emulsifiers on pan bread and macaroni made from whole wheat meal. The relationships between the used additives and rheological dough properties and the quality of bread and macaroni were also evaluated.

MATERIALS AND METHODS

Wheat grains (Giza 155) obtained from wheat Breeding Research Department were milled to obtain whole wheat flour (100 % extraction rate). Commercial lemone pectin lemone pectin obtained from local market was used. Two kinds of emulsifiers were used; the first was glycerol monostearate (GMS) obtained from Aldrich Chemical Company, LLd., and the second was the commercial emulsifier Advitacel 1614 which consists of monoglycerides, polysorbate, sorbitol, polyglycerol esters and propylene glycol. The latter emulsifier was obtained from local market.

Pectin was mixed with whole wheat flour in the ratios of 1,2 and 3% of formula weight. The two emulsifiers were used in the ratios of 1.1. 5 and 2 % and 1,2 and 3% for GMS and Advitacel 1614, respectivly.

The rheological properties of the blends were estimated by means of Mixograph (Brabender OHG) according to the methods described in A.A.C.C. (1980). The gasograph was used to measure gas pressure produced during fementation as the method described by Rubenthaler et al. (1980). The whole wheat flour mixed with

pectin was used to produce pan bread and macaroni product as the methods described in A.A.C.C. (1980). The whole wheat flour mixed with the tested emulsifiers were used to produce pan bread according to the same methods. The organolyptic evaluation for whole wheat pan bread and the cooking quality of macaroni products were evaluated according to the methods of A.A.C.C. (1980). The organolyptic evaluation for whole wheat macaroni was estimated as described by Matz (1959). Bread freshness was determined at zero time, after 24 and 48h of storage by Alkaline water retention capacity (AWRC) according to the method of kitterman and Rubenthaler (1971).

RESULTS AND DISCUSSION

Data presented in Table 1 indicate that the addition of pectin increased dough deveopment time. Also the addition of glycrol monostearate (GMS) and the emulsifier (Advitacel 1614) increased dough development than in wheat dough without additives (Control).

The mixing stability of dough increased with the addition levels of pectin, GMS and Advitacel 1614. The addition levels of both compounds increased the maximum height of dough peak whereas it was constant in case of GMS addition.

In general, increasing the amounts of pectin, GMS and Advitacel 1614 had resulted in slight, moderate and maximum increase in development time, dough stability and dough strength. The most evident effect was that of the 2% level o fpectin, 2% level of GMS and 1% level of the emulsifier Advitacel 1614 with the whole wheat flour.

It is clear from Table 2 that the amount of gas production after 90 minutes of fermentation, had increased by increasing the levels of pectin. This is in agreement with Mettler and Seibel (1993). Gas production increased at 2% level and decreased by increasing the levels of Advitacel 1614. Increasing the levels of GMS to whole wheat flour increased the amount of gas production.

The data in Fig.1 revealed that staling had developed more rapidly in the untreated whole wheat bread than in blended bread. After the frist day, the untreated

whole wheat pan bread decreased in its alkaline water retention capacity (AWRC) by 17.2 % , while it increased by 3.2, 3.7 and 1.4% at 1,2 and 3% levels of pectin. This could be attriluted to the fact that pectin substanses enhance water holding capacity of bread and retarded staling (Riaz, 1971).

With regard to AWRC in whole wheat pan bread blended with GMS, AWRC decreased in the first day and was 9.1, 5.8 and 1.9 at 1, 1.5 and 2%, respectively. In case of bread blends with Advitacel. 1614, the decrease was 6.7, 12.2 and 12.7 at 1,2 and 3% eavels, respectively. At the second and third days, the difference between blends and those wihout blending was lesser than the first day, and was still lower in the blended bread than in those without blending. This improvement might be due to the surfactants which slow the staling process (Seibel et al., 1968).

The results of sensory evaluation of whole wheat pan bread containing pectin, GMS and Advitacel 1614 are shown in Table 3. Incorporating 1,2 and 3% levels of pecting and 1% GMS as well as 1 and 2% levels of Advitacel. 1614 to whole wheat flour had resulted increasing in the average of total score (Excellent), while resulted in ivcreaing the other blends having GMS and Advitacel 1614 gave the grade Very good.

It is clear from Table 4 that the cooking quality of whole wheat macaroni with blends had more good quality properties than those produced without pectin. However, the cooking quality of macaroni having a level up to 2% pectin was mearly not affected.

Data of sensory eveluation of whole wheat macaroni are shown in Table 5. The whole wheat macaroni blends with 1% level and 2% levels gave grade very good, while that having 3% level of pectin gave grade good similar to the control.

Finally, it can be concluded that whole wheat pan bread and macaroni blends with pectin is beneficial in improving the nutritional value. The addition levels of 2% pectin and GMS, and 1% level of the emulsifier Advitacel 1614 to whole wheat flour have improved the technological properties, which had consequently retarded staling.

Table 1. Mixograph paramters of dough from whole wheat flour containing pectin, GMS and Advitacel 1614.

Blends (%)	Time to maximum height development (Min)	Dough Stability (Cm)	Max-height peak (Dough strength) (Cm)
Whole wheat flour (100%) (Control)	2.6	8.4	4.2
A- whole wheat flour with pectin			
%			
1	4.8	9.7	4.7
2	6.3	9.9	5.0
3	6.5	10.0	5.2
B- Whole wheat flour with GMS			
%	8.5	8.9	4.5
1	6.5	9.2	4.5
1.5	5.7	11.0	4.5
2			
C- Whole wheat flour with with Advitacel 1614			
%	6.3	10.0	4.7
1	5.8	9.4	4.5
2	5.8	9.0	4.5
3			

Table 2. Gas production (GU) during fermentation of dough containg whole wheat flour and pectin ; GMS and Advitacel 1614.

	Time (Min)					
	15	30	45	60	75	90
Whole wheat flour (100%) (Control)	4	7	9	12	16	20
A- whole wheat flour with pectin						
%						
1	4	5	7	12	17	21
2	5	8	9	13	18	23
3	4	8	9	14	19	25
B- Whole wheat flour with GMS						
%						
1	5	7	11	17	23	29
1.5	5	8	12	18	23	31
2	5	9	14	20	27	34
C- Whole wheat flour with with Advitacel 1614						
%						
1	5	7	10	13	16	21
2	5	9	12	15	19	23
3	5	8	10	14	17	22

(GU) : Gassing units.

Table 3. Sensory evaluation of whole wheat pan bread containing pectin; GMS and Advitacel 1614.

Blends	External characteristics		Internal characteristics				Over all score (70)
	Symmetry (10)	crust color (10)	Texture color (10)	crumb color (10)	Taste (20)	Crumb color (10)	score
Whole wheat flour (100%) (Control)	8.8	8.3	8.2	8.8	18.2	9.5	9.5
A- whole wheat flour with pectin							
%							
1	8.5	8.7	7.5	8.7	18.0	8.7	60.1
2	8.5	8.7	7.7	8.7	18.2	9.9	61.5
3	8.7	9.2	7.7	8.0	18.0	8.5	60.1
B- Whole wheat flour with GMS							
%	8.5						
1	7.5	8.4	8.1	8.7	18.7	8.7	61.1
1.5	8.2	8.0	8.2	8.8	18.3	8.2	59.0
2		7.8	7.8	8.6	16.7	7.3	56.4
C- Whole wheat flour with with Advitacel 1614							
%							
1	8.7	8.2	8.0	8.7	19.2	8.0	60.8
2	8.5	8.2	8.5	8.5	19.2	8.4	61.3
3	7.7	8.0	7.2	7.2	17.5	7.2	54.8

EX : 60 - 70 V.G: 50-59 G : 45-49

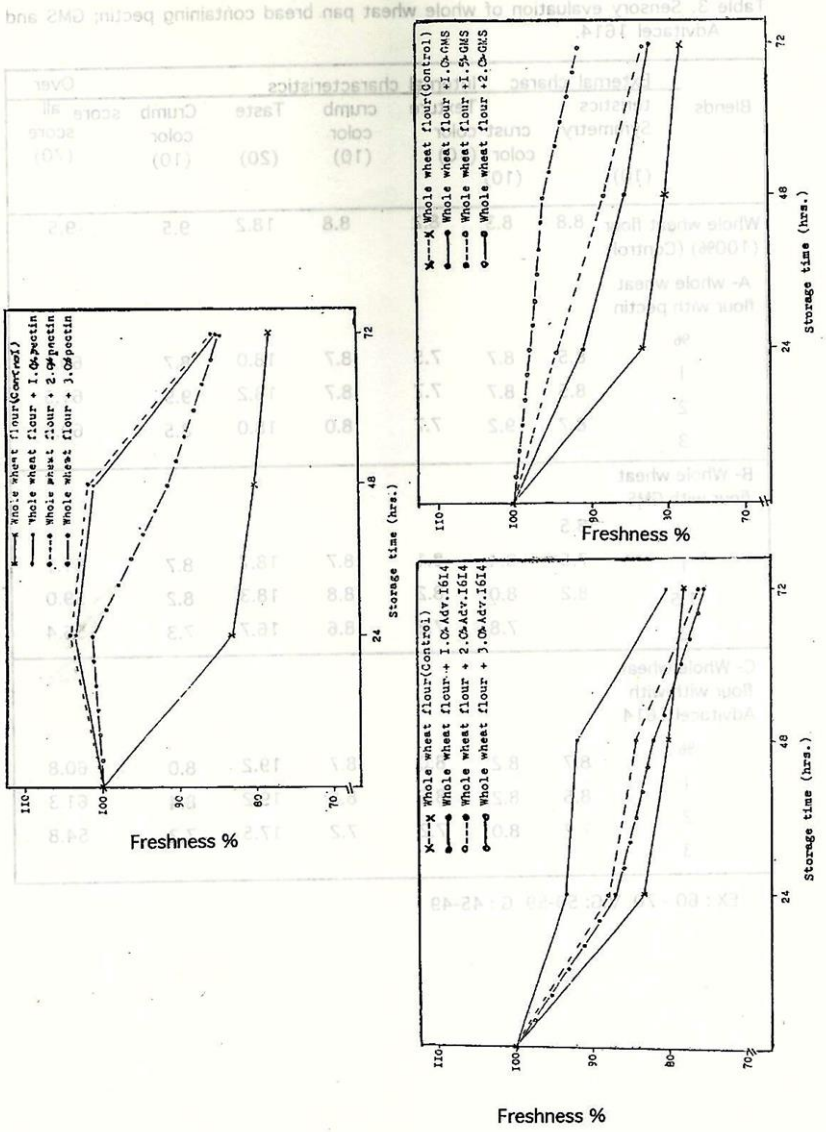

Fig.1. Effect of different blends of pectin, GMS and Adv.1614 on whole wheat pan bread freshness % during storage.

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استخدام دقيق حبة القمح الكاملة فى انتاج بعض منتجات المخابز

بثينة محمد عبد اللطيف ، عفاف عبد الحميد

معهد بحوث تكنولوجيا الاغذية - مركز البحوث الزراعية - الجيزة .

تم استخدام ثلاثة من المواد المحسنة وهى بكتين وجلسرول أحادى الاستيارات (GMS) ومادة تجارية محسنة (Adv. 1614) لمعرفة مدى تأثيرهم المحسن على الخبز الافرنجى والمكرونة الناتجين من حبة القمح الكاملة - وقد تم استخدام البكتين والمادة المحسنة التجارية بنسب ١، ٢، ٣٪ GMS بنسب ١ ، ١,٥ ، ٢٪ وقد تم تقدير تاثيرهم على الصفات الريولوجية للعجين والخواص الحسية ومعدل البيات للمنتج النهائى.

أوضحت النتائج أن إضافة ٢٪ من البكتين وكذلك ٢٪ من المادة التجارية (Adv. 1614) ، ١٪ من GMS قد أدت إلى تحسين الصفات الريولوجية للعجين ولى تحسين الطزاجة والصفات الحسية (طعم - رائحة - انتظام حبيبات اللبابة) فى الخبز الافرنجى الناتج من الحبة الكاملة.

كما أدت إضافة ٢٪ من البكتين الى انتاج مكرونة لها نوعية جيدة فى الطبخ والقوام والتماسك.

من هذا يتضح انه يمكن استخدام البكتين ، GMS والمادة التجارية Adv. 1614 فى تحسين منتجات الخبير التى يتم انتاجها من دقيق حبة القمح الكاملة.