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PHYSICO-CHEMICAL, MILLING AND BAKING QUALITY CHARACTERISTICS OF SOME PROMISING TRITICALE LINES

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ABSTRACT

Five advance lines of triticale alongwith a bread wheat variety check Chenab70 were tested for various quality parameters during 1978-79. Blending of triticale with wheat, barley and coarse rice for chapati quality was also studied. All the promising lines of triticale were lower in bushel weight, straight run-flour yield and bread baking quality than bread wheat check (Chenab70). The protein content and quality (DBC value) was higher in triticale lines. However, red colour of the chapaties prepared from triticales was not acceptable. However, flexibility and palatability were quite acceptable. Blending studies revealed that fairly good chapaties with better protein quality were prepared when triticale 'atta' was blended with barley, coarse rice and wheat in 1:1 or 1:3 proportions, respectively. It leads to the suggestion that chapaties of higher nutritive values can be prepared by masking or eliminating red colour by blending triticale with barley, coarse rice and/or wheat which will help encourage its increase in acreage on marginal lands and rainfed areas.

KEYWORDS: *Tritico secale*, *Triticum aestivum*, barley, rice, blending, baking quality, nutritive value, Pakistan.

INTRODUCTION

Pakistani diet is mainly based upon 'chapati' which is generally prepared from whole-meal wheat flour i.e. 'atta'. Triticale having higher lysine, has not found acceptability with farmers for lack of its use as a food. Among other set-backs encountered in popularization of triticale was shrivelling of grains which has been overcome and its yields are quite at par with wheat. Moreover, the chapaties of triticale had though higher lysine, good flexibility, easy chewability and good taste coupled with good keeping quality, (1,2), yet these gave reddish look-a cause of less liking in Pakistan.

Being conscious of this fact, attempts were made by Ullah (13) to utilize triticale in local recipes, such as 'dalia', 'kababs', 'sohn halva', idli, etc., but these products are not used extensively which points to its use as 'chapati'. For that purpose, breeders may be actively engaged to improve its colour, while the technologist should also find ways and means for reduction or masking of its red colour for 'chapati' use by blending with cereal grains of white colour. Masking of colour (red) will thus not only help in the preparation of 'chapatis' with desirable quality but it will also provide more nutrition i.e. higher lysine.

It is reasonable to postulate in such a perspective that colour of 'chapati' may not matter much if the varieties/lines of triticale are high yielding possessing resistance to drought, diseases (rusts), etc. to provide plentiful better nutrition.

Studies in this direction have been initiated to determine the suitable blending proportions of vulgare wheat, barley or rice flour with triticale for good 'chapati' preparation to achieve desirable colour and other quality standards.

The present study was, therefore, designed to comprehensively determine quality of triticales included in our national

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programme alongwith testing of 'chapati' quality prepared from triticale blended with wheat, barley and/or rice, respectively.

MATERIALS AND METHODS

Five advance lines of triticale included in our national uniform yield trials, P157-4, Mayo II x Arm'S'(Fod), NIAB-T183, Mayo II x Arm'S'II (Quetta), NIAB-T77,alongwith commercial wheat variety Chenab70 were grown during 1978-79 at Wheat Research Institute. Barley variety V5681 and wheat Sandal used for blending were also evolved by Wheat Research Institute, Faisalabad Coarse rice IR6 (paddy) was got from Rice Research Institute, Kala Shah Kaku.

(i) Preparation of 'atta'

'Atta' of each triticale line and wheat was prepared on electric cyclon mill using screen of 1 mm mesh. Barley variety was pearled by the barley pearler and then milled in electric cyclon mill for 'atta' preparation. Coarse rice paddy was milled in Buhler experimental mill for the preparation of 'atta' in which upper two plane sifters of break roll and reduction roll units were removed and paddy was dehusked and milled automatically.

(ii) Preparation of patent flour

Five lines of triticale and wheat variety Chenab70 were milled through Buhler experimental mill by following standard method of Mac-Masters (9).

(iii) Moisture

The moisture content was recorded with the help of electronic Steinlite Moisture Tester.

(iv) Protein content and dye binding capacity (DBC value)

The protein content in 'chapati' prepared from various triticales alone and blends with wheat, rice and barley were estimated following the Kjeldhal's method and using 6.25 as conversion factor of nitrogen into protein as developed by Mossberg, (10). The DBC value was also determined by the method described by him (10).

(v) Quality of bread

Bread from patent flour of each sample was prepared following the straight dough methods,(9). Baking quality scores were designed according to the formula of Blish, (4).

(vi) Preparation of 'chapatis'

'Chapatis' from 'atta' of various triticale lines alongwith wheat variety Chenab70 and blendings of triticale line, NIAB T-183 with 'atta' of coarse rice (IR6), wheat Sandal, and barley (V5681) in equal and 1:3 proportions, respectively were prepared according to the method of Aziz (3) with some modifications as suggested by Ullah (12). These 'chapaties' were presented before a panel of judges for organoleptic evaluation following the procedure of Krum,(8).

RESULTS AND DISCUSSION

(i) Milling performance

The data regarding 1000 kernel weight and various milling fractions of triticales compared with wheat check Chenab70 are shown in Table-1.

The data indicate that triticale lines NIAB T 183 and NIAB T77 possessed higher while others were lower in 1000 kernel weight than wheat variety check Chenab70. Grain filling i.e. plumpness is a rough index of the

flour yield which is confirmed from the milling data as shown in various columns of bran, shorts, breakroll and reduction roll flour yields.

It is obvious from the milling data that straight run flour yield of three triticale

Table-1. Milling characteristics and 1000-kernel weight of various triticales

Milling fraction	N U T Y T lines					
	P-157-4	Mayo II x Arms's I	NIABT 183	Mayo II x Arm's' II	NIABT 77	Chenab -70 (check)
1. kernel weight (grams).	32.58	33.37	40.38	36.57	41.15	39.80
2. Bran %	27.30	29.12	27.29	27.60	28.32	21.6
3. Shorts(%)	9.42	7.07	8.22	6.80	7.35	5.3
4. Milling feed(%)	36.72	36.20	35.51	34.40	35.67	26.9
5. Break roll flour(%)	10.01	10.36	12.68	12.60	11.60	6.6
6. Reduction roll flour(%).	47.29	46.12	51.02	50.24	47.65	60.6
7. Straight run flour yield(%)	57.30	56.48	63.70	62.84	59.25	67.2
8. Milling loss (%)	5.98	7.32	0.79	2.76	6.08	5.9

lines, viz. NIAB T183, Mayo II x Arm'S'II and NIABT77, was nearly close to that of wheat Chenab70 and were in respective order of merit.

According to Zilinsky (14) the flour yield of triticales ranged from 51.7 to 59.0 percent as compared with the control, Inia66 which yielded 83.71 percent. In our study, one triticale line NIABT77, is comparable with the lower limits of Zilinsky's findings. This study reveals that the milling quality of triticale is just like soft wheats and more nutritive protein i.e. bran and shorts (6) which is about 35 percent generally will go as animal feed depriving human-being from good nutritive food material. It is, therefore, imperative to use the whole grain of triticale by extracting five percent or more bran for chapaties.

(ii) Physico-chemical and bread baking characteristics

The results pertaining to protein content, DBC value and baking quality characteristics of various triticale lines have been presented in Table-2.

The data presented in Table-2 show that protein percentages of all triticale lines were higher than wheat variety check Chenab70. But the colour of all the triticale lines except NIABT77 was observed to be reddish(a cause of lesser liking) which has some light red grains as well. Lysine approximation based on DBC value was found consistantly higher than bread wheat variety Chenab70 like the previous years despite improvement in test weight over the past years. Similarly, higher nutritional values i.e. elevated lysine have been reported to be stable in CIMMYT reviews, 1978.

It can also be seen from the data in Table-2 that the bread making potentials of all the triticale lines were found to be poor, as all the triticale lines scored lower than wheat variety Chenab70, which is considered to be poor in baking quality due to its weak gluten quality. However, amongst all the lines of triticale under study, NIABT77 got

Table-2. Physico-chemical and baking characteristics of various triticale lines grown at Faisalabad during 1978-79

NUTYT lines	Character							
	Colour	Bushel Wt. (Lbs).	Protein%	Dye binding capacity	Texture (1-6)	Feel to tough	Loaf Vol. (C.C.)	Baking qual. score
P-157-4	Red	56.5	12.46	40.25	2.0	Tough	415	44.8
Mayo II x Arm's' I	-do-	56.35	12.85	39.05	2.0	-do-	415	45.8
NIABT183	-do-	56.03	12.37	41.00	1.5	-do-	400	43.5
Mayo II x Arm's'II	-do-	56.13	12.18	37.80	1.5	-do-	420	44.5
NIABT77	-do-	56.13	12.85	38.65	1.5	-do-	425	47.0
Chenab70(Check)	Amber	67.13	11.30	31.65	1.5	Soft	440	59.5

comparatively higher baking quality scores than other lines. The baking quality scores were the lowest in case of NIAB-T 183, and Mayo II x Arm'S'II.

The loaf volume of these triticales was also lower than wheat as these could not retain the gas produced during fermentation which might be due to lower and weak quality of gluten responsible for gas retention. The second reason may be the higher tendency of α-amylase activity of triticale than wheat (5).

The results of this study are in close agreement with the results of triticale lines of NUTYT reported by Ullah *et al.* (12), However, other reports (1,6) have indicated that satisfactory bread can be prepared from flour of triticale by certain modifications in bread baking and reported that 40 percent triticale of weak protein could be mixed with 60 percent wheat for acceptable bread with good loaf volume.

Utilization of triticales for 'chapati' preparation

Triticale being at par in yield with wheat, if exploited for large scale preparation of 'chapaties' can bring great improvement in general nutrition due to higher lysine content - a limiting factor in our diets. However, its grain is beset with problem of reddish colour, on this score alone it cannot become a practical proposition. Presently, attempts to breed less reddish types of triticale have been initiated by the breeders but present situation points to the regular testing for acceptabilities of 'chapati' making through other techniques such as blending with amber wheat, rice and pearl barley. Blending with two latter ones is more desirable for enhancing nutritional value (lysine level).

The average score, of various quality characters of chapaties prepared from triticales and their blends are presented in Table-3.

The table depicts data on average scores of 'chapati' prepared from 'atta' of triticales and/or their blends with vulgare wheat, rice and/or barley. It is clear from the data that 'chapatis' prepared from atta of triticale were poor in quality mainly in appearance due to red colour. The colour was not acceptable but flavour and taste (palatability) and texture (flexibility) were

Table-3. **Organoleptic evaluation scores of chapaties prepared from various triticale lines**

Atta	Colour and appearance 1-10	Flavour & taste 1-10	Texture 1-10	Overall accept-ability	Protein (%)
a. NUTYT LINES					
P-157-4	3.2	6.0	6.0	14.0*	12.06
Mayo II x Arm's'	3.0	6.0	6.0	15.0*	12.9
NIABT183	3.0	6.0	6.0	15.0*	11.97
Mayo II x Arm's'II	3.0	6.0	6.0	15.0*	11.8
NIABT77	3.0	6.0	6.0	15.0*	12.36
b. TRITICALE BLENDING					
NIABT 183+rice(IR6)					
1 : 1	6.0	6.2	6.0	18.2	9.53
1 : 3	6.5	6.5	7.0	20.2	8.76
NIABT 183+barley(V5681)					
1 : 1	5.5	6.2	6.2	17.9	11.88
1 : 3	7.2	6.2	6.7	20.6	11.7
NIABT 183+sandal					
1 : 1	5.17	6.33	5.5	16.81	-
Chenab70 (wheat)	7.0	7.0	7.0	21.0	11.04

(*) Except colour

quite acceptable and 'chapaties' were rated as fairly good for these two attributes. On blending 'atta' of NIABT183 with rice flour and/or barley in 1:1 and 1:3 proportions, respectively, the quality of 'chapatis' improved especially in respect of colour. The quality of 'chapatis' was superior at 1 3 ratios of blends of rice and/or barley with triticales as compared to blends of equal proportions. However, 'atta' of triticale when blended with wheat (Sandal) 'atta', he quality of 'chapatis'improved. The protein content of 'chapatis' prepared from triticales was generally higher than wheat. However, it was lower in 'chapaties' blended with barley and rice but of better quality than wheat for higher lysine contents.

It is indicated from the present work that the colour of chapati may not matter much,, but chapatis should be more nutritional with good keeping quality.

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