Physical, Rheological, and Baking Characteristics of Some Triticale Lines Grown in Pakistan

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The physical grain quality and baking attributes of triticale lines have considerably improved during the past few years. This progress was achieved through extensive breeding programs (Zillinsky *et al.* 1980). One of the main objectives of triticale breeders is to develop triticale varieties well adapted to climatic and agronomic conditions that are ill-suited for wheat production. In Pakistan, there is a need for such a cereal crop that can offer a significantly better yield than wheat in unfavorable growing areas. Triticale lines developed at CIMMYT, Mexico, and grown at various research stations in Pakistan have shown some favorable response for local production. However, triticale will only be acceptable in Pakistan if it can be made into acceptable flat breads, e.g. chapati, naan, etc. This study aims to evaluate the technological quality of triticale lines grown in Pakistan in comparison with a popular wheat variety widely acceptable for traditional flat breads.

Materials and Methods

Three triticales (T-183, T-306, and Juanillo) and one wheat variety (Pak-81) grown in Pakistan were tested for their physical, rheological, and baking characteristics. The wheat variety was used as a reference standard. All the physical and chemical tests were conducted according to the standard methods of AACC (AACC 1982). The Brabender farinograph was used to determine the rheological characteristics of doughs prepared from triticale and wheat flours. Flour yield was determined by Qd. Junior mill and the wholemeal flour was prepared in a disc-pin mill. A standardized baking test for chapati production, based on previous methods (Rashid 1974; Elber and Walker 1983) was developed. This consisted of mixing 300 g of flour and water in a farinograph bowl to 500 B.U. consistency and optimum development (peak time), and then resting the dough at room temperature for 60 min. Dough was divided into 65 g-pieces, each shaped to a round ball and then rolled to a 7 inche-diameter disc. Each dough disc was baked for 3.5 min. on a hot plate at 205°C.

Samples of chapaties were presented to a panel of seven judges for evaluation of quality.

Results and Discussion

Data for physical grain quality; milling characteristics; and protein, ash, and wet gluten contents of experimental wheat and triticale are summarized in Table 1. The test weight of triticale ranged from 65 to 70 kg/hl and the values were lower than for wheat (75 kg/hl). All samples, except T-183, had hard kernels. Flour yield of Juanillo was better than those of T-183, T-306, and wheat. All triticale flours had higher protein as compared to wheat. All wheat and triticale flours had gluten contents below 30%, and glutens were short and weak.

The rheological and baking data indicated the high water absorption of wheat flour, but slight differences in peak time (dough development time) and stability of triticale and wheat flours were observed. The extremely weak nature of the gluten with little tolerance to mixing was evident. During baking, stickiness of dough, particularly in triticale, was a major problem. All triticale samples produced chapaties of an acceptable texture, with a slightly bitter aftertaste however. In addition, triticale

Table 1. Physical and chemical composition of triticale and wheat flours.

Cultivar	Test weight	Hardness	Flour yield (%)	Protein (% dry basis)	Ash	Wet gluten (%)
T-183	65	Soft	55.4	12.7	1.8	24.6
T-306	70	Semihard	48.0	15.4	1.8	29.0
Juanillo	66	Semihard	66.7	16.3	1.6	21.4
Pak-81	75	Semihard	57.4	11.4	1.6	28.8

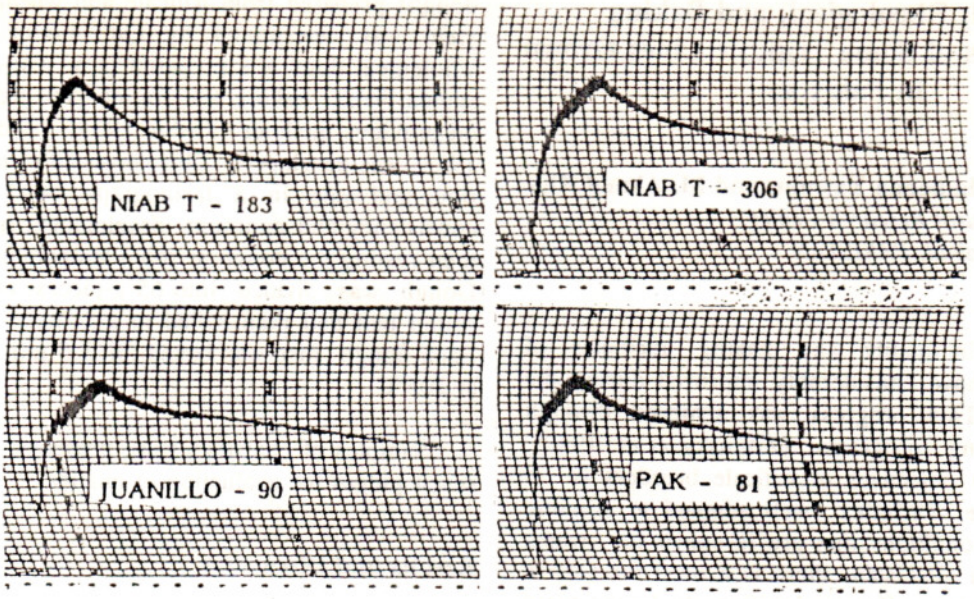

Fig. 1. Farinograms of triticale and wheat flours.

Table 2. Rheological and baking characteristics of triticale and wheat flours.

Cultivar	Water absorption (%)	Do. Dv. (min.)*	Stability (min.)	R**	Color	Smell	Texture	Taste
T-183	63.4	3.1	1.1	250	US	S	S	Q
T-306	67.7	4.4	1.5	165	US	S	S	Q
Juanillo	62.0	4.2	1.3	145	US	S	S	Q
Pak-81	70.0	3.3	1.3	190	S	S	S	S

* = Dough development time (minutes)

** = Tolerance index (B. Units)

US = Unsatisfactory; S = Satisfactory; Q = Questionable.

chapaties were darker in color compared with wheat, and this was probably the predominant factor in lowering their overall acceptability. However, the handling qualities of dough were reported to be improved with a marked decrease in stickness in a 75:25 wheat triticale blend, and the quality of the chapati was similar to a wheat chapati. (Khan and Rashid 1986).

As evident from the farinograms (Fig. 1), and the data in Table 2, wide differences existed in the rheological characteristics of wheat and triticale lines. Improving the gluten quality will no doubt assist in handling the dough during baking, but this remains as a matter of secondary importance, as compared to that of lightening the bran color. In summary, triticale can produce chapaties of acceptable quality, provided the color of the bran is improved, which may be achieved through breeding trials.

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