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SOME PHYSICOCHEMICAL TRAITS OF SEVEN SPRING WHEAT CULTIVARS GROWN IN SOUTHERN-ZONE OF PAKISTAN

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ABSTRACT

Some physicochemical traits were analyzed to assess the bread making quality of seven indigenous spring wheat cultivars viz. Anmol, Sarsabz, Mehran, Kiran, Sindh, T.J-83 and Moomal obtained from the Nuclear Institute for Agriculture, Tandojam, Pakistan. The protein content of all cultivars was found in a range of 12.3-15.4 % with a minor variation of moisture content i.e. 10.3–10.5 %. Wet Gluten, Dry Gluten and Gluten Index were found in the range of 26.8-29.4 %, 8.7-9.5% and 28-92.5% respectively. Moomal with Falling Number of 590 seconds showed least α-amylase activity. Anmol and TJ-83 with a Hardness Score of 59 and 55 offered highest and limited formation of damaged starch during milling process respectively. Anmol with a high content of Protein (15.4%), Wet Gluten (29.4%) and Gluten Index (92.5 %) was found to be most preferable for hard wheat products (Bread) while Sarsabz due to a lesser content of the same physicochemical parameters i.e. Protein (12.3 %), Wet Gluten (26.8 %) and Gluten Index (28 %) was found to be suitable for soft wheat products like cookies.

Key Words: Gluten Index, Falling Number, Hardness Score, wheat cultivars, protein content.

INTRODUCTION

Common wheat (*Triticum aestivum* L.) is the most cultivated of all wheat varieties. It provides nutrients and the raw materials for industrialized food production. It is used to make variety of bakery products that requires specific quality of wheat flours. The quality of wheat in terms of its suitability for particular end-use can be evaluated by determining various physicochemical parameters. These parameters vary due to genetics as well as environmental conditions (Anjum and Walker, 2000). Among these, protein content, hardness, quantity and quality of gluten are the most important parameters attributing processing and quality of the finished products. Most of the workers have described that protein content and protein quality are the two variables that regulates the processing quality (MacRitche *et al.*, 1990; Weegles *et al.*, 1996). Gluten is a complex mixture of wheat proteins containing several hundred polypeptides. About half of the protein is monomeric (gliadins) and the remainder is disulfide cross linked polypeptides that forms the polymeric glutenin fraction, whose sizes ranges up in to the tens of millions of Daltons (Gianibelli *et. al*., 2001; Wrigley, 1996). Gliadin can be solubilised in 70 % aqueous ethanol, one of the steps of the Osborne fractionation of wheat proteins, and the residue after this extraction is considered to be glutenin (MacRitchie, 1985).

In reality the proteins that form gluten are storage proteins according to their function for wheat grain (Shewry, 1999). In this respect, the storage proteins of the mature wheat may not differ much from those of the other grains (Shwery and Halford, 2002). However, the distinctive feature that makes wheat unique is the visco-elastic properties of its storage protein. When the grain is milled and mixed with water, these storage proteins forms dough with unique rheological properties, capable of retaining gas bubbles. It is these properties that make wheat alone suitable for the preparation of a great diversity of the food products like breads, noodles, pasta, cookies, cakes, pastries, and many other foods (Wrigley *et al*., 2006).

Generally, high protein content and strong gluten is preferred for the production of pan bread (Hoseney, 1994). Gluten has also significant impact on the baking quality of wheat flour (Kent and Evers, 1994). It was described by Faridi (1990) that cookies and crackers made from soft and weak gluten flour has tendered and more desirable texture. In addition to protein and gluten, hardness has profound affects on milling and baking quality of wheat (Martin *et al.*, 2001).

It is essential to know about the basic quality parameters of frequently growing wheat cultivars. The study was therefore designed to evaluate the bread making quality by determining some physicochemical characteristics of wheat cultivars grown in Sindh province of Pakistan.

MATERIALS AND METHODS

Physicochemical Properties

Non-infested samples of wheat cultivars viz. Anmol, Sarsabz, Mehran, Kiran, Sindh, T.J-83 and Moomal were obtained from Nuclear Institute for Agriculture, Tandojam. These were mixed thoroughly by precision electronic divider (Seedburo Equipment Company, Model No. SB-106) and cleaned manually. Moisture content of grains was determined through digital Moisture Tester (Burrows Model 700) duly calibrated with Air Oven method. 300 gm of grains of each wheat variety was milled through Perten Laboratory Mill 3100 installed with 0.8 mm sieve. The flour obtained from this mill was used for the analysis of protein content and hardness score using NIR-technique (Inframatic 8620A). Gluten contents and gluten index were determined according to AACC (2000) method No. 38-12. Falling number apparatus was used for the determination of α-amylase activity and it was determined according to A.A.C.C. (2000) method No. 56-81B. All quality tests were performed in triplicate and results reported as an average with standard deviation that were analyzed in accordance with Zar (1974).

RESULTS AND DISCUSSION

The studied quality parameters of seven wheat cultivars are given in Table-I. A narrow range (10.3-10.5%) of moisture content with a mean value of 10.4 % was obtained. All the cultivars revealed higher protein content in the range of 12.3 to 15.4 %. Anmol variety attained high protein (15.4%) as compared to other wheat varieties. The protein content of wheat cultivar is strongly influenced by environmental conditions and crop management practices (Cornish *et al.,* 1991). In this study, both of these factors were kept identical for all cultivars. Thus, protein content of all wheat cultivars was found in a narrow range. The quality and quantity of protein of studied cultivars was found to be suitable for the making of yeast leavened products except for Sarsabz due to low Gluten Index i.e. 28 %. The contents of wet and dry glutens were found in the ranges of 26.8 – 29.4 % and 8.7 – 9.5 %. The highest and lowest content of wet and dry gluten were exhibited by Anmol and Sarsabz respectively. This supported the study reported by Anjum and Walker (2000) that the wet and dry gluten of Pakistani wheat were significantly influenced by cultivars but not by growth locations. Hardness is the parameter significantly used to classify wheat according to end-use suitability (Anjum and Walker, 2000). NIR-hardness was found in a range of 55-59 scores. Anmol and Sarsabz with a highest value of Hardness score (59) revealed a greater proportion of damaged starch during milling process as compared to remaining wheat cultivars. The Falling number values for all cultivars exceeded 400 seconds indicating very low α-amylase activity; however, minor differences were recorded in their diastase activity as evident from their falling numbers i.e. 500 to 590 seconds (Mailhot and Patton, 1988). It is concluded that among all studied wheat cultivars, Anmol was found to be the most suitable for bread making process by virtue of high protein and gluten content in addition to strong strength of gluten.

Table I. Some Physicochemical Characteristics of Seven Wheat Cultivars.

Name of wheat cultivars	Protein content (%)	Wet gluten (%)	Dry gluten (%)	Gluten index (%)	Hardness score	Moisture content (%)	Falling number (sec)
Anmol	15.4±0.1	29.4±0.25	9.5±0.11	92.5±0.50	59±1.00	10.5±0.11	500±5.00
Sarsabz	12.3±0.07	26.8±0.20	8.7±0.15	28±0.78	59±0.80	10.4±0.08	550±4.00
Mehran	14.8±0.09	28.6±0.18	9.4±0.10	91±0.60	57±0.70	10.5±0.09	530±5.00
Kiran	12.7±0.1	29.3±0.26	8.9±0.20	59.3±0.55	58±0.70	10.3±0.10	510±4.00
Sindh	13.8±0.06	27.6±0.30	8.9±0.16	86±0.80	56±0.56	10.5±0.10	500±4.50
TJ-83	15±0.1	29±0.21	9.0±0.11	57.7±0.58	55±1.00	10.4±0.10	560±5.00
Moomal	14.8±0.1	27.3±0.20	9.0±0.11	88±0.56	57±0.60	10.4±0.12	590±4.70

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