QUALITY PARAMETERS OF MIXED WINTER WHEAT FLOUR WITH AMARANTH FLOUR

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ABSTRACT

Grain amaranth (Amaranthus hypochondriacus) has gained increased attention since 1970s when it has been rediscovered. It has been cultivated in the Mayan civilization of South and Central America. This plant is produced as a grain and as a vegetable. Amaranth is quite nutritious. Amounts of vitamin C, iron, carotene, calcium, folic acid. Both the leaves and seeds contain protein of an unusually high quality The protein is high in the amino acide lysine, which is the limiting amino acid in cereals like maize, wheat and rice. The protein is also relatively rich in the sulfur-containing amino acid, which are normally limiting in the pulse crops. In our work we have analysed the quality of winter wheat, especially the alveographical and extensigraphical parameters, wet gluten content and gluten expansiveness.

1. INTRODUCTION

Amaranth has been cultivated for 8,000 years in Aztecs word (Robert, 2002).
Now grain amaranth is known hardly in agriculture fields in North America and Europe, but range of amaranth products are sold in health food shop in Europe (Aufhammer, 2000).
Chaturvedi et al.(1997) according to the protein is high in the amino acide lysine, which is the limiting amino acid is cereals like maize, wheat and rice. The protein is relatively rich in the sulphur-containing amino acids, which are normally limiting in the pulse crops, it has not gluten contain.
The quality of wheat is a complex concept (Lásztity, 1980, Matuz et al., 1993, Véha and Gyimes, 1999). The alveograph is suitable for the examination of rheological characteristics which characterises the extensibility of dough (Rakszegi et al., 2005). This method gives extra information for backing tests (Zsikla, 2005).
Vida et al. (1996) analysed the relation between the alveographical and other baking industry quality characteristics of 19 winter wheat varieties and they established the close positive correlation between the alveographical G, W and gluten index with statistical method.
The alveographical G and W are in satisfactory significant relation with the wet gluten content (Tanács et al., 2008).
Matuz el al. (1999) established the values and the value relation of 13 parameters (among others alveographical P, L, P/L, W, G wet gluten content, spreading of wet gluten) of 29 winter wheat varieties produced in 1995, 1996 and 1997. The aim of their analyses was to define the parameter that has the closest correlation with the alveographical W.

2. MATERIAL AND METHODS

The winter wheat and grain amaranth samples came from mill industry from 2009 cropping year, these are industrial flour samples. We made alveographical examinations with SMS2

texture analyser (ISO 5530-4:1991) and extensigraph research with Brabender extensigraph (ISO 5530-2:1997). Wet gluten content and gluten expansiveness were analysed with MSZ 6369/5-87 standard. The parameters were analysed in Laboratory of ABO-MILL ZRt. in Törökszentmiklós, Hungary (Table 1).

Table 1: Methodes and instruments in analysis

Examination	Method	Instrument
Moisture content	MSZ 6369/4-1987	LP 303 type dryer machine
Examination by Farinograph	MSZ 6369/6-1998	Brabender farinograph
Extenzigraphical examination (Brabender)	ISO 5530-2:1997	Brabender extensigraph
Kneading for Alveographical examination (Dobraszczyk) SMS2 texture analyser	ISO 5530-4:1991	Chopin MR 2L Rotary Mixer
Alveographical examination (Dobraszczyk) SMS2 texture analyser	ISO 5530-4:1991	SMS2 Texture Analyser (Dobraszczyk) D/R system
Wet gluten content	MSZ 6369/5-87	Glutomatic
Gluten expansiveness	MSZ 6369/5-87	Glutomatic

3. RESULTS AND DISCUSSION

During examination we used the following mixing ratio: control winter wheat flour, 95% winter wheat flour+5%amaranth flour, 90% winter wheat flour+10%amaranth flour, 85% winter wheat flour+15%amaranth flour, 80% winter wheat flour+20%amaranth flour. Table 2 shows the wet gluten content and gluten expansiveness. Parameters show, that increasing of quantity of grain amaranth resulted decrease of wet gluten contant, but gluten expansiveness not changed.

Table 2: Wet gluten content (%) and gluten expansiveness (mm/h) parameters

mixture	wet gluten content (%)	gluten expansiveness (mm/h)
winter wheat flour	29,4	1,5
95%winter wheat flour+5% amaranth flour	29,0	1,5
90%winter wheat flour+10% amaranth flour	25,9	1,5
85%winter wheat flour+15% amaranth flour	25,05	1,5
80%winter wheat flour+20% amaranth flour	20,20	2,0

During measuring I specified alveographical W, P, L and P/L value. I analysed tree parallel measuring. Table 3 shows the average values.We can see in table 2, that increasing of quantity of grain amaranth resulted decrease of W, P and L parameters. According to requirement of French baking industry, various bread types were determined. Cardinal parameter the P/L. P/L value of cracker and paste are from 0,4 to 0,5 values, traditional bread 0,6±0,1 and brioche 0,7±0,1. The date in table 2 show high values.

Table 3: Alveographical parameters with SMS2 texture analyser

mixture	W (10^{-4}J/g)	P (mm)	L (mm)	P/L
winter wheat flour (control)	233	110	84	1,32
95%winter wheat flour+5% amaranth flour	201	122	51	2,44
90%winter wheat flour+10% amaranth flour	168	121	36	3,41
85%winter wheat flour+15% amaranth flour	140	118	28	4,44
80%winter wheat flour+20% amaranth flour	139	153	18	8,62

I specified extensographical energy, resistance to extension, extensibility and extensibility ratio values, too. The table 4 show, that increase of quantity of grain amaranth resulted decrease of energy, resistance to extension and extensibility parameters.
In table 4 we can see, that every parameters decreased with increase of quantity of grain amaranth.

Table 4: Extensigraphical parameters with Brabender extensigraph

mixture	Energy (cm^2)	Resistance to extension (BU)	Extensibility (mm)	Entensibility ratio value
winter wheat flour	92	336	151	2,2
95%winter wheat flour+5% amaranth flour	79	332	142	2,3
90%winter wheat flour+10% amaranth flour	66	278	149	1,9
85%winter wheat flour+15% amaranth flour	54	278	128	2,2
80%winter wheat flour+20% amaranth flour	43	278	113	2,5

Nowadays, there is a growing claim for the special rheological examinations, mostly for the extensibility and resistance of extension parameters both in the international and most of the Hungarian wheat export markets. We have to analyse the alveographical and extensigraphical parameters of Hungarian growing winter wheat to help to realize the alveographical and extensigraphical quality and qualification. The correlation among some quality parameters can give us extra information about backing values of winter wheat varieties, selection of special quality types for wheat growing and qualification of the different export rate. Grain amaranth is a new crop that is in its adolescence. The cultivation and utilization of grain amaranth will continue to increase as more information is developed to exploit the market niches for high quality protein foods. This extra information can give us help to select special quality types for wheat growing and qualify the different export rate.

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