DIFFERENCES IN GLUTEN PROTEINS CONTENT BETWEEN SOME HISTORICAL AND MODERN WHEAT CULTIVARS *(TRITICUM AESTIVUM L.)*

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INTRODUCTION

Wheat is a major source of energy, protein, and dietary fibre in human nutrition and animal feeding. It provides approximately one-fifth of the total calorific input of the world's population (FAO, 2009). Wheat is unique among the edible grains because wheat flour has the protein (P) complex called „gluten“ that can be formed into a dough with the rheological properties required for the production of leavened bread (Uthayakumaran et al., 2002). Traditionally, proteins classified into four different groups according to their solubility: albumins and globulins (AG) as non-gluten proteins and gliadins (GLI) (ώ−, α−, γ −) and glutenins (GLU) (HMW-GS and LMW-GS) as gluten proteins (Wieser and Kieffer, 2001). Several studies have shown that peptides derived from incomplete digestion of all gluten proteins, in particular those of the α-GLI, are the main responsible for the onset of celiac disease (Camerlengo et al., 2017)

MATERIALS AND METHODS

Six common wheat cultivars grown at the Agricultura Institute Osijek during two consecutive years were subdivided into two groups depending on the year of released. The historical group includes cultivars released until the late 60s (San Pastore, U-1 and Libellula), while the modern group consists of cultivars released in the last 20 or 30 years (Kraljica, OS Olimpija and Srpanjka). In whole grain P was measured by NIT analyzer Infratec 1241 and sedimentation (SED) value acc. to Zelany (ICC 116/1). Wet gluten content (WG) and gluten index (GI) were analyzed using a Glutomatic 2200 (Perten Instruments, Hagersten, Sweden) according to ICC standard No.155. Gluten proteins were extracted and separated according to the method of Wieser et al. using RP-HPLC (Perkin Elmer Instruments, Walthman, MA, USA) coulped with C18 column, photodiode array detector (210 nm) and Total-Chrom software.

RESULTS

On average, the very similar protein and wet gluten content were found between historical and modern cultivars (14.3% vs. 14.2% and 27.0% and 26.5%, respectively), while the more significant differences have found for gluten index (84 vs. 92) and sedimentation values (27cm^3 vs. 36 cm^3) as good indicators of gluten strenght. Considering gluten proteins content, a significant decrease in expression of total GLI and γ-GLI (15.7% vs.18.7), was observed in modern cultivars, while ώ-GLI (6.7% vs. 5.6%) was increased. A significant increase content of total GLU and its sub-fractions HMW-GS (10.6% vs. 9.4%) and LMW-GS (22.9% vs. 19.1%) was noticed im modern cultivars as well as a reduced GLI/GLU ratio (1.48 vs. 1.90).

CONCLUSSIONS

The better technological properties of modern cultivars were correlated with an increase of total GLU, HMW-GS and LMW-GS, while observing them from a health aspect, trend of decrease of α-GLI content as the main triggers of coeliac diseaseas was noticed.

ACKNOWLEDGEMENTS

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Table 1. Average values of proteins, wet gluten, gluten indeks and sedimentation

CULTIVARS	P (%)	WG (%)	GI	SED (cm^3)
HISTORICAL	14.3	27.0	84	27
MODERN	14.2	26.5	92	36

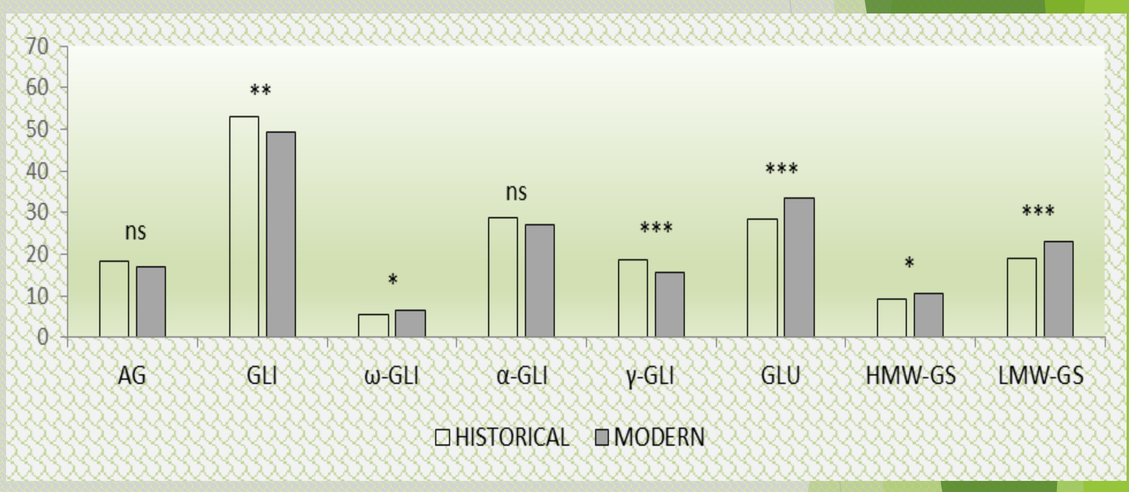

Fig.1 Average values of AG, GLI, ώ-GLI, α-GLI, ϒ-GLI, GLU, HMW-GS, LMW-GS in historical and modern wheat varieties; *, **, * represent significant differences between historical and modern wheat varieties at 0.05, 0.01 and 0.001 respectively; according to t-test**

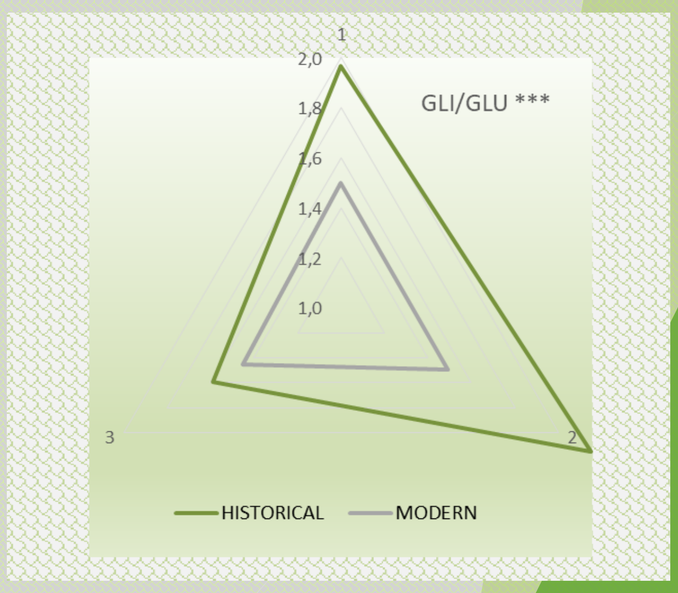

Fig.2 GLI/GLUratio in historical and modern wheat

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