ABSTRACT

From thousands of years wheat is one of the most important crop in the world. The factor contributed to the success of wheat has been the unique viscoelastic properties of wheat dough which allow it to be processed into a range of foodstuffs, mainly bread and other baked products. These properties are determined by specific composition and structures of the grain proteins comprising gluten proteins (gliadins and glutenins) and nongluten proteins (albumins and globulins) able to form gluten network. However, in persons showing gluten intolerance, all of the wheat protein groups may cause IgE-mediated allergies such as asthma, atopic dermatitis, urticaria, angioedema, food allergy, anaphylasis and many others. Consequently, the wheat protein allergenic properties have been widely studied over a period of years to improve health quality of wheat products. In these studies an influence of allelopathic interactions (simulated by modification of wheat kernels with water and hypericum herbal solutions) on protein composition, allergenicity and technological properties of wheat flour was investigated. Modification efficacy index (WEM) calculated for native materials as well as for the materials modified by water and hypericum solution allowed to find out whether the observed changes were the effects of protein hydrolysis or allelopathic interactions. Three commercial wheat cultivars (Muszelka, Tonacja and Ozon) and two hybrid lines of decreased number of allergenic ω-gliadin protein fractions (2-1a and 3-1b) where the objects of the studies. Protein composition was analyzed by electrophoretic (A-PAGE and SDS-PAGE) and chromatographic (RP-HPLC) techniques. The allergenic properties of wheat proteins (HMW and LMW glutenins, gliadins and water/salt soluble proteins comprising albumins and globulins) were analyzed using immunobloting after SDS-PAGE, while technological properties of wheat flour were determined by NIR analyzer. Six technological parameters were determined. They were: total protein, starch and wet gluten content, sedimentation value, water absorption and Falling Number. Only a minor changes in gliadin and LMW glutenin composition after hypericum treatment of wheat grains were observed on SDS-PAGE electrophoregrams. The 10% concentration of the hypericum solution, 24 hours' time of the treatment and temperature 20^0C was the most effective combination of physical conditions to induce reduction of number and intensity of separated protein bands. The detected changes were unspecific in character – in most cases decreasing of protein content was observed in the whole range of protein spectra. However, some specific changes were also

noticed. In all three wheat cultivars two adjacent protein bands of molecular mass 35 kDa and 40 kDa, belonging to γ-gliadin and LMW glutenin groups, showed significantly lower staining intensity in modified materials as compared to native material. On the contrary, strong decreasing of immunotedction signal (considered as decreasing of immunoreactive properties) cased by hypericum treatment was observed among HMW and D-type LMW glutenin subunits. However, increased number of immnoreactive protein bands in modified materials was observed among water/salt soluble albumins and globulins. Two of six technological parameters - sedimentation value and Falling Number - determined by NIR method strongly decreased in modified materials. Decreasing of sedimentation value for modified materials varied in the range of a dozen of percent to native kernels. However, Falling Number decreased from 50% to 80% gaining values 62 sec., 138 sec., and 124 sec. for Tonacja, Ozon and Muszelka respectively. In manufacturing and in technological research the Falling Number level close to 60 sec. lead to disqualification of flour as raw material for bread baking. Although, at the level 138 sec. there is possible to modify processing methodology allowing to produce bread of good technological properties.