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FUNCTIONAL CHARACTERIZATION OF TWO RARE LMW-GS IN DETERMINING VISCO-ELASTIC PROPERTIES OF WHEAT DOUGH

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Prolamins are a group of wheat storage proteins composed by monomeric (gliadins) and polymeric proteins (glutenins) held together by disulphide bonds. These proteins form a proteinaceus complex (gluten) that is of critical importance in determining bread-making and pasta-making quality. In particular, the amount, the composition, and the average size of the polymers constituting the glutenin fraction are the main factors affecting wheat dough rheological quality.

Because most prolamins are similar in structure and are difficult to separate and characterize, the role that the single subunits play in affecting technological properties of the dough is not clear yet, especially for the low molecular weight glutenin subunits (LMW-GS). LMW-GS correspond to a very numerous and heterogeneous group of proteins, in which peculiar sequences are present, along with gliadin sequences with a modified number of cysteines. In the present work we investigate the functional roles of two rare LMW-GS, an i-type LMW-GS (a typical LMW-GS) and a modified γ-gliadin, showing a peculiar primary structure and a different cysteine residue organization, respectively.

At first, we have demonstrated their *in vivo* expression in the glutenin fraction of the endosperm by means of a proteomic approach. To carry out the functional studies we have incorporated the heterologously expressed proteins in the doughs obtained from two Italian cultivars of durum wheat (Lira 42 and Lira 45, of poor and good technological quality respectively) and from an "Australian prime Hard" bread wheat flour (cv Kukri). SE-HPLC, RP-HPLC and two dimensional electrophoretic analyses of proteins extracted from doughs after incorporation have shown that the two polypeptides are present in the glutenin fraction. The rheological parameters of the dough in which the heterologous proteins were incorporated were monitored by using the 2 g Mixograph and compared to the controls (plain semolina and flour). We found a different behaviour of the two polypeptides with respect to durum or bread wheat doughs. In fact, both polypeptides exerted a negative effect on rheological parameters of the two durum wheat doughs, whereas a strong difference was observed in bread wheat. In particular, incorporation of the modified γ-gliadin resulted in a considerable weakening of the dough, whereas the LMW-GS i-type did not exert any significant effect.

These results can be explained assuming that the modified γ-gliadin is a chain terminator polypeptide that reduces the average size of the polymers, at least in bread wheat. The null or slight negative effect exerted by the LMW-GS i-type, that should be a chain extender on the basis of cysteine organization, might be explained by considering the extra strong nature of the bread wheat flour, that likely makes it hard to bring in substantial improvements. At the moment we cannot explain the differences observed between

results obtained from durum and bread wheat doughs, because this is the first report of incorporation into durum wheat. The parameters that are classically taken into account for evaluating rheological properties of bread wheat doughs might not be valid for durum wheat.