

Impact of leavening times on structure and in vitro digestibility of a bread with lentil flour

ROMANO A. (1), D'AURIA G. (1), GALLO V. (2), FERRANTI P. (1), MASI P. (1)

1 University of Naples FEDERICO II, Naples, Italy

2 Institute of Food Science Research , Madrid, Spain

Bread represents a staple part of the Mediterranean diet with a complex crumb structure and usually a high glycaemic index. Leavening is a step in the breadmaking process that can be crucial in determining the final characteristics of a bakery product such as bread. The effects of different leavening times (60 and 105 minutes) and the presence of green lentil flour on structure and physico-chemical and nutritional properties of breads were investigated.

Farinograph characteristics of the flour blend dough were studied by using a Brabender farinograph. The 20% of lentil flour strongly influenced all farinographic properties of dough except of dough development time. In particular lentil flour decreased the stability due to weakening of the gluten network. Leavening time affected bread physico-chemical properties and macrostructure, leading to a significant reduction in moisture content, an increase in weight loss and pH of bread crumb as leavening time increased. Image analysis results to be an effective technique for measuring bubbles structure of breads. Crumb macrostructural properties such as Young's modulus were well correlated to the Image Analysis results such as gas bubble area fractions. Bread quality attributes and in vitro digestibility were significantly influenced by the structure resulting from different leavening times and formulation. The in vitro starch digestibility was analysed enzymatically, determining the amount of released glucose during starch digestion. Bread samples showed a similar total starch content ($P > 0.05$), while the more compact crumb structure of samples led to lower Rapidly Digestible Starch and estimated Glycemic Index. The protein bands of bread samples leavened for different times showed different intensities. In particular, samples leavened for the shortest time (60 minutes) exhibited the weakest protein bands, which may depend on the strength of starch–gluten interactions. The ? amino nitrogen release at the end of digestion reached the lowest values in bread leavened for the longest time (105 minutes).

The results of this research provide interesting information on how and to what extent leavening time can affect the structure and other properties of bread enriched with different content (0 and 20 %) of lentil flour.