

**Title:**

Surface texture of fresh egg pasta enriched with brewers' spent grain

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**Abstract:**

Traditional quality parameters for pasta products are weight increase and matter loss during cooking as well as the mechanical properties of both raw and cooked products. Furthermore, aspect features (e.g. colour, shape, size, surface texture) are evaluated as they can play an important role in consumer's acceptability.

The aim of this work was to define the surface texture properties of fresh egg pasta enriched with brewers' spent grain (BSG) and egg white powder (EWP) by image analysis techniques. BSG is a low-value co-product of the brewing industry, produced in large quantities every year. Its use in pasta products can contribute to increase its value and the sustainability of the brewing process. However, the high amount of fibre can damage the gluten network and thus the pasta texture properties. For this reason, EWP was added as a protein network improver. Thirteen pasta samples, produced as sheets for *lasagna* using wheat flour, semolina, 20% whole egg, 6.2-25% BSG, 0-12% EWP and keeping moisture to a constant level, were characterized by means of heterogeneity (HTG) and grey level co-occurrence matrix (GLCM) indices. Correlations between surface texture properties and traditional quality parameters were also evaluated.

The results showed that the image analysis techniques applied are able to evidence differences within and between raw and cooked samples, even if cooking process reduces these differences. Furthermore, highly significant correlations ( $p < 0.001$ ) were found among the image analysis indices (HTG, contrast, entropy and homogeneity) and common quality parameters (i.e. CIE  $L^*a^*b^*$  values, break deformation, Young's modulus and matter loss).

In conclusion, BSG resulted the most influencing factor affecting surface texture indices. Image analysis can thus be applied to identify pasta samples with different fibre content.