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Refining and bran grinding levels of wheat flours besides baking properties affect tensile characteristics of derived bio-plastics

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Statement of the Problem: There is a recent literature on the use of wheat flours to obtain bio-plastics as an energetically and economically cheap alternative to purified starch. Previous researches from our group demonstrated that the tensile properties of thermoplastic films depended on wheat grain hardness and baking properties of refined flours, expressed as Chopin's Alveograph parameters (P, L, P/L and W). No research, however, has considered the use of wholegrain flours, while this could be of relevance because the bran could work as reinforcement instead of being a by-product to get rid of when exceeding the need for livestock feeding.

Aim: The purpose of this study is to describe the mechanical performance of thermoplastics obtained from wheat flours differing for grain hardness, alveographic parameters and refining and bran grinding level.

Methodology: Grains of four common wheat (*Triticum aestivum* L.) cultivars (Altamira, Aubusson, Blasco, Bologna) were milled separately in a laboratory mill in order to produce single-cultivar refined (R) or wholegrain flour with fine (F) or gross (G) bran grinding. Grain hardness and alveographic parameters for R flours were reported by Benincasa et al. The flours were then plasticized, filmed and tested for tensile properties (strengthσ; elongation at breakε) according to Puglia et al.

Results: The bran reducedσ but increasedε for the films derived from any of the four cultivars. Theσ was higher andσ was lower in films from F than G flours. The reasons for the effect of refining and bran grinding levels were discussed based on SEM microscopy of films which revealed that bran and its texture affected starch granules exposure to plasticizer.

Conclusion & Significance: Both the alveographic parameters and the refining and bran grinding levels of wheat flours represent novel choice factors to consider tailoring manufactures according to requirements and uses.

Biography

Paolo Benincasa is an Associate Professor in Department of Agricultural, Food and Environmental Sciences at University of Perugia. He has expertise in Crop Science and Technology. His research activity focused on "The evaluation of agronomic aspects affecting crop yield and quality and on the management of crop residues and soil fertility in conventional and organic farming systems". Recently, together with his colleagues of the Materials Engineering group, he has started working on "Bio-based materials looking at factors (cultivar, environment, cultivation practices and post-harvest manipulation) that may affect the mechanical properties of derived manufactures".

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