

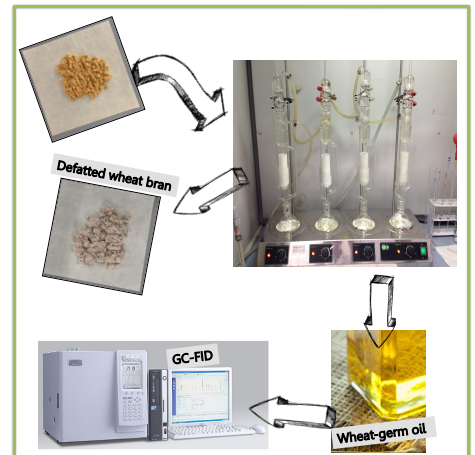
INTRODUCTION

The agri-food sector generates significant quantities of by-products and waste, the disposal of which produces negative environmental and economic impacts. The adoption of an industrial symbiosis approach to transfer and share resources between dissimilar industries, reflects recent European strategies on decoupling economic growth from environmental impacts [1]. Wheat by-products have unique functional and nutritional properties related to colour and their content of dietary fibre [2]. Up-to-date milling technology of durum wheat allows to separate it into different fractions indicated as durum wheat by-products.

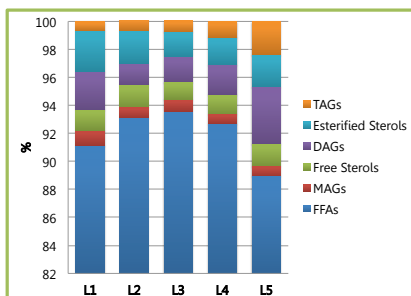


MATERIALS AND METHODS

Wheat bran by-products were obtained by an Italian industrial milling process (Barilla G. e R. F.lli S.p.A). Five different bran layers were selected, isolated according to their sieving mesh size during the flour milling. From each layer, the lipid fraction was extracted by soxhlet procedure and the main lipid classes (triacylglycerols (TAGs), diacylglycerols (DAGs), monoacylglycerols (MAGs), free and esterified sterols, free fatty acids (FFAs)) and the total fatty acid (FA) composition [3] of each lipid extract, were also determined.



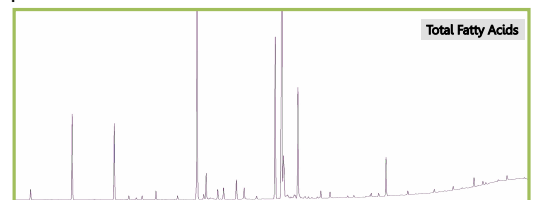
RESULTS



The lipid content ranged from 8% (expressed in dry basis) (L3) to 5% (L1, L4 and L5).

The lipid matter was mainly constituted by FFAs (89–94% of total fat), followed by total sterols (3.4–4.0% of total fat), DAGs (1.5–4.0% of total fat), TAGs (0.6–2.4% of total fat) and MAGs (0.7–1.1% of total fat). In general, FFAs decreased from the outer to the inner layers, whereas TAGs showed the opposite trend; this could be ascribed to a lipolytic phenomena related to an on-going fermentation process.

Total FA were mainly constituted by polyunsaturated fatty acids (PUFA; 53–58% of total FA), followed by monounsaturated fatty acids (MUFA; 21–24% of total FA) and saturated fatty acids (SFA; 17–20% of total FA). More than 50% of total FA was represented by linoleic acid (C18:2 n-6; 51–54%) without significant differences among bran layers.



CONCLUSIONS

The by-products from durum wheat bran could represent a source of added-value edible oil. The extracted oil could be potentially used as a functional ingredient due to its high content of PUFA and low amount of SFA, with an important contribution of linoleic acid (essential fatty acid). However, to reduce its free fatty acid content, as well as to ensure its stability and the preservation of its nutritional and sensory characteristics, a shelf-life study of the functional bran oil is necessary.

REFERENCES

[1] Andrade K.S. et al., Talanta (2012), 88, 544–552. [2] Esposito F. et al., Food Research International (2005), 38, 1167–1173. [3] Gallina Toschi T. et al., Journal of Agricultural and Food Chemistry (2014), 62, 10836–10844.