

VARIATIONS IN TOTAL ANTIOXIDANT ACTIVITY IN RAW MATERIALS AND PRODUCTS OBTAINED FROM WHOLE DURUM WHEAT GROWN IN SICILY

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INTRODUCTION

Several articles have reported interesting levels of total antioxidant capacity of different cereal products derived from whole durum wheat flour, bread and pasta, (Hirawan et al., 2010; Serpen et al., 2007; Quaglia, 2001, Russo, 2008), comparable to those of fresh fruits and vegetables (Miller, 2000). These articles conclude that cereals possess significant free radical and may serve as a potential source of natural antioxidants.

Also, epidemiological studies have shown that consumption of bread and pasta produced from durum wheat, is associated with reduced risk of some chronic diseases such as cardiovascular disease, type 2 diabetes and some forms of cancer (Liu, 2007).

The present study reports the results of total antioxidant activity and total phenolic content in derivatives of wheat such as bread and pasta. These products are obtained from durum wheat crops in Sicily and are produced with traditional methods (grinding stone, natural yeast and low temperature drying pasta).

In particular, the authors investigated the process from the production of flour up to the derived products (bread and pasta), and estimated the total antioxidant activity (expressed as mmol TE per 100 g).

MATERIALS

During the year 2011 samples were collected consisting of cereal flour products (bread and pasta) produced from durum wheat grown in Sicily. These products were obtained in companies providing traceability from raw material. In particular, five sicilian farms' production processes were chosen.

In this way it was possible to identify for each batch of production the raw material from which the same has been obtained (Tab.1); and some sample of pasta that are commercially available. Samples were ground by using a hammer mill (Buhler), having mesh size of 400 µm.

METHODS

| SITE COMPANIES | N° COMPANIES | TYPE OF PRODUCT | NOTE |
|----------------|--------------|-------------------|---|
| TRAPANI | 2 | Whole flour | Obtained from grinding stone. Cultivation of sicilian ancient varieties of durum wheat grown <i>Timilia</i> . |
| | | Pasta | Whole wheat |
| | | Bread | Whole wheat Natural yeast |
| PALERMO | 1 | Flour | Obtained from industrial milling of sicilian durum wheat grown |
| | | Pasta | Drying at low temperatures |
| ENNA | 1 | Whole wheat bread | Natural yeast |
| | | Bread | Natural yeast |
| MESSINA | 1 | Whole flour | Obtained from grinding stone |

➤ Total antioxidant capacity determination (TAC)

The analysis of TAC was determined by ABTS using spectrophotometric analytical method. The samples (1gr) were extracted with methanol. The percentage of inhibition of the absorbance, of a solution containing the substance radical 2,2'-azinobis (3-ethylbenzotiazolin-6-sulfonate) (ABTS), is calculated as a function of the concentration of antioxidant activity of the sample against a Trolox Standard. The absorbance measurement at 734 nm after 0, 15, 30 and 60 min to determine the time required to reach a plateau value. All samples were analysed in duplicates.

➤ Total phenolic content determination (TPC)

The TPC in the extracts was determined with Folin-Ciocalteu reagent according to the method of Slinkard and Singleton (1977) modified partially. Gallic acid was used as a standard. The absorbance of the solutions were measured at 750 nm, after incubation at room temperature in the dark for 90 min. All samples were analysed in duplicates.

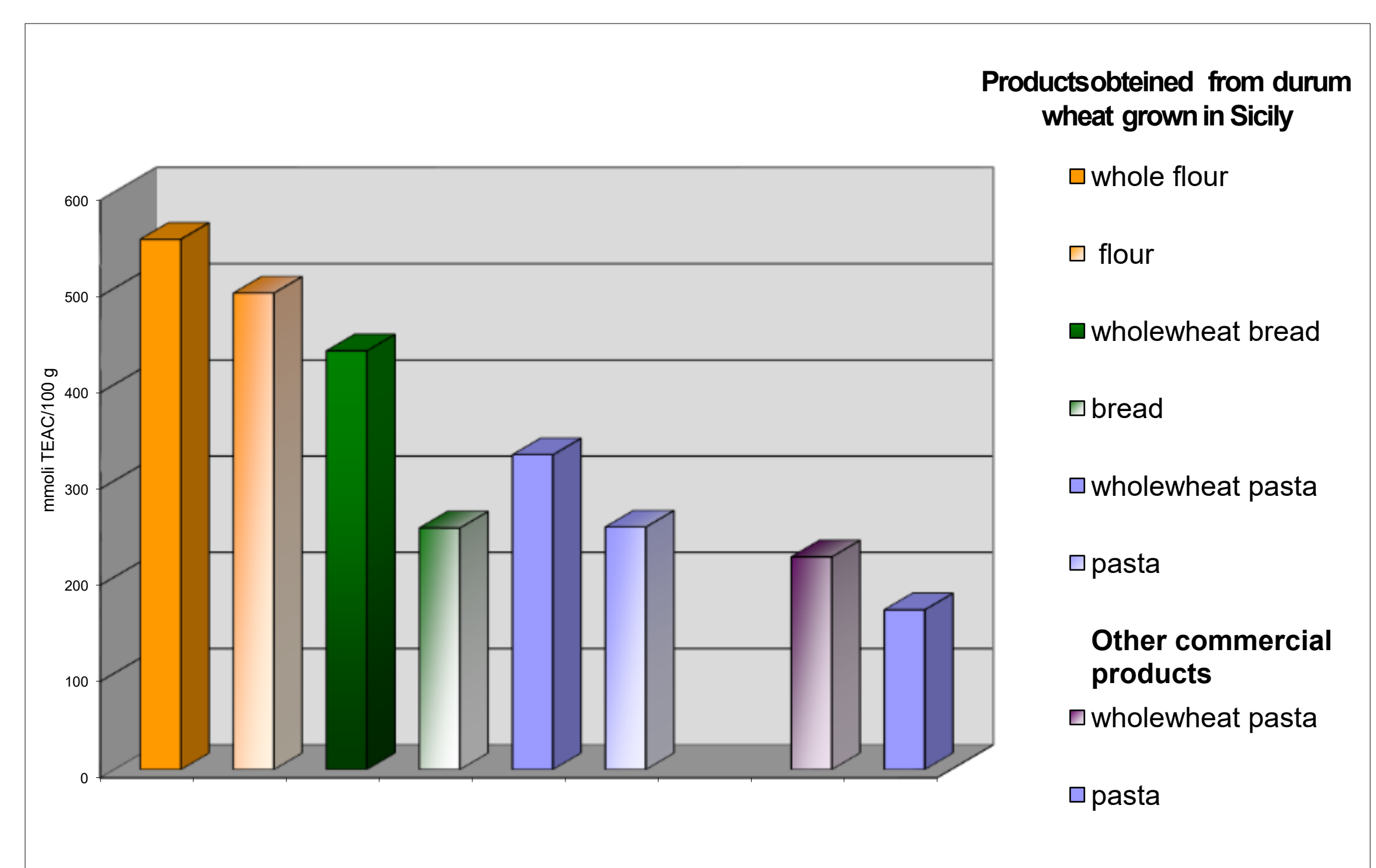
RESULTS AND DISCUSSION

The results of TAC are expressed as mmol Trolox equivalent antioxidant capacity (TEAC)/100g of sample (Grafic).

The results of products (flour, bread and pasta) produced from durum wheat grown in Sicily, show that antioxidant activity is higher in whole flour and derivatives than flour and derivatives. Therefore the commercial products (pasta) show similar trend but with lower values than sicilian products.

Preliminary results of Folin Ciocalteu assay, indicate that total phenolic content in analysed samples ranges from 123,5 for whole flour to 313.9 mg GAE/100g for the whole stone ground flour; from 67.2 for bread to 145.9 mg GAE/100g for whole bread; from 71.13 for pasta to 165.58 mg GAE/100g for whole wheat pasta.

These results may help to support consumption of health products obtained through traditional production processes.



References

- Hirawan R. et al. - Antioxidant properties of commercial, regular-and-whole-wheat spaghetti. Food chemistry 119 (2010) 258-264
- Serpen A. et al. - Direct measurement of the total antioxidant capacity of cereal products.
- Russo G. Introduzione allo studio delle proprietà nutrizionali del grano duro e dei prodotti derivati. IV Rapporto della Filiera Cerealicola Siciliana. Consorzio di Ricerca Gian Pietro Ballatore. (2008) 179-198.
- R. H. Liu et al. Whole grain phytochemicals and health. Journal of Cereal Science 46 (2007) 207-219

