Looking If Any Correlation Exists Between the Total Antioxidant Capacity and Polyphenol Concentration (Measured Using Two Different Enzyme Sensors) in Several Food or Feed Based Vegetables and Pharmaceutical Integrators

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Abstract. The principal aim of the present research has been to check if any correlation exists between the total antioxidant capacity (TAOC) value and the total polyphenols content (TPC) of several food, or beverages and feed samples based vegetables. The research was also extended to several food supplements currently sold as pharmaceutical integrators.

Keywords: Antioxidant capacity · Polyphenols · Correlation · Foods · Seeds · Pharmaceutical supplements

1 Introduction

The measurement of antioxidant capacity, linked to numerous natural plant products, has been aroused in recent years increasing interest. Really, while the antioxidant capacity of the principal vegetables products is now sufficiently well known through the publication of numerous reports on the subject (some of which by the authors of the present communication), little or nothing is actually known from the experimental standpoint about the antioxidant capacity of many food supplements, most of which have appeared on the market recently and can be found in drugstores, side by side with actual pharmaceutical products. Furthermore, although numerous methods are described in the literature to measure antioxidant capacity, the situation has become complicated ever since the United States Department of Agriculture [1] severely criticized and also withdrew from its catalogue the principal and widely known ORAC fluorimetric method [2, 3]. Numerous researchers have therefore recently gone back to using the polyphenol content of vegetables or vegetables based products as a measure of antioxidant properties rather than using methods based for instance on Hydrogen Atom Transfer (HAT), such as ORAC method.

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2 Results and Discussion

In recent years our research team has developed an original biosensor method based on superoxide dismutase enzyme [4–6] for the purpose of measuring the total antioxidant capacity (TAOC) in many vegetables matrices. This new method has been found to correlate highly with methods of Electron Transfer (ET) type [7]. In the present research this biosensor method has been used to determine the TAOC of several different food supplements available in drugstores and advertised above all as having antioxidant properties that can act as radical scavengers. At the same time, in the same products, the total concentration of polyphenols content (TPC), which are deemed to be the main and most effective radical scavengers of plant origin, was measured using a classical enzymatic-amperometric tyrosinase sensor pointed out in the past years by our group [8]. Lastly we checked if any correlation exists between TAOC and polyphenols content values (TPC). Results show that TAOC values and total polyphenol concentration measured in food supplements do not always correlate closely (Fig. 1), not only because of the presence of other non phenolic molecules, which also have a their significant antioxidant capacity, in several of the supplements tested, but due in addition to the different antioxidant capacity of the various polyphenols present.

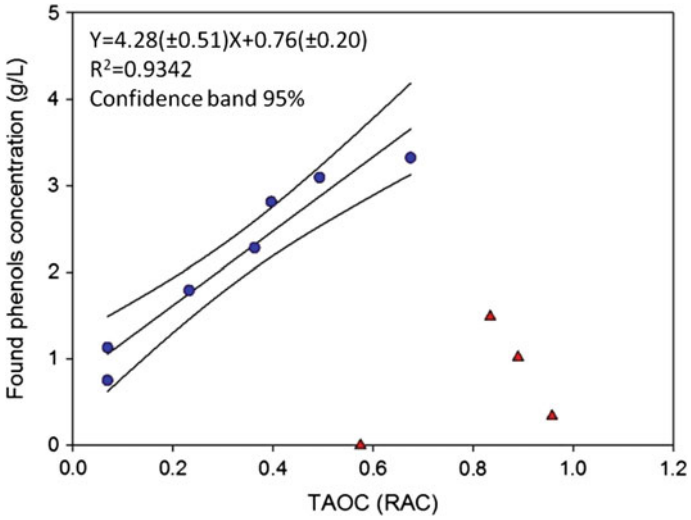

Fig. 1. It can be shown as a correlation between TPC and TAOC exists for several (*filled circle*), but not for all (*filled triangle*) pharmaceutical integrators

Lastly this investigation was extended to several food (beverages) or feed based vegetables already considered in previous researches [4–6, 9–12]. In the case of these food and feed based vegetables, on the contrary, this correlation between TAOC and TPC seems to be usually in a rather evident, as our experimental data have shown (see Figs. 2, 3 and 4).

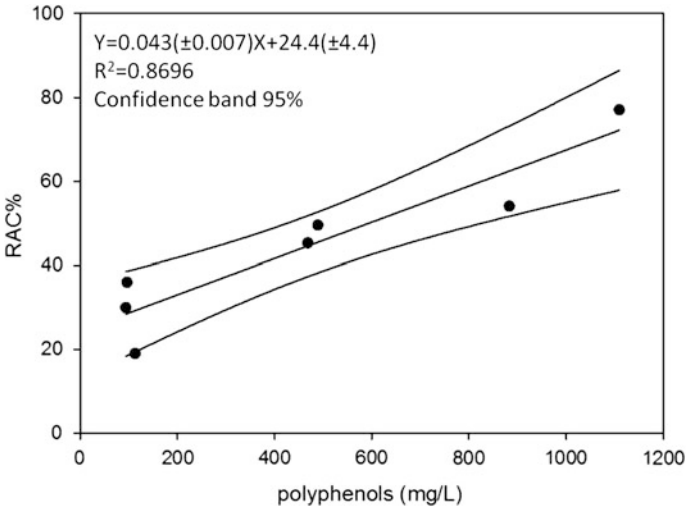

Fig. 2. Correlation between TPC and TAOC for beverages based vegetables product, i.e. common, green and detheinated tea, black and white wines (*filled circle*)

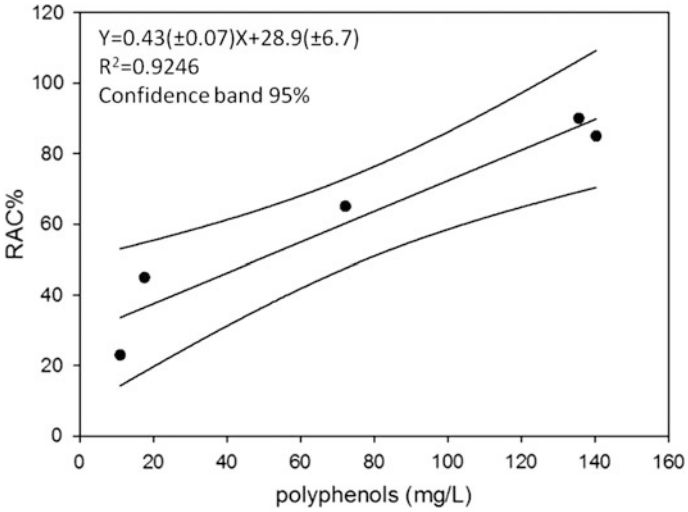

Fig. 3. Correlation between TPC and TAOC for food based vegetables product, i.e. aromatic herbs: anise, basil, majoran, rosemary and juniper (*filled circle*)

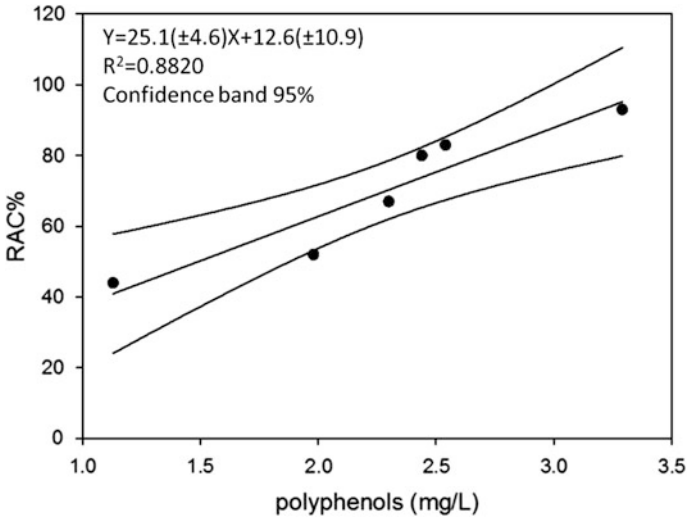

Fig. 4. Correlation between TPC and TAOC for feeds based vegetables product, i.e. maize, bean, mixture of barley maize and bean, grass hay, poultry feed (*filled circle*)

3 Conclusions

One conclusion that may therefore be drawn from this research is that it was confirmed as two used biosensors are very suitable for measurement in foods, feeds and integrators real matrices. Nevertheless the polyphenol concentration alone cannot always be taken as a completely reliable indicator of the total antioxidant capacity of matrices, like those represented by pharmaceutical food supplements. While the polyphenol content represent on the contrary a good indicator of the TAOC value, for food and feed based vegetables.

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