Influence of organic and conventional agricultural practices on chemical profile, in vitro antioxidant and anti-obesity properties of Zingiber officinale Roscoe

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INTRODUCTION

Spices have been in use for thousands of years in cooking to enhance the sensory quality of food (flavour, colour, pungency, food additive etc.). In recent years, the physiological functionality of food spice, used in traditional cooking, has received much attention due to the increasing interest in human health and has been studied in vitro and in vivo by many research groups. Zingiber officinale Rosc. (ginger) is a rhizomatous herb belonging to the family Zingiberaceae. The rhizome is extensively used around the world as spice in culinary, beverages and herbal medicinal practices to treat a wide range of diseases such as rheumatic disorders, col symptoms, fevers, gastrointestinal complications, motion sickness, bronchitis, diabetes, cancer, etc. [1]. Moreover, it was used to treat wide range of diseases in ancient times. Zingiber officinale Rosc. (ginger) has a consequent impaired glucose tolerance, dyslipidaemia, obesity, hypertension and the oxidative stress plays an important role. It is estimated that MetS affects 28% of the population [2]. The efficacy of natural products especially derived from vegetables and spice,largening interest not only to cure but also to prevent the onset of the disease. In this study the influence of organic (OR) and conventional (CONV) agricultural practices on chemical profile and nutraceutical properties of Zingiber officinale Roscoe spice was evaluated.

MATERIALS AND METHODS

Sample and extraction procedure

Commercial dried ginger powders from conventional (CONV) (Z1-Z4) and organic (OR) (Z5) agricultural practices were bought in the market in Cosenza, Calabria (Italy). Ginger powder (5 g) were exhaustively by ultrasound assisted maceration process with ethanol (48h x 3 times). The resultant solutions were dried under reduced temperature and pressure using a rotary evaporator to give extract yield in the range 0.24-0.85 g for Z4 and Z1, respectively.

Total Phenols, flavonoids and carotenoids content

Total phenols, flavonoids and carotenoids content was determined as previously reported by Leporini et al. [3].

In vitro antioxidant activity

Antioxidant compounds may act in vivo through different mechanisms of action. For this reason, no single method can fully evaluate the antioxidant capacity of food since levels of singlet antioxidant in food do not necessarily reflect their antioxidant activity. Therefore, to investigate the antioxidant activity of chemicals choosing an adequate assay based on chemicals of interest is critical. In a multi-target approach was used to test the antioxidant activity by using DPPH, ABTS, β-carotene bleaching, and FRAP assays [3]. DPPH and ABTS test are used to evaluate the radical scavenging activity, the β-carotene bleaching assay as a mimetic model of lipid peroxidation in biological membranes while, FRAP test to evaluate the effect on iron, one of the most important ions involved in oxidation process. RACI and GAS approaches were used to evaluate samples with the highest antioxidant potential.

In vitro hypoglycaemic and hypolipidemic effects

The hypolipidemic potential was investigated through inhibition of lipase while, the inhibition of carbohydrate hydrolysing enzymes, α-amylase and α-glucosidase, was used to evaluate the hypoglycaemic activity [3].

RESULTS AND DISCUSSION

OR Ginger (Z5) showed the highest TPC and TFC with values of 39.27 and 15.38 mg/g dried weight (DW). Similar values were found for the CONV sample Z3. However, the following rank was found for TCC: Z1>Z2>Z3>Z4.

In vitro antioxidant activity of ginger samples

Samples from OR agricultural practices resulted the most active in all applied antioxidant test with particular reference to ABTS test where Z5 showed a stronger activity with IC50 value of 0.81 µg/mL in comparison to the control ascorbic acid (1.70 µg/mL). The same observation was noted in FRAP assay.

RACI and GAS statistical approach confirmed the Z5 highest antioxidant potency followed by the CONV sample Z3.

Moreover, the sample Z5 exhibited a promising lipase inhibitory activity with IC50 value quite similar to the positive control orlistat (IC50, values of 34.48 vs 37.42 mg/mL). Interesting were also, the results obtained for the sample Z4 against α-amylase and α-glucosidase enzymes with values statistically comparable with positive control orlistat.

CONCLUSION

Collectively, our results demonstrated the impact of agricultural practices on ginger health properties. Moreover ginger may serve as a potential dietary nutraceutical supplement to keep human beings healthy. Furthermore, it holds promise for becoming a natural food additive as an antioxidant agent. However, further in vivo studies will be needed to confirm the potential in humans and prove the safety of the products.

REFERENCES