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Short Communication

Determination of total phenolic amount of some edible fruits and vegetables

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Total phenolic content of some fruits and vegetables namely; garden egg (*Allium sativvum* L.), ducanut (*Irvingia wombolu*), lemon (*Citrus limonia*), garden egg (*Solanum melongena*), grape (*Citrus paradise*) and carrot (*Daucus carota* L.) purchased from an open market in Benin City, Nigeria were determined. The results obtained showed that ducanut had the highest amount of total phenolics (98.77 µg/g), gallic acid equivalent (GAE), while the lowest amount determined (5.75 µg/g) GAE was in the grape fruit. These values were generally lower than similar studies conducted elsewhere.

Key words: Total phenolic, acid equivalent, free radicals, cultivars.

INTRODUCTION

Antioxidants are naturally occurring or synthetic chemi-cals in foods that help to counter the detrimental effects of reaction oxygen species (ROS) and free radicals which causes degenerative human diseases such as cancer, heart diseases and cerebrovascular diseases (Wresburger, 2002). Recently, natural foods and derived antioxidant such as vitamins and phenol phytochemicals have received growing attention. This is because they are known to function as chemo preventive agents against oxidative damage (Wang et al., 1997). Vitamin C is one of the most popular and least toxic antioxidant compo-nents of foods and has been most widely used as a dietary supplement to prevent oxidative stress mediated diseases (Gardner et al., 2002).

However, the contribution of vitamin C to the anti-oxidant activity of fruits and vegetables is generally about 10% (Slinkard and Singleton, 1977). Phenolics or poly-phenols have received considerable attention because of their physiological functions, including antioxidant, anti-mutagenic and antitumour activities. They are known to possess remarkably high antioxidant activity. A recent review of current literature suggests that fruits and vege-table in combination have synergistic effects on anti-oxidant activities leading to greater reduction in risk of chronic diseases (Won and Park, 2005). For some time now, health organizations have recognized beneficial roles fruits and vegetables play in the reduced risk of diseases and have developed enlightenment prog-rammes to encourage consumers to eat more antioxidant rich fruits and vegetables. Reinforced by current re-search, the message remains that antioxidants obtained from food sources, including fruits, vegetables and whole grains are potentially active in diseases risk reduction and can be beneficial to human health (Dreosti, 2000).

Phenolics or polyphenols have received considerable attention because of their physiological functions, includ-ing antioxidant, antimutagenic and antitumor activities. They have been reported to be a potential candidate to combat free radicals, which are harmful to our body and foods systems (Nagai et al., 2003). It is imperative therefore to evaluate or quantify the amount of these anti-oxidant derivatives in commonly consumed fruits and vegetables. Hence, the present work was aimed at deter-minating the concentration of total phenolic antioxidant present in some edible fruits and vegetables.

MATERIALS AND METHODS

The following foodstuffs were obtained at New Benin market in Benin City, Edo State, Nigeria. Grape fruit (*Citrus paradise*), ducanut pulp (*Irvingia wombolu*), lemon fruit (*Citrus limonia*), garlic fruit (*Allium sativum* L), and vegetable garden egg (*Solanum melongena*) carrot fruit (*Daucus carota*). They were thoroughly

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Table 1. Total phenolic content (TPC) of the food stuffs.

Fruit/vegetable	Total phenolic content (TPC) µg/g (GAE)
Garlic (*Allium sativum* L)	20.48 ± 4.37
Ducanut (*Irvingia wombolu*)	98.77 ± 17.22
Lemon (*Citrus limonia*)	18.00 ± 5.63
Garden egg (*Solanum melongagena*)	20.37 ± 2.00
Grape (*Citrus paradise*)	5.75 ± 2.45
Carrot (*Daucus Carota* L).	26.59 ± 1.70

washed with distilled deionised water. The grape and lemon fruits had their outer parts (pericarp) peeled off and then the fruits were homogenized in ice cooled blender without the seeds. The other fruits were equally homogenized in a similar manner. For sample extraction, 75 g each of the blended materials were macerated in 100 ml of methanol containing 0.1% of HC1. Then the extracts were filtered over Whatman no. 1 filter paper under vacuum and the residues were repeatedly extracted with the same solvent until they were colourless (Sun and Ho, 2005) . All the extract in methanol were removed and concentrated by a rotary evaporator at 50^{o}C for the determination of total phenolic content. Total phenolic content was determined with Folin–Ciocalteu reagent according to the method of Slinkard and Singleton (1977) using gallic acid as a standard phenolic compound. Briefly, 1 ml of approximately diluted samples and a standard solution of gallic acid were added to a 25 ml volumetric flask containing 9 ml of distilled water. A reagent blank using distilled water was prepared. 1 ml of folic–Ciocalteu phenol reagent was added to the mixture and shaken. After 5 min, 10 ml of a 7% Na_2 CO_3 solution was added with mixing and then allowed to stand for 2 h. The absorbance was measured at 760 nm. The concentration of total phenolic compounds in the various fruits and vegetables were determined as microgram of gallic acid equivalent by using an equation that was obtained from standard gallic acid graph. All samples were analysed in duplicates.

RESULTS AND DISCUSSION

The total phenolic concentrations of the food stuff investigated are as shown in (Table 1) . Ducanut (pulp) had the highest amount of total phenol while grape fruit possessed the lowest amount (5.75 µg/g). Elsewhere, Karadeniz et al. (2005), while evaluating the antioxidant activity of selected fruits and vegetables grown in turkey reported that total phenolics in grape, red cabbage and onion were 2025 ± 56.6, 2166 ± 7.1 and 536 ± 113.1 mg/kg respectively. Several factors could be added to be responsible for differences in total phenolic content of foodstuffs of same or similar origin. They include variation in fruit cultivars, harvest and post harvest handling and storage conditions, processing techniques during analytical determinations. Pearson et al. (1999) reported that apples showed antioxidated activity attributed to total phenolic amount over a wide range of cultivars from 14.7 to 40.7%. In the present study all the fruits and vegetable were obtained at the open market; the implication is that several physiochemical reaction would have taken place between the harvest time and the open market where the foodstuffs are sold which may be responsible for the relatively low levels of total phenolics determined in the fruits and vegetable.

Conclusion

Total phenolic amount of fruits and vegetables obtained from the open market in Benin City was generally lower than concentrations reported elsewhere.

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