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Comparative analysis of antioxidant capacity and total phenolic content of some selected fruits in Ekiti State, Nigeria

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ABSTRACT: Antioxidant capacity and total phenolic content of aqueous extract of some selected fruits (*Citrus aurantifolia, Citrus reticulata, Daucas carota, Mallus pumila* (green and red varieties), *Citrullus vulgaris, Citrus sinensis, Ananas comosus* and *Citrus paradisi*) were evaluated using Ferric ion Reducing Antioxidant Potential (FRAP) assay and Folin-coicalteau method. The results showed that the antioxidant activity (AA) of the fruits ranged from 0.93(*Citrullus vulgaris*) to 4.61(*Citrus sinensis*) µmoleTrolox equivalent/ml while the total phenolic content (TPC) of the fruits ranged from 89.47(*Citrullus vulgaris*) to 428.99(*Citrus sinensis*)mgGAE/ml. A high correlation between total phenolics and antioxidant capacity was observed. The fruits investigated in the study are shown to be rich sources of antioxidant compounds which when included in the normal diet can be utilized as scavengers of free radicals thereby preventing the incidence of chronic and degenerative diseases such as cancer, cardiovascular diseases and other age related diseases prevalent in developing countries.

Key words: Bush food plants, FRAP assay, Folin-Coicalteau method, Diseases.

Introduction

Different species of edible fruits are recognized and consumed in rural communities of the tropical countries (Adeyeye, 2008). Fruit eating in these communities was associated with childhood eating habits but in recent times, the bush food plants are becoming popular and commonly consumed as adjuncts to food/ or deserts by both young and old. This awareness has grown especially with the association of fruits inversely with morbidity and mortality from degenerative and coronary diseases (Verzelloni *et al*, 2007).

Polyphenols are bioactive phytochemicals with strong antioxidant activity (Rice-Evans, 2001). They are found in all parts of plants such as leaves, fruits, seeds, roots and bark (Mathew and Abraham, 2006). Polyphenols are known to play an active role in the prevention of degenerative diseases such as cancer and cardiovascular diseases (Lambert *et al*, 2005; Vita, 2005). They protect cell constituents against oxidative damage through scavenging of free radicals and thereby avert their deleterious effects on nuleic acids, proteins and lipids (Rice-Evans, 1996; Rice-Evans *et al*, 2001). Oxidative properties of polyphenols arise from their high reactivity as hydrogen or electron donors (Rice-Evans *et al*, 2001).

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Edible fruits which served as a source of food and medicine for many years were reported to posses nutritious and organoleptic properties (Rezzali *et al*, 2008). Although fresh fruits as well as their products are available from farms and in local supermarkets with increasing rate of consumption, yet there is paucity of information on the antioxidant capacity of common edible fruits. Some reported work on the antioxidant capacity of fruits and fruit products include those of Yim *et al* (2002), Riberio *et al* (2008) Bharti and Gargi (2009) and Rohman *et al* (2010).

This work presents the antioxidant activity and total phenolic content of lime ((*Citrus aurantifolia)*, tangerine (*Citrus reticulata*), carrot (*Daucas carota)*, sweet orange (*Citrus sinensis)* apple (*Mallus pumila*), watermelon (*Citrullus vulgaris*), pineapple (*Ananas comosus*) and grape fruit (*Citrus paradisi)* to enrich the available information on the nutritional quality of fruits.

Materials and Methods

The fruits were purchased from Okesa market in Ado-Ekiti, Nigeria. Extracts of washed, uncooked, fresh fruits were prepared by homogenising 5g (fresh wet weight of the edible part, with or without skin, as would normally be eaten) in 100ml distilled water for 30s. Homogeneates were centrifuged, and the antioxidant activity of the extracts of the fruits was determined using Ferric-ion Reducing Antioxidant Potential (FRAP) assay (Benzie and Strain, 1996) while the total phenolic content of the fruit extracts was determined using Folin-Coicalteau method (Singleton *et al*, 1999).

Results and Discussion

The general order of the antioxidant activity of the selected fruits is orange (*Citrus sinensis*) > carrot (*Daucas carota*) > pineapple (*Anana comosus*) > tangerine (*Citrus reticulata*)> grape> red apple (*Mallus pumila*) > lime> green apple (*Mallus pumila)* > water melon (*Citrullus vulgaris*). The relatively high antioxidant capacity in orange, pineapple and red apple (Figure 1) are in conformity with the report of Yim et *al* (2002). The high level of antioxidant activity recorded for orange and carrot may be due to the presence of vitamin C and carotenoids in orange and carrot respectively.

The general order of total phenolic content of the fruits follows the order: orange> red apple> green apple> grape> pineapple > carrot> tangerine> lime> water melon (Figure 2). Phenolic compounds contribute to the overall antioxidant activities of plants mainly due to their redox properties (Rohman, *et al*, 2010). It is worthy of note that the red variety of apple recorded higher values of antioxidant activity and total phenolic content than the green variety. It is obvious from Figures 1 and 2 that water melon recorded the lowest levels of antioxidant activity and total phenolic content while the highest levels of both antioxidant activity and total phenolic content were recorded for *Citrus sinensis* (orange). In fact, the levels of both antioxidant capacity and total phenolic content in orange are almost five folds higher than those recorded for water melon. Even though the market price of water melon is higher than the prize of the same quantity (in kg) of orange, yet orange has a comparative advantage over water melon in terms of antioxidant activity and total phenolic content. In terms of moisture content and sugar level, water melon could have an advantage over orange.

The relationship between antioxidant activity (Y) and total phenolic content (X) (Figure 3) reveals coefficient of determination (R^2) of 0.188. This suggests that phenolic compounds contribute 18.8% to antioxidant activity from the fruit extracts of the nine fruits considered in this determination. This also implies that antioxidant activity of these fruit extracts is not limited to phenolic compounds alone. Other antioxidant metabolites like volatile oils, carotenoids, flavonoids and vitamins may contribute to the antioxidant activity of the extracts of these fruits.

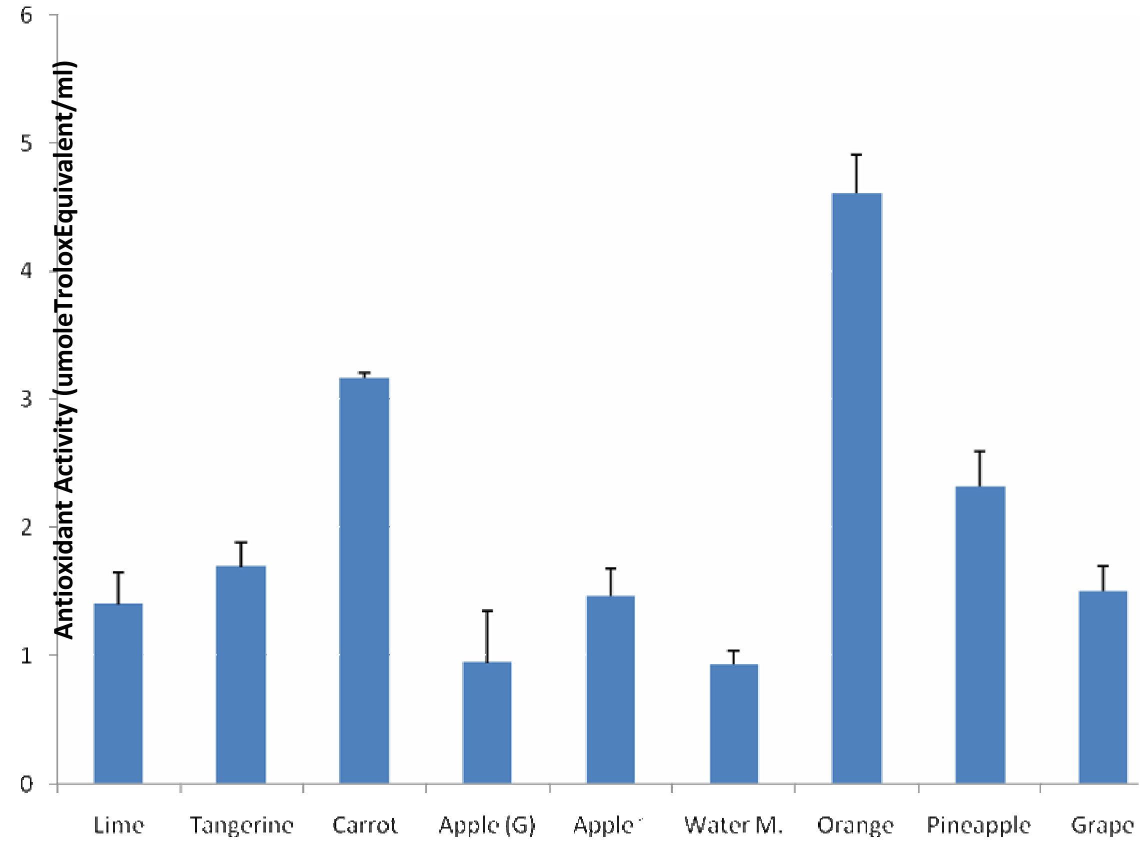

Figure 1: Antioxidant activity of some selected commonly consumed fruits in Ekiti State, Nigeria

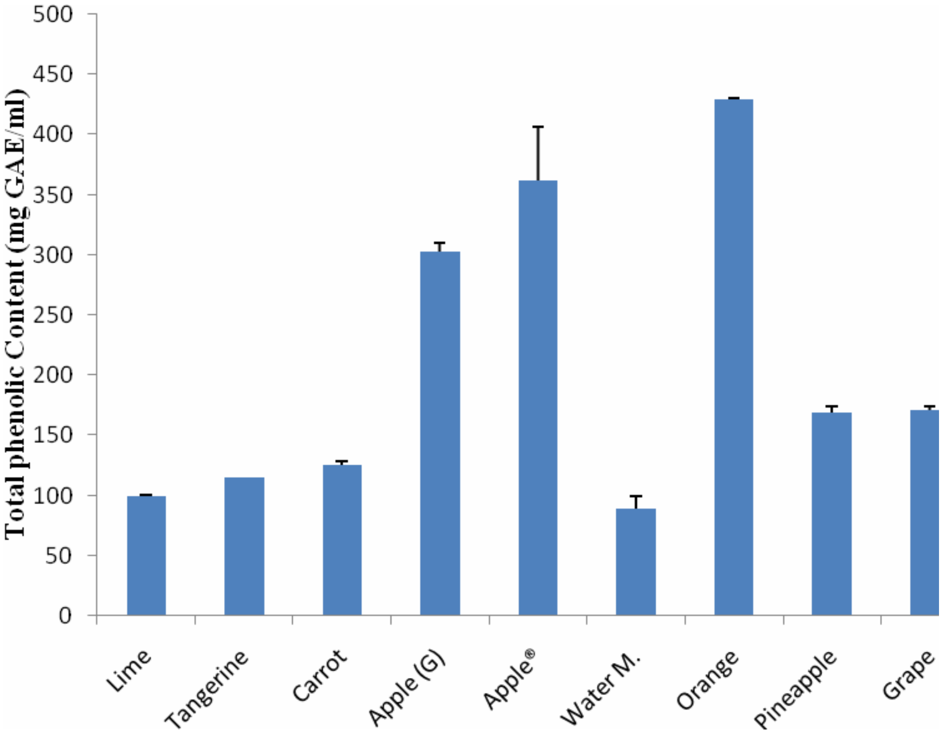

Figure 2: Total phenolic content of some commonly consumed fruits in Ekiti State, Nigeria

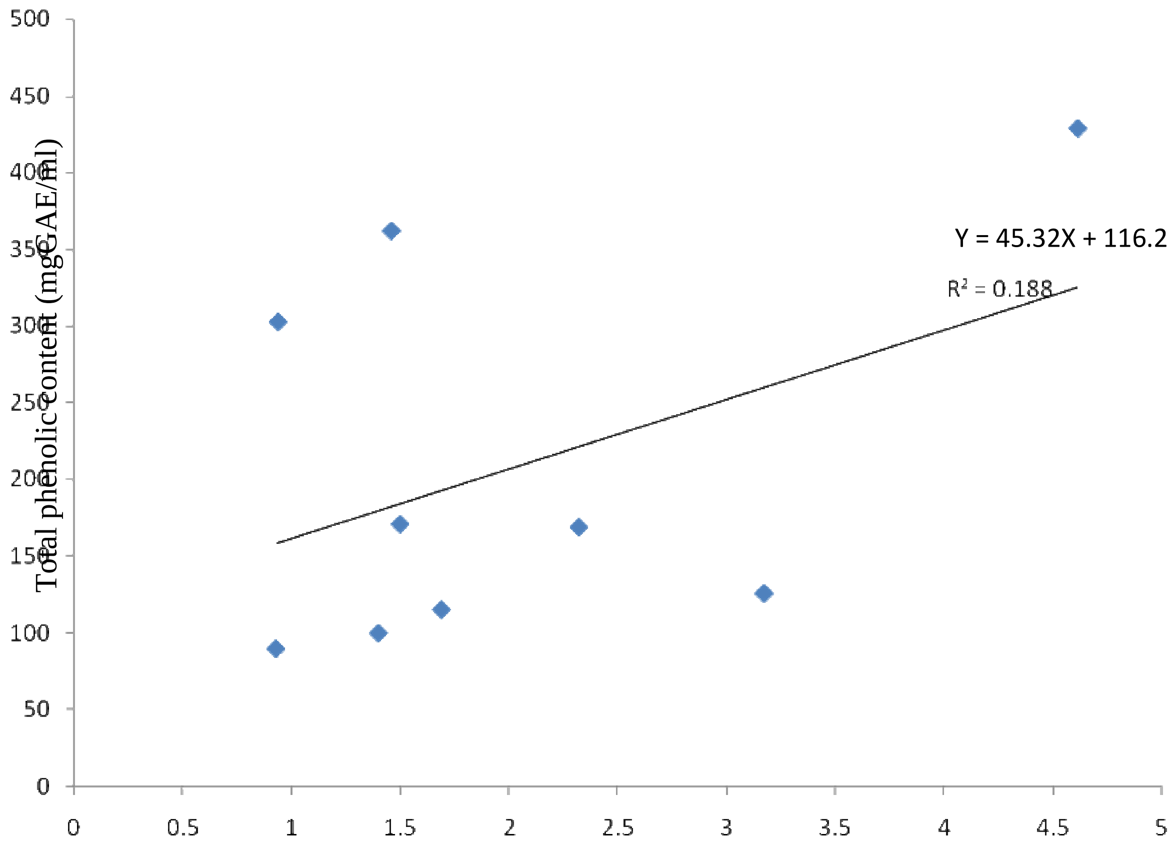

Figure 3: Relationship between antioxidant activity and total phenolic content of some selected commonly consumed fruits.

Conclusion

Our data on the selected fruits commonly consumed in Ekiti State, Nigeria indicate that the fruits represent rich sources of antioxidant due to significantly high levels of phytochemicals. Therefore utilizing these fruits as sources of bioactive phytochemicals could offer enormous opportunities for the functional food industry.

Further work on the studies for the identification of further antioxidant compounds and clinical trials for testing the fruits bioactivity in vivo is in progress.

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