A Survey of Nutritional Benefits and Diseases of Citrus Fruits Consumed by Humans

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Abstract
This study was carried out to investigate the nutritional benefits and diseases of the consumption of citrus fruits by humans. Reviews of previous works were carried out to enable the reviewer arrive at his conclusions. It was discovered that Citrus fruits were one of the most important fruits all over the world, due to their health-related elements and valuable components which includes vitamin C, carotenoids, flavonoids, pectin, Calcium and Potassium. It was concluded that Citrus fruits are known for their beneficial biological activities to the human body and they are available all year round. Citrus fruits and their components are a rich source of flavonoids, carotenoids, and bioactive compounds which are used in treatment of hypertension, also, there are active compounds extracted from citrus fruits used to fight heart diseases. Moreover, Citrus juice contains enzymes considered as a natural tool for obesity control and contained a range of different proteins which burns human fats. It was recommended that: Agriculturalists, government, and industry can provide assistance in increasing production and trade as well as provide information to improve citrus varieties.

INTRODUCTION

Citrus is widely grown in Nigeria and many other tropical and subtropical regions (Piccineli et al, 2008). In terms of volume of production, citrus ranks after banana as the world second fruit crop with more than 108 million tons (FA O Statistics 2006) sweet orange (Citrus sinesis L. Osbeck) commonly called orange is a member of this family and a major source of vitamins, especially vitamin C, sufficient amount of Folacin, Calcium, potassium thianmine, niacin and magnesium. Economically, oranges are important fruit crops with an estimated 60 million metric tonnes produced worldwide as at 2005. For a total value of 9 billion united states of America (Bernardi et. al. 2006). The global citrus acreage according to FAO statistics in 2009 was nine million hectares with production put at 122.3 million tons, ranking sweet oranges first among all the fruit crops (Calomme, M; Pieters L; Vlietinck A; Berghe, D.V; 1996). Oranges probably originates from South East Asia, and were cultivated in China by 2500 BC (Nicolosi et al, 2006), where it was referred to as "Chinese" apple. Today, it is grown almost all over the world as a source of food for humans because of it high nutritional values, source of vitamins and other uses. Propagation through seed is associated with problems like poo, pollen production, self-incompatibility and muscular embryo (Mortton, 1987).

Therefore, budding onto appropriate rootstocks is the common means of assuring the reproduction of cultures of known quality. Kawaii et al; (2011) posited that the issues of tissue culture to produce good quality plantlets, but are highly susceptible to root diseases and this limits production. The different species of cultivated citrus constitute major fruits of subtropical regions and is the most important fruit crop in West Africa. Primary species of cultivated citrus are the sweet orange (C. sinesis), lemon (C. limon), grape fruit (C. parcidis),

lime (C. ciurantifolia) and manokrin (C. reticulate), it also includes hybrids such as tango and tangelo.

They belong to the order, Geraniates and to the family, Rutacea. They are evergreen trees or small shrubs and vary in size from 3-5m tall (Jung, U.J; Lee, M.K; Jeong, K.S; & Chol, M.S; 2004). Citrus fruits are most important fruit crops known by humans since antiquity and are a good source of vitamin "C" with high antioxidant potential (Matsuda H; Yano M; Kubo M; Iinuma, M; 2001). They contain volatile oils, limonene, alpha terpinene, alpha pinene, beta pinene, citrel, coumarins, bioflavanoids, vitamins and mucilage. They also act as antiseptic, antirheumatic, antibacterial and antioxidants, (Matsuda, H; Yano, M; Kubo, M; Iinuma, M; 2001). Citrus fruits are well known to be rich in certain phyto nutrients especially especially flavonoids that protects humans against cancer and cardiovascular diseases, (Mortton, 2007). They are rich in minerals that help in lowering blood pressure levels and substantially reduce the risk of stroke.

Propagation

Though citrus can reproduce sexually through seeds, most commercial plantings in Northern Nigeria are done vegetatively; this is partly due to the fact that the crop exhibits polyembryology and as such desirable characteristics of parent trees would not be exhibited by sexually propagated offsprings (FAO (2006). Furthermore, there are some advantages offered by certain root stocks such as the ability to withstand certain diseases endemic in an area, which are good for the establishment of the crop in the field. The commonest propagation method is by grafting or budding of nursery plant before they are planted are planted on the field, (FAO 2006). At the nursery, bud lings showing undesirable characteristics are destroyed to ensure that plants on the field are only the desirable ones.

The nursery is therefore very important in the cultivation of citrus in Nigeria. Commercial powers of the crop either depend on people specialized in the raising of seedlings for sale or have there the raising of seedlings are raised for propagation (Tweneboah, 2000). Others with large planting have their own nurseries where planting materials are raised for the orchards and at the time to be supplied to other farmers.

Pathology of Citrus

In recent times however, there appear to be an upsurge of foliage diseases in the nursery. Presently, all the different varieties of the crop in the nursery, including both the scions and rootstocks are diseased. The alarming rate of spread of these diseases in the nursery and the rapid destruction of the foliages of the seedlings has become a great concern to the station. The most disturbing observation about these diseases is that the routine disease control measures in the nursery appear to be ineffective against these diseases.

With the exception of funguran, which offer to suppress these diseases, all the other fungicides have proved ineffective against these diseases (Breutu; personal comm). With the disease affecting foliage of scions, there is high risk of disseminating these diseases to the field of farmers, who depend on the station for planting materials this would unitimately prove detrimental to the citrus industry in country as a whole, if these diseases prove to be destructive in the farmer's field.

Origin and Spread of Citrus

Cultivated species of citrus are believed to be indigenous to south-east Asia, (FAO 2006), particularly the subtropical regions (Rice et al, 1986). Recent evidence suggests that, the Yunmen province in south central China, may be an important source of origin of the crop due to the diversity of the citrus species found there and the system of rivers that could have provided dispersal of the fruit to the south (Gmitter and Hu, 1990). Many types of the

citrus species are believed to have moved to various Arabian areas such as Oman, Persia, Macedonia and Palestine long before Christ (Galati, E.M; Monforte, M.T; Kirjavainen, S; Forestieri, A.M; & Trovato, A; 2004).) and had been playing important role in the Jewish religion as early as 50 AD – 150 AD (Mortton, 2007).

Limes apparently originated in the East Achipelago and were probably brought acroos the sea of Oman by Arabian sailors and subsequently to Egypt and Europe (Albrigo and Davies, 1994). Sweet orange was introduced to Europe during the last half of the 15th century by Arab traders and finally into West Africa by the Portuguese and Europeans.

Citrus was believed to be cultivated in their natural habitat before introduction into Europe by the Portuguese, (FAO 2006). Currently, the crop is cultivated primarily between latitude 40^{0}N and 40^{0}S. More northern and southern locations of commercial production exist where temperatures are moderated by ocean winds. The main centers of production in the world are southern Africa, Israel, the United States of America, Brazil, Spain, Japan and Italy, with the United States being the largest producer. In Africa, large-scale production occurs in the Mediterranean coast and Zimbabwe, Mozambique, South Africa and Swaziland. In the other areas cultivation of the crop is on small scale and mainly for auto-consumption (Albrigo and Davies, 1994; Tweneboah, 2000; Rice et al, 1986).

Major Health benefits of Citrus fruits

The main health benefits of citrus fruits include, orange among others

Anti-carcinogenic properties: Citrus flavonoids possess anticarcinogenic and anti-tumor activities.

Cardiovascular properties: Citrus flavonoids show an antiadhesive and anti-aggregation action against red cell clumping.

Hyperglycemia: Citrus flavonoids play important roles in preventing the progression of hyperglycemia, partly through binding with starch, increasing hepatic glycolysis and the glycogen concentration, and lowering hepatic gluconeogenesis.

Anti-inflammatory, Antiallergic and Analgesic activity: Citrus flavonoids like hesperidin, diosmin, quercetin, and other flavonoids have shown dose-dependent anti-inflammatory activity by influencing metabolism of arachidonicacid and histamine release.

Anti-microbial activity: One of the properties of flavonoids with their physiological action in the plants are their antifungal and antiviral activity.

Anti-anxiety, antidepressant, and antiallergic activity: Apigenin shows antidepressant activity, some flavonoids show antiallergic.

Citrus and lipids control: Many clinical studies reported that the citrus juice is helpful for control higher cholesterol and major lipid problem of the human body, due to the higher content of soluble and insoluble fiber in citrus juice

Conclusion

Citrus fruits are known for their beneficial biological activities to the human body, Citrus fruits are available all year round, Citrus fruits and their components are rich sources of flavonoids, carotenoids, and bioactive compounds which are useful in the treatment of hypertension. Also, there are active compounds extracted from citrus fruits useful in combating heart diseases. Citrus fruits are precious sources of phytochemicals which are

beneficial to the human body as vital bioactive medicines. Phytochemicals are naturally present in citrus juices and play a role in physiological functions and metabolic changes of the human body. Citrus fruits and juices has a unique value of essential nutrients, and these nutrients protect against several chronic diseases. Citrus has potential health benefits like antimicrobial, anti-inflammatory, antiviral and anticancer, besides that, Citrus juice contains a lower amount of cholesterol that helps for diabetes patients However, Citrus juice contains enzymes considered a natural tool for obesity control and contained a range of different proteins which burns human fats. Citrus fruit has a lot of nutiritional benefits and can be naturally present in citrus juice and can also play a role in body development.

Recommendations

Based on the findings, the following recommendations were made:

1. Increasing domestic production, improving current yields, and investing in transportation, storage, and production infrastructure, especially in developing countries, may improve accessibility, which can influence price.
2. Agriculturalists, governments, and industry can provide assistance in increasing production and trade and provide information to improve citrus varieties. For example, some nutrients and phytochemicals can be increased by not only selecting for nutrient-rich varieties of citrus, but also by manipulating external conditions and harvesting times. Vitamin C can be increased by increasing potassium and maintaining adequate zinc, magnesium, and copper in the soil, and can be negatively affected by elevated nitrogen from fertilizer; growth and storage in cooler temperatures, and growth in direct sunlight can also increase and retain vitamin C in citrus as well as the type of rootstock the citrus is grafted on.
3. Encouraging research on lesser known citrus varieties, and developing citrus varieties capable of expanding into new environs might increase consumption in low income countries that currently lack sufficient domestic citrus production and extend the potential health benefits of citrus to these populations.
4. Finally, promoting the nutritional and health benefits of citrus may correspondingly encourage consumption.

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