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Physico-chemical Properties of Serendipity Berry (*Dioscoreophyllum cumminsii*) Fruit

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ABSTRACT: This study evaluates the physico-chemical properties of serendipity berry. Physico-chemical properties of the serendipity berries were analyzed. The total number of berries in a bunch of fruit ranged from 45 to 98. This depends on the size of the bunch. The results revealed the dry matter, moisture, soluble solids and vitamin C to be 19.56%, 80.44%, 11.20% and 12.80mg/100g respectively. Titratable acidity and pH were 0.21 % and 6.6 respectively. The number of berries per bunch ranged from 45-98 and the 10-fruit weight was 5.30g. Total carotenoid value was 2.01 mg/100g in the fruit. The fruits have appreciable amount of total soluble solid which could serve as a source of energy. Serendipity berry fruits compared relatively with other fruits used in the fruit industry. © JASEM

Introduction: Serendipity berry (*Dioscoreophyllum cumminsii*) is a tropical rainforest vine. It belongs to the order Ranunculales and the family, Menispermaceae. The genus *Dioscoreophyllum* belongs to the tribe, Tinosporeae comprising *D. cumminsii* and *D. volkensii* (Oselebe and Nwankiti, 2005). The intense sweetener of the fruit of *Dioscoreophyllum cumminsii*, called the serendipity berry, was revealed to be a protein (Inglett, 1976). Monellin is a sweet protein from the fruit of "serendipity berry" (*Dioscoreophyllum cumminsii*), a tropical plant native to West Africa (Wlodawer and Hodgson, 1975). This protein is the sweetest known naturally occurring substance, up to 3,000 times sweeter than sucrose, and approximately 100,000 times as potent as sugar on a molar basis (Inglett and May, 1969, Faruya et al., 1983, Penarrubia et al., 1992). Monellin could thus replace sugar in foods for diabetics and dieters (Oselebe and Nwankiti, 2005). *D. cumminsii* also has many medicinal values: the tubers, stems, and leaves are used in indigenous medicine (Irvine, 1961; Oselebe and Nwankiti, 2005). In Nigeria, the plants grow in the relatively undisturbed rainforest areas of southern Nigeria (Oselebe and Ene-Obong, 2007). Fruits generally, are needed in our life as part of nutrition component and have many beneficial effects on human health, e.g. as the source of dietary antioxidants (Azlan et al., 2009). Serendipity berry (*Dioscoreophyllum cumminsii*) is among the unpopular and under-utilized fruit found in the forest towards the end of the raining season. The properties of this fruit have not been widely investigated and consumption of this fruit could have beneficial effect on human health. Unlike other fruits, there are dearths of information on the chemical compositions and physico-chemical properties of serendipity berry fruit. Therefore, this work evaluates the physico-chemical properties of serendipity berry fruit.

MATERIALS AND METHODS

Serendipity berries were obtained in Oke-Oro farm, Esa-Odo, Osun State, Nigeria in October 2012. Fruits were homogenized, and the homogenate samples were analyzed for total soluble solid content using a digital refractometer (Atago Model PR-1, Tokyo) (Hajilou and Fakhimrezaei, 2011). The method for analysis of titratable acidity was based on titration of the acids present in the fruit juice with sodium hydroxide (0.1N). Values of titratable acidity were expressed as % citric acid. Ten-fruit weight was determined by weighing 10 frozen fruit (Zatylny et al., 2005)). The pH value was measured using a digital pH-meter (WTW Inolab pH-L1, Germany). Vitamin C content (mg/100g) was determined using 2, 6-Dichlorophenolindophenol by visual titrimetric method (AOAC, 2005). Results were expressed as mg ascorbic acid 100g-1 fresh weight (fw). To determine water and dry matter content (%) the 5g of the fruit were dried in an oven (65ºC, 48 h) until a constant weight was obtained and the weight loss was used to calculate the water and dry matter content in fruit. Total carotenoids (mg/100g) were determined by a modified method of Ahmed and Beigh (2009) using acetone and petroleum ether as extracting solvents and measuring the absorbance at 450nm. The physico-chemical analyses were carried out in triplicate while carotenoid contents was done in duplicate. The mean and standard deviation of the data obtained were calculated.

RESULTS AND DISCUSSION

The physico-chemical properties of serendipity berry were shown in Table I. Number of serendipity berries on a bunch ranged from 45 to 98. This number depends on the size of the fruit bunch (Fig. I). The number of berries varies in all fruits depending on the size, species and types of fruits. The ten-fruit weight

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of serendipity berry fruit was 5.30 g. This weight was slightly lower than that of chokecherry. Fruit of the chokecherry cultivars differed significantly in their 10-fruit weights. Ten-fruit weights of the cultivars ranged from 6.6 to 9.2 g (Zatylny et al., 2005). Fruit size and contents of dry matter and solids are important fruit quality attributes and characteristics that determine the taste and process ability of fruit (Walkowiak-Tomczak et al., 2008).

The total soluble content was 11.20 ^{o}Brix. The value observed was lower than that observed for cultivars of peach fruits and pineapple (Hajilou and Fakhimrezaei, 2011; Chanprasartsuk et al., 2012). Soluble solid reported for orange was 8.2 ^{o}Brix (Jesus et al., 2007) while the value reported for cantaloupe fruit ranged from 3.7-7.1 ^{o}Brix (Ghanbarian et al., 2007). The sugar content (Brix value) is a good indicator of consumer appraisal in relation to fruit quality Ghanbarian et al., (2007). The degree of consumer acceptance of fruit was reported to be significantly related with total soluble solids of the fruit (Crisosto and Crisosto, 2005; Hajilou and Fakhimrezaei, 2011). Titratable acidity of serendipity berry was low 0.27 % citric acid. This value was lower than other fruits such as pineapple (0.67 % of citric acid), black berry (3.04-4.03 % citric acid) but within the range for peach cultivars (0.25-1.05% citric acid) (Zatylny et al., 2005; Hajilou and Fakhimrezaei, 2011; Chanprasartsuk et al., 2012). The high pH value 6.6 in fully ripe fruits result in a very low acidity thus characterizes serendipity berry as a low-acid food. The same observation was reported by Felker et al. (2005) and MoBhammer et al. (2006) for Cactus Pear Fruits (Opuntia spp.).

Moisture contents and dry matter were 80.44 % and 19.56 % respectively (Table 2). The moisture and dry matter contents were relatively comparable to that of plum fruit and peach fruits (Walkowiak-Tomczak et al., 2008; Hajilou and Fakhimrezaei, 2011). Dry matter (19.56 %) obtained was within the range of values obtained for Quince fruits (Rop et al., 2011). Moisture content of fruit and vegetables is one of the important factors that have certain effect on their quality. It is an important quality feature that directly influences storability of fruits and vegetables (Vesali et al., 2011). Moisture contents in food products are a measure of yield and quality and as such are of economic importance. The chemical, physical and microbial stability of foods is affected by the properties of water and it influences the textural properties of food products (Park and Bell, 2004). The vitamin C content of serendipity fruit was 12.80 mg/100g. This was higher than the vitamin C of local orange (12.2 mg/100g), watermelon (10.2 mg/100g) and banana (6.4 mg/100g) (Tee et al., 1988). This indicates that the fruit are useful for human health and could be substituted for citrus fruits.

Total carotenoid value was 2.01 mg/100g. The total carotenoids were lower than the values obtained for other fruits such as cucumber, oranges and grape fruits as listed by Holdens et al. (1999). The highest total carotenoid content among the berries studied by Lashmanova et al. (2012) was found in cloudberry (2840 μg/100g dw), followed by blueberry (2140 μg/100 g). Carotenoids have various health benefits and physiological effects of vitamin A, particularly its benefits on vision, disease resistance, cell integrity, bone re-modelling and reproduction (IITA, 2008).

Conclusions: Serendipity berry fruit contains appreciable amount of total soluble solid which could serve as a source of energy. The fruits compared relatively with other fruits used in the fruit industry for juice and concentrates. Processing of the ripe berry is required to increase the shelf life due the lower acidity. This will also make the product to be available during off season. The fruit could be used in wine and juice production.

Table 1: Physicochemical properties of serendipity fruit

Parameter	Values
No of berry per bunch	
Smallest	45
Largest	98
10-fruit weight (g)	5.30±0.07
Total soluble solid (^{o}Brix)	11.20±0.21
pH	6.6±0.00
Titratable acidity (% citric acid)	0.21±0.10

Table 2: Chemical composition of serendipity fruit

Parameter	Value
Moisture (%)	80.44±0.15
Dry matter (%)	19.56±0.10
Vitamin C (mg/100g)	12.80±0.12
Total carotenoid (mg/100 g)	2.01±0.36

Fig. I: Serendipity berry fruits

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