Camu-camu: a Promising Fruit from the Amazon Basin

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Abstract:

The Amazon forest contains a great number of fruit bearing species in the wild state, with a small part being explored by harvesting from the wild or subsistence agriculture. This group includes the camu-camu (*Myrciaria dubia* [H.B.K.] Mc Vaugh), family Myrtaceae. The most distinctive feature of the camu-camu fruit attracting attention is its extremely high content of vitamin C (1000 to 3000 mg/100 g in the pulp) [1]. The harvest of camu-camu fruit in naturally occurring stands is difficult - at harvest time (December to March) the shrubs are usually partially flooded. Recently, growing trials on non-flooded soils are promising. In the harvest regions, the fruit is consumed in the form of juice, ice-cream, fruit purees and jams, not being consumed in its natural state due to its high acidity. More recently there has been an increasing demand for camu-camu pulp in the larger commercial centres of Brazil for the production of “healthy beverages” [2]. Compounds like ascorbic acid and anthocyanins, present in the camu-camu, are known to act as dietary antioxidants. They are reactive oxygen species scavengers, which can play an important role in the prevention of illnesses like cancer or cardiovascular diseases or to slow down the ageing process. For a better understanding of the health benefits from the camu-camu fruit, we have determined the antioxidant capacity of the fruit with the Total Oxidant Scavenging Capacity assay. This assay is based upon the ethylene yielding reaction of α-keto-γ-methiolbutyric acid with three reactive oxygen species (peroxyl radicals, hydroxyl radicals, and peroxynitrite). In comparison with other fruit, camu-camu presents against peroxyl radicals and peroxynitrite outstanding antioxidant features [3]. Not only the extremely high content of ascorbic acid and the content of anthocyanins but also flavonolglycosides seem to contribute to the overall antioxidant capacity of camu-camu fruit pulp [4]. The camu-camu is, until now, a hardly known fruit that presents a high potential to be explored as a functional food not only in the Amazon region but also in the big markets of Europe and the USA.

General Information:

The Amazon forest contains a great number of fruit bearing species in the wild state, with a small part being explored by harvesting from the wild or subsistence agriculture. This group includes the camu-camu (*Myrciaria dubia* [H.B.K.] Mc Vaugh) (Fig 1) a shrub from the family Myrtaceae. The most distinctive feature of the camu-camu fruit attracting attention is its extremely high content of vitamin C (1000 to 3000 mg/100 g in the pulp) [1]. The harvest of camu-camu fruit in naturally occurring stands is difficult - at harvest time (December to March) the shrubs are usually partially flooded (Fig 2). Recently, growing trials on non-flooded soils are promising (Fig 3) and have a longer harvesting period, between November and May. From that point of view camu camu could become an interesting new crop for the small farmers in that region.

Fig 1: camu camu

Fig 2: camu camu partially flooded

Fig 3: camu camu plantation in a non-flooded soil

The greatest concentration of natural populations and varieties can be found in the Peruvian Amazon. Also in the north western part of the Brazilian Amazon it occurs frequently; its distribution extends into Venezuela and Columbia. Since the camu camu is found in different countries, it is also designated by a variety of other popular names like camo-camo (Peru), caçarí and araçá d'água (Brazil), guayabo (Colombia) and guayabato or guaiabito (Venezuela)

Typically, the camu camu shrub achieves a height of 1 to 3 m. The fruits are globular, from 1.0 to 3.2 cm in diameter, with a thin shiny skin going from pink to deep red or even dark purple when completely ripe. The juicy, extremely acidic, pink pulp surrounds one to four seeds per fruit, more commonly three, of a kidney-shape and from 8 to 15 mm in length and from 5.5 to 11 mm in width.

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there has been an increasing demand for camu-camu pulp in the larger commercial centres of Brazil for the production of “healthy beverages” [2].

Little or no information is available on the antioxidant capacity of these fruits. A considerable antioxidant capacity of camu camu is to be expected because of its high content of vitamin c and anthocyanins. Therefore the antioxidative capacity was evaluated. Analyses were performed with the GC based **TOSC** (Total Oxidant Scavenging Capacity) assay [3].

Material and Method:

Camu-camu pulp was acquired from the Tomé-Açu Agricultural Cooperative in Tomé-Açu, State of Pará, (Brazil) and freeze dried fruit pulp (harvested in 2006) was obtained from INPA (Instituto Nacional de Pesquisa da Amazonia) in Manaus, Brazil.

The analysis of antioxidative capacities was carried out with the TOSC assay in a modified and automated version. This assay is based upon the ethylene yielding reaction of KMBA (α-keto-γ-methiolbutyric acid) with the three ROS. TOSC values were quantified by comparing the areas for (uninhibited) con-trol and sample reaction: a sample without antioxidative capacity has a TOSC value of 0%, a complete suppression of ethylene formation corresponds to a TOSC value of 100%. Samples were analysed in at least five different dilutions to cover the TOSC range as complete as possible. Dilutions were calculated, that match TOSC values of 20, 50 and 80%.

The time course of ethylene production was monitored during one hour at 37 °C by repeated headspace GC with a Combi-PAL autosampler (see Fig. 4) and the data evaluation was done according to Lichtenthäler & Marx (2005) [3].

Fig 4: GC - GC with Headspace-autosampler CombiPal

Results and Discussion:

It turned out that camu camu juice has a very high antioxidant capacity against peroxyl radicals, peroxynitrite in comparison with some other European and Brazilian juices.

Peroxyl-radicals

Camu-camu > Açaí > Blueberry > Cashew > Orange > Apple

Peroxynitrit

Camu-camu > Blueberry > Cashew > Açaí > Orange > Apple

Hydroxyl radicals

Cashew = Blueberry > Apple > Camu-camu > Orange > Açaí

Almost all analyzed fruit juices are most effective against peroxyl radicals, less potent against peroxynitrite and fewest against hydroxyl radicals. This behaviour is explainable by the different ROS reactivities. The peroxyl radicals are the most stable ones with the least reactivity, with a half-life of several seconds.

Both camu camu samples also presented a higher antioxidant capacity against peroxyl radical and peroxynitrite. Even after dilution (1:1092) the camu camu juice presented a TOSC value of 50% against peroxyl radical [4]. In comparison to that the corresponding TOSC value of orange juice (60-90 mg Vit. C/100 ml) is lower by far. To achieve the same TOSC value the juice needs to be diluted only to 1:50.

Camu camu fruit shows very high antioxidant capacity against two of the three ROS studied, higher than that of other foods that have been studied with that assay, up to now. The camu-camu is, until now, a hardly known fruit that presents a high potential to be explored as a functional food not only in the Amazon region but also in the big markets of Europe and the USA.

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