



Review

Phytochemical and nutritional properties of underutilised fruits in the southern African region



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ABSTRACT

The underutilised fruits including kei apple, cape gooseberry, marula and monkey orange are fruits widely found in the southern African region. These fruits have the potential to cut to the heart of Africa's great problems in rural development, hunger, malnutrition, and gender inequality. Kei apple, cape gooseberry, marula and monkey orange trees are drought resistant or tolerant plants. Therefore, the domestication of the underutilised fruits found in the southern African region could be considered to be a sustainable solution to enhance the fruit availability, thereby increasing the food security since the global warming currently affects the food production. The fruits are rich in macronutrients, micronutrients, and dietary phytochemicals and have several health benefits. Despite this and the existence of a broad and unlimited niche in terms of the use of these fruits in new product development (food products, medicinal products, etc.), they are mainly processed on a small scale for the production of a few food products. This review also covers food product development from these fruits based on their functional characteristics.

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1. Introduction

Indigenous fruits possess the potential to contribute to food, nutrition security, health and the income of rural communities in southern Africa, especially in dry areas where cultivation of exotic fruit species is often not possible (Stadlmayr et al., 2013). These indigenous fruits yield a harvest even during drought, since they are well adapted to their local environment, while staple crops fail (Stadlmayr et al., 2013). Thus, they may be used as emergency food during times of food shortage. Nonetheless, the indigenous fruits are relatively unknown in the global market because they remain undomesticated. This is mainly due to the lack of knowledge and bias of research and development in profit-driven large-scale agriculture (Stadlmayr et al., 2013). The information about indigenous fruits to the livelihood of farmers and food nutrition is often neither documented in science nor acknowledged in poverty reduction strategies.

Underutilised fruits may possess essential nutrients, but studies on their composition and consumption are limited and fragmented (Stadlmayr et al., 2013). This renders it difficult to evaluate the contribution of underutilised fruits to dietary adequacy. The information about the phytochemical, nutritional and functional characteristics is important to promoting and expanding the utilisation of these indigenous fruits, thereby facilitating the fruit tree domestication programme as well as enhancing food and nutrition security and income generation.

The development of functional products from the underutilised fruits in the southern African region offers another alternative for the exploitation of these resources, to supplement their nutritional value and promote the new export channels. In this context, being the fruits used in Andean folk medicine since ancient times, one can establish a niche for future scientific research. Since most of the existing information is not confirmed by scientific studies, the collection of data is mainly necessary to filter the most essential and reliable information.

This review highlights the information on agro-food, phytochemical, mechanical, physicochemical, nutritional, functional properties of the underutilised fruits of the southern African region, for example, kei apple (*Dovyalis caffra*), cape gooseberry (*Physalis peruviana*), marula (*Sclerocarya caffra*) and monkey orange (*Strychnos* spp.).

2. Overview of underutilised fruits in the southern African region: origin and physical description of the fruit

2.1. Kei apple

Known as a deciduous fruit, kei apple (*Dovyalis caffra*) is considered to be native to the Kei River in Namibia; thus the name “Kei apple”. It belongs to the flocourtiaceae family and is added to the other two

Dovyalis cultivars, including wild apricot (*D. zeyheri*) and common sour berry (*D. rhamnoides*) (Ndou, 2003). According to DAFF (2013), kei apple is predominantly found in the wild in the Limpopo, Mpumalanga, Eastern Cape and Kwazulu Natal provinces in South Africa. It grows in a wide range of soils such as those with high salinity. Despite being known as a subtropical fruit, it also grows well in the areas where the temperatures can drop to -6°C ; hence it qualifies as a frost tolerant tree (Du Preez, 2003). The kei apple tree is described by Orwa et al. (2009) as an evergreen shrub (3–8 m) with a vigorous growth pattern and strong thorns. Its common names are: kei apple; wild Apricot, kei-appel; appelkoosdoring (Afrikaans), incagolo (IsiXhosa), umqokolo (IsiZulu), mothono (Sesotho sa Leboa), mutunu (Tshivenda), amaqokolo (IsiNdebele) and mukokolo (Shona) (DAFF, 2013). According to Loots et al. (2006), kei apple fruit is almost round, bright yellow and has a tough skin. The harvesting maturity of kei apple is reached after 90 days from full flower opening and its ripeness is determined by the full development of colour (DAFF, 2013). The average sugar content of the ripe fruit is estimated to be 15–18% (DAFF, 2013). The kei apple is harvested by selecting the fruit with a stalk in order to avoid tearing its skin. Then, a cluster is cut from the branch with a sharp knife or clippers. Thereafter, the fruits are detached from both the cluster and the stalk and the fruit is graded according to size and colour to ensure that the packs are uniform.

2.2. Cape gooseberry

Cape gooseberry (*Physalis peruviana*), also known as golden berry, is a plant native to tropical South America and belongs to the Solanaceae family (Bravo et al., 2015). Cape gooseberry includes many cultivars from different regions and countries. The cultivars are differentiated by size, colour, taste, flower shape, plant height and plant size. Of these cultivars, three types originated from Colombia, Kenya and South Africa and are currently cultivated in these regions (Bravo et al., 2015). The Colombian type has an intense yellow colour and higher sugar content compared to the ecotypes found in Kenya and South Africa. These characteristics make this type more palatable to consumers (Bravo et al., 2015). The annual production of cape gooseberry in Columbia is estimated at 12,000 tons; thereby rendering Columbia to be the largest cape gooseberry exporter in the world (B1Bravo et al., 2015). Cape gooseberry is described as a domed shrub that can grow to 1 m (Ramadan, 2011). The flowers are yellow with purple blotches in winter. According to Ramadan (2011), cape gooseberry is also described as an herbaceous, semi shrub, which is upright, perennial in subtropical zones, and can grow until it reaches 0.9 m. The fruit weighs approximately 4–5 g, is protected by an accrescent calyx and covered by a brilliant yellow peel (Ramadan, 2011). Yahia (2011)

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