

Carpobrotus edulis

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Carpobrotus edulis, formerly known as *Mesembryanthemum edule* L, belongs to the Aizoaceae family of plants. It is a facultative halophytic invasive medicinal and edible succulent plant that is native to South Africa and is distributed worldwide. Hitherto, this plant appears to be mainly known for its ornamental use in decorations, soil stabilization and erosion control, and not for its many potential medicinal and nutritional benefits, thus suggesting its underutilization. This entry presents cogent and comprehensive information on the distribution, ethnomedicinal use, phytochemistry, pharmacology, toxicology, and nutritional value of *Carpobrotus edulis* and provides the rationale for further pharmacognostic research that will validate its many folkloric medicinal and nutraceutical claims, and promote its standardization into a commercially available product.

Carpobrotus

ethnomedicinal

food

phytotherapeutic

succulent

invasiveness

ornamental

edulis

1. Introduction

Carpobrotus edulis (*C. edulis*) is a medicinal and edible succulent plant that belongs to the Aizoaceae family, which is considered to be South Africa's most diverse and abundant plant family that has been less studied for medicinal properties. *C. edulis* is a facultative halophyte that is common in the Eastern and Western Cape regions of South Africa, but also widely found along other coastal areas of Africa and other continents. *C. edulis* is known in English as Hottentot fig or highway ice plant or sour fig plant, while in Afrikaans, it is known by many names viz: "ghaukum", "ghoenavy", "hottentotsvy", "kaapsevy", "perdevy", "rankvy", "suurvy", or "vyerank". In isiZulu, it is called "ikhambi-lamabulawo" or "umgongozi" and its isiXhosa name is "igcukuma" [1].

C. edulis is a mat-forming plant with bright-green foliage and leaves that could have red, orange, or purple-coloured margins and surfaces [2] as shown in [Figure 1](#) below. This plant reproduces both sexually and asexually, producing large flowers and fleshy indehiscent fruits that contain arrays of seeds. The plant grows by invading and colonizing the environment through its stolons, which spread along the soil surface yielding new ramets at every node for proper propagation [3]. *C. edulis* can be found on cliffs, coastal rocks, and dunes where it spreads widely, forming a creeping mat on the surface, displacing several other coastal flora [4] and negatively affecting species diversity [5][6][7]. Some European countries have prohibited the release of plants belonging to the *Carpobrotus* species to protected areas, mainly because of the invasiveness of this species [8].



Figure 1. The flowering *Carpobrotus edulis* plant. ^[2].

Although *C. edulis* is naturally distributed beyond the shores of Africa through mammals by way of ingesting the fruits and discarding their seeds, high adaptability and tolerance to environmental stress factors such as salinity, drought and excess of light, have helped to sustain its spread ^[9]. The family Aizoaceae and subfamily Ruschioideae contain about 1585 species in 112 genera that include *C. edulis* ^[10], thus, the proper identification of individual species has always been a challenge to botanical researchers, some of whom have only focused on the various parts of the plant that differentiate it from other closely-related species, especially *Carpobrotus acinaciformis*. The leaves of *C. edulis* are straight or sometimes curved and its receptacle is turbiniform, measuring between 20–40 mm and elongating into the pedicel. The lobe of the calyx is unequal, the longest being 30–70 (80 mm) and shortest 10–35 mm, while the corolla has yellow petals that fade as the plant matures, and the ovary has about 7–11 loculi. These features are different in other *Carpobrotus* species ^{[3][8][11]}.

The use of medicinal plants in drug development is well documented and research into these plants should take into consideration some criteria suggested by Baker et al. ^[12], which include the traditional use of the plant by the local population, the enormity of various ailments or diseases the plant is used for, the extent of geographical spread and availability of large quantities of the plant and finally, the natural sustainability of the plant over prolonged periods.

2. Dietary Uses of *Carpobrotus edulis*

Many medicinal plants are edible and contain quality nutrients, thus presenting reasonable potential to be developed into a new food product or prepared into such nutrient-rich condiments as food additives, spices, and flavors. Other forms of preparation could include tonics, nuts, wine, jelly, and vegetables, to mention a few. Van

Wyk reported that 16 indigenous plants from South Africa including *C. edulis* gave rise to 119 commercialized African products of which food products or additives are prominent. The fruits of *C. edulis* were rated very highly for the production of such food products as jam, chutney, or sauce and other dried processed products [13].

In one study, the leaves of *C. edulis* were evaluated to ascertain adequacy and suitability for human composition in terms of nutrients and safety. The parameters of proximate chemical analysis evaluated showed that antioxidants were higher than other halophytes, an indication that *C. edulis* has a great potential as a nutritional supplement to tackle oxidative-stress linked disease conditions [14]. Similarly, edible wild fruits of five *Carpobrotus species* including *C. edulis* were assessed for their nutritional significance through proximate chemical analysis [15]. Findings showed considerably high moisture levels of 77.6% to 90.3%, carbohydrate levels of 58.8% to 70.3%, energy levels of 1240 to 1370 kJ 100 g⁻¹, and protein levels were considered adequate at 8.1% to 26.0%. On the other hand, the lipid levels were considered low at 0.9% to 2.4%, while the elemental concentrations were in the decreasing trends of Ca > Mg > Fe > Mn > Zn~Cu > Cr > Se~Ni~Co [15]. Overall, the findings from the study showed that the *Carpobrotus species* evaluated could positively contribute to human nutritional needs in the form of a dietary supplement because of the rich array of essential nutrients in these plants compared to most cultivated fruits like oranges, apples, and grapes. This could potentially contribute positively to the improvement of global food security since these plants have been reported to be widely distributed in different parts of the world.

3. Conclusions

Carpobrotus edulis has been an important source of traditional medicines for decades, especially for the management of tuberculosis and other respiratory infections, toothaches and ear aches, facial eczema, wounds and burns, hypertension, and diabetes mellitus, among others. Some of the ethnomedicinal uses of this plant have been scientifically validated and pharmacological activities such as antimicrobial, anti-proliferative, antioxidant, neuroprotective, anti-inflammatory, and antidiabetic activities have also been studied. The non-therapeutic uses of *C. edulis* including its nutritional use were also highlighted. It is hoped that this entry will elicit renewed research interests in this valuable medicinal plant with the overall aim of repositioning and expanding its uses from its predominantly ornamental and environmental management role to evidence-based phytotherapeutic uses through scientific studies aimed at validating its folkloric medicinal and therapeutic efficacy for drug discovery and development purposes. Hitherto, only limited *in vitro* scientific studies have been reported, hence more scientific validation studies are necessary in the form of toxicological and pharmacological profiling of *C. edulis* in more *in vitro* and animal models, as a prelude for human investigations through clinical trials.

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