

FROM JADE TO HEALTH: A HOLISTIC REVIEW OF CRASSULA
PHYTOCHEMISTRY AND PHARMACOLOGY

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ABSTRACT

Crassula is a succulent plant genus that includes around 200 recognized species, including the popular jade plant (*Crassula ovata*). These plants belong to the stonecrop family (*Crassulaceae*) and are found in various parts of the world. Crassula plants are known for their air-purifying properties, ability to increase indoor humidity, easy maintenance, good luck charm, and medicinal benefits. This review provides an overview of the different types of crassula plants, with a special focus on jade propagation and cultivation, toxicities, and the significance of crassula ovata. Additionally, the review highlights the phytochemistry and pharmacological actions of crassula ovata.

KEYWORDS: Crassulaceae, Crassula ovata, Phytochemistry.

INTRODUCTION

The Jade plant, also known as the lucky plant, money plant, or money tree, is a succulent from South Africa and Mozambique. It has small pink or white flowers and is commonly grown as a houseplant all around the world. This plant is well-loved due to its low maintenance requirements and ability to survive in various indoor conditions with little water.

Biological description

Kingdom	Plantae
Clade	Tracheophytes
Clade	Angiosperms
Clade	Eudicots
Order	Saxifragales
Family	Crassulaceae
Genus	<i>Crassula</i>

Introduction to jade Plant and Its types

Jade Plant, scientifically known as *Crassula ovata*, is a popular succulent house plant. Several types of jade plants include traditional green jade, variegated jade, and miniature jade. Each type varies in leaf coloration, growth habit, and overall size. As a type of succulent, *Crassula ovata* requires very little watering during summer, and even less during winter. Over-watering can be detrimental, especially in colder months, causing leaf fall and root rot. On the other hand, a lack of water can also harm it. It is best to grow it in a porous substrate with good drainage, which may vary depending on the climate. It needs around 4-6 hours of direct sunlight or medium shade with bright light. In mild climates, it can

withstand light frost if the substrate is kept dry.

When exposed to bright sunlight, *C. ovata* may display a red tinge around its leaves, and in more extreme cases, the green color can be replaced by yellow. This is due to the plant producing pigments such as carotenoids to protect itself from harsh sunlight and ultraviolet rays. The plant also flowers in winter, particularly during cooler, darker, and drier spells. Mealybugs can sometimes attack *C. ovata*, which is a common issue for succulents.

Propagation of the jade plant is relatively easy and can be carried out via clippings or even stray leaves that fall from the plant. Propagation from leaves has higher success rates than from cuttings. In the wild, vegetative propagation is the main method of reproduction. Wild jade plant branches regularly fall, and these may root and form new plants. Like many succulents, jade plants can be propagated from swollen leaves, which grow in pairs on the stems. While propagation methods may vary, most follow similar steps. Typically, the wounds on the leaves are left to dry and callus over. Then, the leaves are placed in or on soil, and roots begin to grow about four weeks after being removed from the stem. Environmental factors such as temperature and humidity affect the speed at which roots and new plants develop. Foliage usually appears soon after new roots have formed.

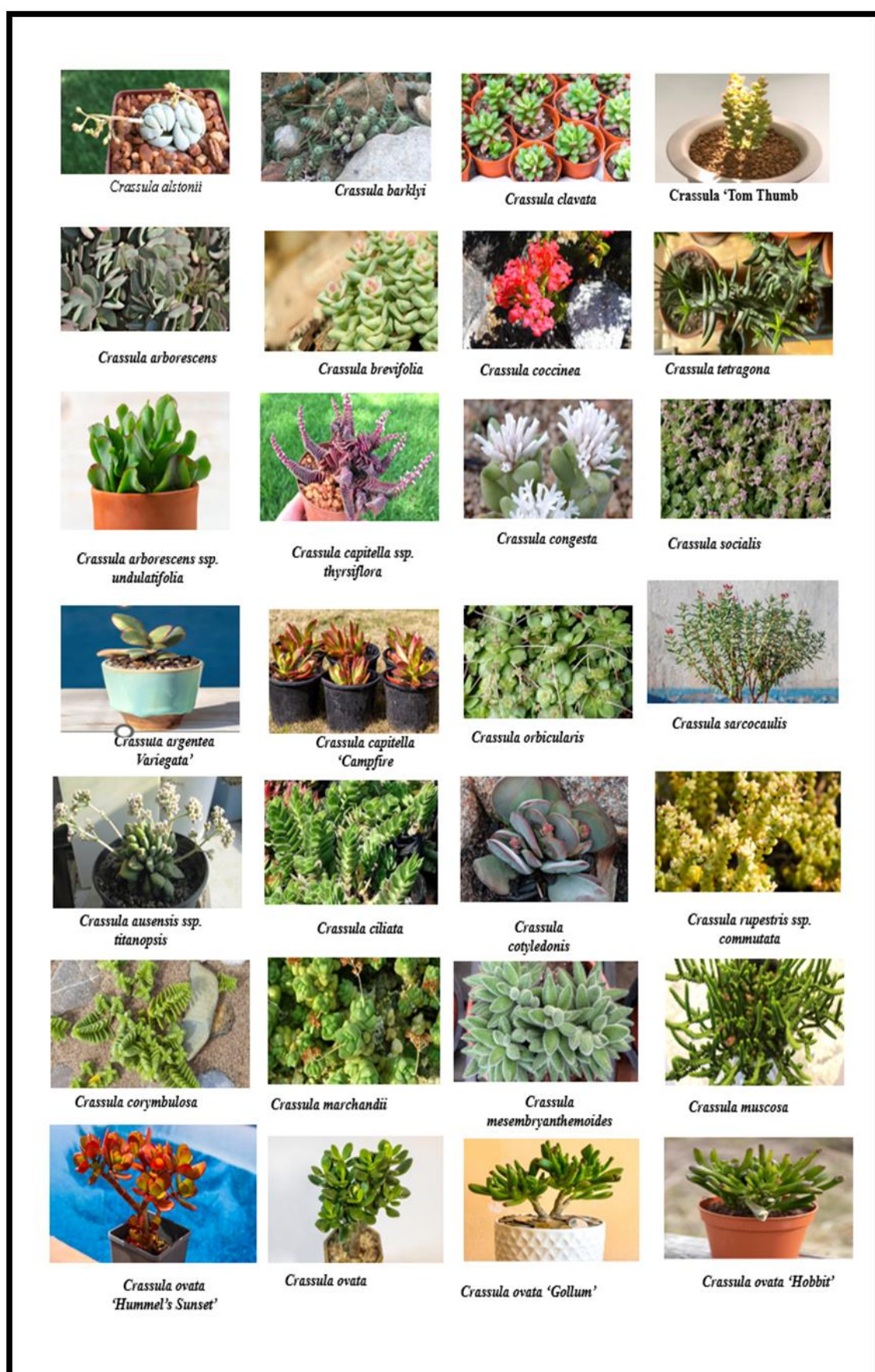


Figure 1: List of crassula species.

Parasites and Diseases

Scale insects are a common problem affecting *Crassula ovata* plants' growth, causing them to become deformed. To eliminate this infestation, you can use a cotton bud or brush soaked in rubbing alcohol to kill each insect. This process should be repeated daily until all the mealybugs have been killed, along with any new insects that may hatch after the initial infestation has been eliminated. Aphids can also be a problem, mainly affecting the stems of flowers. Spider mites are yet another issue that can cause harm. However, it's worth noting that exposure to sap or leaves from the *Crassula ovata* plant can cause dermatitis in humans.

Regarding toxicity, some sources claim that certain species from the Crassulaceae family, including the jade plant, may be toxic to horses, cats, and dogs. They may also be mildly toxic to humans through skin contact, but these claims remain unproven. Despite this, *Crassula ovata* is still known to be used as a medicinal plant in some regions.

A popular succulent that is widely cultivated as a houseplant.

Aesthetic Appeal The Jade Plant is a beautiful succulent that is known for its striking appearance. It features thick, glossy, oval-shaped leaves that are often tinged with red or have red edges, which makes it an attractive addition to any indoor space. Moreover, it is resilient and can thrive in various conditions, adding to its visual appeal.

Low maintenance One of the standout features of the Jade Plant is its low maintenance requirements. It can withstand neglect and can survive in dry conditions, making it an ideal choice for individuals who may not have a green thumb or those looking for a low-maintenance indoor plant. It has a slow growth rate and doesn't require frequent repotting.

Drought Tolerance The Jade Plant is also well-adapted to survive in arid conditions due to its fleshy leaves that store water, allowing the plant to endure periods of drought. This characteristic makes it suitable for individuals who may forget to water their plants regularly or for those living in regions with dry climates.

Symbolic Meaning In some cultures, the Jade Plant is considered a symbol of good luck and prosperity. It is often given as a gift during celebrations or when someone is starting a new venture. The belief is that the plant brings positive energy and financial success to its owner.

Versatility While the Jade Plant is commonly grown as a houseplant, it can also thrive outdoors in mild climates. In suitable conditions, it may produce small, star-shaped pink or white flowers, adding an extra layer of beauty to the plant. Its versatility in terms of growing

environments makes it a versatile choice for various settings.

Potential Challenges Despite its hardy nature, the Jade Plant may face issues such as overwatering, which can lead to root rot. Additionally, it may be susceptible to pests like mealybugs and spider mites. However, these issues can usually be addressed with proper care and attention.

CO₂ absorber Crassulacean Acid Metabolism process executes at night. This process allows the plant to absorb CO₂ while performing photosynthesis during the daytime. As one of the few plants that possesses this special ability, it's a good idea to keep the jade plant in your bedroom to reduce the carbon dioxide levels in the room and maintain humidity. By doing so, you can improve the overall air quality of your room.

Phytochemicals and Phytochemical screening

Phytochemical analysis of the extract indicated the presence of Saponin, phenol, phytosterol, steroid, terpenoid, flavonoid, carbohydrates, and proteins while tannin, glycoside, and plobatanin were absent.

The phytochemical studies showed that most plants belonging to this family contain 55 different types of phenolic compounds, eight steroidal compounds, and eight bufadienolides and cardenolides isolated from the family Crassulaceae. *Crassula capitella* contains Quercetin Quercetin 3-O- α -D-arabinopyranoside; Quercetin 3-O- β -D-glucopyranoside, Bergenin, 11-O-(4'-O-methyl galloyl)-bergenin, 11-O-galloyl bergenin, 4-methoxy-3, 5 dihydroxy methyl benzoate, Astragallin 6"-gallate, Ethyl 3,5 dihydroxy 4-methoxy benzoate, Gallic acid, Kaempferol and Kaempferol 3-O- α -D-arabinopyranoside (El-Hawary SS., 2016)

Herbal knowledge

Plant-based remedies have long been used by various cultures to treat a wide range of ailments, and are gaining renewed interest due to their potential as a source of therapeutic compounds for developing new drugs. Many people today use herbal remedies as part of their daily health regimen, whether to prevent illness or manage existing conditions. One such plant with traditional medicinal use is *Crassula ovata*, also known as Jade plant, which has been used to treat symptoms of diabetes. However, there have been few systematic studies to validate these claims. *Crassula ovata* is native to South Africa and is a common houseplant in many parts of the world, particularly in cold, dry areas where water is scarce.

Many communities have traditionally used the fluid extract from the leaves of *Crassula ovata* to treat warts, which are small, firm, circumscribed tumors of the outer layer of the skin caused by various forms of the contagious human papilloma virus (HPV). Warts can be flat or elevated from the surrounding skin and vary in

size, and may be accompanied by pain, particularly if they occur on the feet (plantar warts). To treat warts, the leaf of the *Crassula ovata* plant was sliced in half and the moist inside was attached to the wart for a few hours or overnight. With just three applications, the unsightly growth would fall off (Morandini P, 2003).

In Asian cultures, particularly in China around 700 AD, the jade plant was a popular element used in medicine. Medicine men prescribed a tea made from the jade plant to treat symptoms of diabetes. The jade plant was abundant and soft, making it easy to shape into various forms, and thus used in the art of Bonsai. Because of its beauty, the plant was also spread around as a luxurious gift to royalties all over the Chinese empire (Eggle UR., 2002).

The Jade plant is a popular plant that is used in many cultures for various purposes. In Chinese culture, it is believed to attract money and is used in the practice of Feng Shui to create balance and harmony of energies within a space. It is often placed near a cash register in businesses to attract prosperity. In Africa, the jade leaves are boiled in milk and consumed to stop diarrhea. The roots and stems of the plant are also eaten by some African tribes, and the leaves are boiled in milk to treat epilepsy, corns and as a purgative. The Jade plant is also known by different names like the Penny Plant, Money Tree, Dollar Plant, and Tree of Happiness in various parts of the world.

Traditionally, the Jade plant is grown in square porcelain tubs with lion feet to bring good financial luck and general prosperity. In Kenya, the *Crassula ovata* plant is grown in local homesteads for its ornamental value, and some people keep it for its medicinal values. The Kamba community believes that the juice extracted from this plant helps heal burn wounds on the skin, while other communities like the Maasai use it as a relief for stomach upsets.

Pharmacological actions

Antioxidant activity

Studies have shown that jade plant extracts exhibit significant antioxidant activity.

The antioxidants present in jade plant help neutralize harmful free radicals in the body. Antioxidants may contribute to reducing oxidative stress. Reported to having scavenging activity against the DPPH and hydrogen peroxide (Chokhone K., 2017).

Anti-Inflammatory activity

Jade plant extracts have demonstrated anti-inflammatory effects in various studies. These effects may be attributed to the presence of flavonoids and other bioactive compounds. Anti-inflammatory properties of jade plant may have potential applications in the treatment of inflammatory conditions.

Antimicrobial activity

Research suggests that extracts from the jade plant possess antimicrobial properties that can help inhibit the growth of certain bacteria and fungi, including *Escherichia coli*, *Pseudomonas*, and *Klebsilla* sp. The maximum inhibition zone for these bacteria ranged from 3.46±0.30 mm to 6.53±0.35mm. However, further studies are needed to explore the potential use of the jade plant in antimicrobial therapies.

Antidiabetic activity

The plant also exhibits anti-diabetic properties, with a significant result of inhibiting up to 83% of α -amylase activity at 700µg/ml concentration of methanol extract. Additionally, the plant shows antioxidant properties inhibiting up to 85% of activity at 200µg/ml concentration of water extract.

Anti-arthritic activity

Crassula capitella is a plant that contains a natural and abundant source of 11-O-(4'-O-methyl galloyl)-bergenin, which is effective in treating chronic inflammatory diseases such as rheumatoid arthritis. This is due to its antioxidant, anti-inflammatory, and membrane-stabilizing properties (El-Hawary SS., 2016).

Anti-trypanosomal activity

The extract from *Crassula capitella* has also been found to have potent anti-trypanosomal activity, meaning it is effective against the parasite that causes sleeping sickness. Bergenin and 11-O-(4'-O-methyl galloyl)-bergenin, which are compounds found in the extract, have been shown to have IC₅₀ values of 0.52 and 0.5 µM, respectively, and IC₉₀ values of 0.66 µM against *T. brucei*. This is more effective than the positive control difluoromethylornithine, which has IC₅₀ and IC₉₀ values of 21.7 and 50.3 µM (El-Hawary SS., 2022).

Anti-platelet aggregating activity

Crassula capitella also has anti-platelet aggregating activity. A new compound called 11-O-(4'-O-methylgalloyl)-bergenin was isolated from the extract and found to inhibit arachidonic acid-induced platelet aggregation more effectively than acetylsalicylic acid. It also showed an anti-oxidative effect (EC (50) = 23.9 microM) equivalent to that of L-ascorbic acid or quercetin (Lee YY., 2005).

Wound healing activity

Some studies have indicated that jade plant extracts may accelerate wound healing.

The presence of certain compounds in jade plant is believed to promote tissue regeneration. Further research is required to fully understand the mechanisms behind this potential benefit.

Anti-Diabetic activity

Preliminary studies have suggested that jade plant may have anti-diabetic effects. Certain compounds found in jade plant may help regulate blood sugar levels.

However, more research is needed to determine the efficacy and safety of jade plant in managing diabetes.

Respiratory issues

In some traditional remedies, Jade Plant extracts have been used to address respiratory issues. It is believed that the plant may have mucolytic properties, helping to break down and expel mucus from the respiratory system.

Anti-Cancer activity

There is emerging evidence suggesting that jade plant exhibits anti-cancer properties. Some compounds present in jade plant have demonstrated cytotoxic effects on cancer cells. Further research is required to explore the potential of jade plant in cancer treatment.

Other potential pharmacological actions

Apart from the mentioned actions, jade plant is also being investigated for its potential effects on cardiovascular health, neuroprotection, and liver health.

CONCLUSIONS

The *Crassula* family consists of several varieties of leafy plants that contain a number of phytochemical constituents, such as phenolic compounds, bufadienolides, and cardenolides. Quercetin, Bergenin, Gallic acid, and Kaempferol are well known for their pharmacological actions towards cardiac issues, diabetes, cancer, gastritis, and respiratory issues due to their antioxidant and anti-inflammatory properties. Therefore, there is a promising future for *Crassula* plants to be used is not only for ornamental purposes but also as medical plants.

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