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Review on traditional and modern medicinal uses of Adenium obesum

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Abstract

Adenium obesum, commonly known as the "desert rose," is a succulent plant from the Apocynaceae family, native to arid regions of Africa and the Arabian Peninsula. Characterized by its striking appearance, with vibrant flowers and a swollen caudex, it is widely cultivated for ornamental purposes. Beyond its aesthetic appeal, the plant has a rich history in traditional medicine, with various parts used to treat ailments such as venereal diseases, skin disorders, headaches, and joint pain. This plant is known to contain bioactive compounds, including cardiac glycosides, flavonoids, and terpenoids, which contribute to its diverse pharmacological activities, including antioxidant, anti-inflammatory, antimicrobial, anticancer, and antiviral properties.

Recent scientific research has validated many of these traditional uses, demonstrating the plant's therapeutic potential in modern medicine. Studies highlight its cytotoxic effects against cancer cells, significant antioxidant activity, and effectiveness in combating various pathogens, including bacteria and viruses. Additionally, the plant's ability to act as an abortifacient, though historically utilized in some cultures, requires caution due to its toxicity, which is attributed to compounds in its milky sap.

This review synthesizes the available literature on the medicinal properties of *Adenium obesum*, exploring both traditional uses and contemporary scientific findings. It emphasizes the plant's therapeutic potential and encourages further investigation into its bioactive compounds and mechanisms of action, which could lead to novel natural remedies or complementary therapies in modern healthcare.

Keywords: *Adenium obesum*, Anticancer, Antioxidant, Antiviral, Antibacterial, Abortifacient

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INTRODUCTION

It belongs to the Apocynaceae family and is popularly known as the "desert rose" although it is an indigenous succulent plant found in arid regions of Africa and the Arabian Peninsula. Its appearance with bright trumpet-shaped flowers and swollen caudex has made *Adenium obesum*an ornamental flower all over the world. Nevertheless, aside from its aesthetic uses, *Adenium obesum* possesses some medicinal value which has been seen in traditional times and in recent times as well.

Traditionally, various parts of *Adenium obesum* are used in folk medicine to cure various diseases. Locals, in Oman regions, have also been using this plant for various therapeutic purposes since they treat different diseases such as venereal diseases, wounds, skin diseases, headaches, and joint aches[1][2]. The plant has many phytochemicals in it, cardiac glycosides, flavonoids, and terpenoids. These are all the reasons that lead to their pharmacological actions[3][4]. These compounds have been shown to possess antioxidant, anti-inflammatory, antimicrobial, and anticancer properties amongst many other diverse biological effects[5][6].

Scientific researches in recent years have proven most of these age-old uses with rigorous scientific study on the bioactive compounds in the plant and how they work. These studies show the potential use of *Adenium obesum* in modern medicine: efficacy against different types of pathogens, and application in cancer treatment[5][3]. Another area of growing interest is natural products as an alternative or complementary agent to synthetic pharmaceuticals. It is an

affirmation of the current relevance of *Adenium obesum* in health care today.
This paper seeks to offer a comprehensive overview of the traditional and modern medicinal applications of *Adenium obesum*. Through a synthesis of existing literature on phytochemical composition and biological activities, we endeavor to shed light on the therapeutic potential of the plant, thereby encouraging research in this area to open avenues for potential modern medicinal applications.

Plant Profile
Adenium obesum
Common Names : Desert Rose, Desert Azalea, Mock Azalea .
Family: Apocynaceae
Native Range: Sub-Saharan Africa, Arabian Peninsula Description
Adenium obesum is a succulent shrub with a thick, swollen trunk (caudex) and crooked branches. When grown, its height usually ranges from 3 to 5 feet (0.9 to 1.5 meters). The simple, glossy, lanceolate-obovate leaves are 5 to 15 cm long and roughly 0.6 cm broad. They are arranged in a loose spiral near the tips of the stems[7][8].
The plant has showy, trumpet-shaped flowers that are red or pink, but some varieties display white or bicolor patterns. These flowers come in small terminal clusters and can be up to 6 cm wide[7][9]. The fruit is a slender, pod-like follicle that can grow up to 10 cm long and splits open to release silky seeds[7].

Habitat and Cultivation
Adenium obesum is a warm-climate species with a dry season. It thrives in full sun or partial shade and prefers well-drained soil to avoid waterlogging, which causes root rot. In temperate regions, it is grown as a houseplant, with a minimum winter temperature of about 10 °C (50 °F) recommended[10].This species is primarily propagates through seeds, stem cuttings, or grafting onto seedling rootstock. Seedlings tend to begin with the swollen caudex character earlier as compared to the cuttings ones[8][10].

Toxicity
All parts of this species are poisonous since it has a milky sap with poisonous substances. Traditionally in some African cultures, the milky sap has been used to prepare poison arrows[7][10].

TRADITIONAL AND MODERN USES

1. Anticancer
Adenium obesum, popularly known as "desert rose," is getting much attention because of its anticancer properties. Ethanolic extracts of *A. obesum* have been shown to be highly cytotoxic against a number of cancer cell lines, such as A549 lung cancer cells. The extract was found to cause nuclear condensation and fragmentation, which reduces the viability of the cells. This shows how it can help combat cancerous cells[11][1]. The anticancer activity is attributed to the presence of several bioactive compounds, including cardiac glycosides and flavonoids, which have been shown to inhibit cancer cell proliferation and induce apoptosis[12]. Moreover, studies have indicated that these extracts possess antioxidant and anti-inflammatory properties, which may enhance their therapeutic efficacy in cancer treatment by mitigating oxidative stress and inflammation associated with tumor progression[13][14]. Overall, *A. obesum* has shown promise as a natural source in the development of herbal-based anticancer therapies.

2.Antioxidant
Adenium obesum, known as Desert Rose, is rich in antioxidant properties attributed to its phytochemical content.It has been found that the extracts of various parts of the plant, particularly flowers and leaves, are rich in anthocyanins, polyphenols, and flavonoids. These are known to scavenge free radicals and reduce oxidative stress. For example, ethanolic extracts of *A. Obesum* have been assayed with a number of antioxidant assays such as DPPH and ABTS methods with notable free radical scavenging activities comparable to that of the standards such as ascorbic acid [11][12][1]. Scientific evidence shows that apart from exhibiting antioxidant activities, the extracts show anti-inflammatory and anticancer effects. The A. has shown in vitro inhibition of growth for various human cancers.
obesum extracts can prevent the survival of cancer cells like A549 lung cancer cells, through apoptosis induction and decrease the inflammatory mediators [11][1].
Besides, the antioxidant activity depends upon the extraction method, for instance methanolic extract from the stem and flowers demonstrated strong scavenging activity due to the high polyphenolic content [12][15]. Overall, *Adenium obesum* presents a promising natural source of antioxidants with potential applications in health and therapeutic formulations aimed at combating oxidative stress-related diseases [7][13].

3. Antiviral
Adenium obesum has been studied for its antiviral properties against influenza viruses Methanolic extracts of *A. obesum* have demonstrated high antiviral activity against the H1N1 influenza virus in vitro(A/PR/8/34). The active compound found in the methanolic extracts of *A. obesum* appears to be oleandrigenin-D-glucosyl (14)-D-digitalose, which is responsible for the resultant antiviral activity[12][4]. Studies have demonstrated the ability of extracts to impede viral

replication effectively, thereby establishing a possible role as an herbal-based antiviral drug discovery source. The involvement of *A. obesum* in folkloric medicine for diverse diseases even defines a better pharmacological role beyond just antiviral activity[1][6]. Another reason for its high therapeutic profile is the presence of multiple phytochemicals, especially cardenolides and flavonoids, making it a candidate for further research in the development of antiviral drugs[7][13].
Overall, *Adenium obesum* represents a promising avenue for exploring natural antiviral ageits bioactive components and mechanisms of action.

4. Antibacterial
The floral extracts of this plant have proven very powerful in combating both Gram-positive and Gram-negative bacteria. Flowers were found to be effective inhibitors against both *Staphylococcus aureus* (a Gram-positive bacterium) and *Escherichia coli* (a Gram-negative bacterium) using methanolic extracts in one study, with the disc diffusion method. The results indicated that higher concentrations of the extract produced larger zones of inhibition, suggesting a dose-dependent antibacterial effect[16][17].
Phytochemical screening revealed the presence of various bioactive compounds, including alkaloids, flavonoids, saponins, and tannins, which are believed to contribute to its antimicrobial efficacy. The antibacterial activity of the methanolic extract was compared with that of standard antibiotics such as ciprofloxacin, which proved to have activity similar or more potent against the test pathogens[16][18]. This shows that *Adenium obesum* might be an excellent source in producing new antimicrobial drugs especially when antibiotic resistance has become an increasingly important concern in modern medicine[17][19].

5. Abortifacient
Adenium obesum, is used for medicinal purposes, including the abortifacient, while other traditional uses include its use as an abortifacient in various regions, especially among indigenous communities found in Africa and parts of the Middle East. In fact, the bark and latex of the plant are typically chewed or prepared in decoctions to induce abortions or abort pregnancies. This practice is recorded among other ethnic groups; for example, in Nigeria, the whole plant is used as an abortifacient, while in Oman, it is used with other remedies for many diseases[20][2][21]. The plant has various bioactive compounds, among them cardiac glycosides that may be responsible for its pharmacological activities.

However, use of this drug should be with caution since it may have toxicity related to its application. While some studies suggest that the ethanol extract of *Adenium obesum* does not show significant haematotoxicity when administered orally, there is a need for further research to fully understand its safety profile and mechanisms of action[20][22]. Overall, while *Adenium obesum* holds a place in traditional medicine as an abortifacient, its use should be approached with care given the complexities of its effects and the potential for adverse reactions.

CONCLUSION
The studies highlighted the significant potential of the plant in modern medicine, especially in the treatment of cancer, antioxidant activity, antimicrobial, and antiviral properties. The extracts of *Adenium obesum* showed promising anticancer effects, including inhibition of cell proliferation and induction of apoptosis in various cancer cell lines. Besides this, the antioxidant, anti-inflammatory, and antibacterial activities of the plant make it an important candidate to combat oxidative stress-related diseases and fight against antibiotic resistance. However, caution should be taken since the plant is toxic. Its milky sap and other parts are known to have toxic substances that may lead to health problems if not handled carefully. Its abortifacient property, in addition, highlights the care that needs to be taken with it.
In conclusion, the *Adenium obesum* is a marvellous model of how there can be that convergence of knowledge from traditional science and modern science to unravel hidden medicinal properties. While much remains to be determined, more research and experimentation are called for to provide complete insight into its mechanisms, optimize its medicinal use, and resolve safety and efficacy issues. As interest continues to grow toward natural remedies, *Adenium obesum* can be said to be a great plant with almost untapped opportunities for both modern and traditional medicinal uses.

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