

Biological Activities of *Adenium Obesum*: A Review

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ABSTRACT:

The Apocynaceae family includes the succulent plant known as desert rose, *Adenium obesum* (Forssk.) Roem. and Schult. *Adenium obesum* is a native of Africa, but it is now grown as a common decorative plant in many countries across the world, including India. This plant is one of the most abundant sources of phytonutrients, including glycosides, and has a lot of promise for use in medicinal and horticultural products. In order to provide a thorough analysis of the literature on the biological activities of *Adenium obesum*, this review is an endeavour. It has impressive piscicidal, trypanocidal, acaricidal, molluscicidal, antiviral, antibacterial activity. This evaluation indicates that additional research is necessary because *Adenium obesum* has a great deal of promise to cure a variety of disorders and might soon serve as a source for revolutionary healthcare products.

Keywords: Biological activities, *Adenium obesum*, antibacterial activities.

I. INTRODUCTION:

Plants have been utilized as a source of medicine. Native populations have employed herbal medicinal therapy to treat a variety of contagious human ailments for thousands of years [1]. The growth of complementary and alternative medicine above conventional medication regimens can benefit greatly from the use of natural resource and herbal remedies [2]. The field of herbal medicine has experienced exponential growth in recent years, and these phytomedicines are gradually gaining acceptance in both developed and developing nations due to their natural source, increased therapeutic potency, and lack of adverse reactions comparison to commercially available drugs. [3-5] More than 80% of the less developed nations' populations, or more than half the world's

population, rely on traditional medicine for their healthcare [6–8]. All facets of human culture employ medicinal herbs extensively, either directly as folklore remedies or indirectly as components of pharmaceutical formulations in contemporary medicine [9]. The use of plants in traditional medicine ranges from 10000 to 53000 species, and it is a significant and pervasive cultural practice [10,11]. Since ancient times, it has been popular to treat specific disorders with various portions of several medicinal plants. Plants create a variety of secondary metabolites that are not essential for their immediate survival but are instead produced in reaction to stress in an effort to defend themselves against pathogens, illnesses, or the environment [12]. Many plant secondary metabolites have important biological properties that have a variety of uses [13]. The many unique phytochemicals that these therapeutic plants often contain are recognized to exert their enormous diverse health effects [14–19]. Succulent plant *Adenium obesum* (Forssk.) Roem. & Schult., popularly known as desert rose, is a member of the dogbane family Apocynaceae and is native to Africa, including Ethiopia, Kenya, Senegal, Somalia, Sudan, and Tanzania. It is also found naturally in Oman, Saudi Arabia, and Yemen [20–23]. Due to its broad variation of bloom color across cultivars, lovely sculptural caudex, and endurance to drought stress, it is one of the popular ornamental plants that have been grown for decades in many humid, tropical nations including India, the Philippines, and Thailand [24–27]. In-depth research on the biological activities of *Adenium obesum*, a beautiful shrub with notable therapeutic properties, is presented in the current review.

Plant Description:

Adenium obesum is a lovely pachycaul shrub that is deciduous and has irregularly spaced, thick, smooth, greyish-green to brown-colored branches that make it distinctive and desirable for bonsai. Simple, spiral-shaped leaves are grouped at the ends of the branches, and the plant produces gorgeous, colourful star-shaped blooms that lack

aroma. Throughout the entire year, flower terminal clusters develop. The plant may be nearly completely covered in blossoms during the summer [25]. (Fig. 1). Fruit is a follicle that splits open along one side when it reaches maturity to deliver seeds with hairy pappus attached for wind dispersal [25].



Fig. 1: Adenium obesum

The following examples show where Adenium obesum belongs in a systematic manner:

Kingdom: Plantae

Subkingdom: Tracheobionta

Super-division: Spermatophyta

Division: Magnoliophyta

Class: Magnoliopsida

Subclass: Asteridae

Order: Gentianales

Family: Apocynaceae

Genus: Adenium Roem. & Schult.

Species: Adenium obesum (Forssk.) Roem. & Schult.

Biological Activities:

An essential medicinal plant known as Adenium obesum has a diverse spectrum of biological functions (Fig. 2). As listed below, the plant possesses anticancer, antiviral, antibacterial, trypanocidal, acaricidal, molluscicidal, antioxidant, and piscicidal properties.



Fig.2: Various biological activities of Adenium obesum

Anticancer Activity:

Several bioactive compounds from *Adenium obesum* were discovered to prevent and treat the cancer illness after several years of rigorous investigation. *A. obesum* aerial component ethanol extract shown cytotoxic properties against human nasopharynx test system epidermoid cancer. The cardenolides somalin, hongheloside A, and honghelin, as well as the flavonol 3,3'-bis(O-methyl)quercetin, were shown to be the bioactive compounds in the extract [28]. From the roots and stems of *A. obesum*, Yamauchi and Abe [29] identified 30 cardiac glycosides and pregnanes. The main glycoside in *A. obesum* was oleandrigenin-gentiobiosyl-thevetoside, and common pregnanes including neridienone A and 16, 17-dihydroneridienone A were identified. According to Cepleanu et al. [30], two human colon cancer cell lines were severely damaged by the crude extracts of *A. obesum*. From the leaves of *A. obesum*, two pregnant compounds with cytotoxic properties against murine leukaemia P388/S cells were identified [31].

Antioxidant Activity:

Using DPPH assay, Bungihan and Matias [41] demonstrated significant radical scavenging capabilities of an ethanolic extract of the Philippine Island of Nueva Vizcaya's *Adenium obesum* flower. *Adenium obesum* flower extracts are a rich source of anthocyanins and have a substantial antioxidant activity, according to Ebrahim et al. [42]. In Saudi Arabia, Alseini [43] observed that the methanolic extract of *Adenium obesum* flowers had excellent antioxidant activity. Another study used the DPPH test to evaluate the antioxidant activity of a methanolic extract of *A. obesum* stems. The results revealed that different concentrations and different crude extracts from *A. obesum* stems had potent free radical scavenging activity. The high concentration of polyphenolic chemicals in various stem crude extracts may be the cause of the robust free radical scavenging action [44]. Different crude extracts of *Adenium obesum* root showed substantial antioxidant activity by DPPH and maceration techniques, according to AL-Ghudani and Hossain [45].

Antiviral Activity:

Utilizing influenza virus A/PR/8/34, methanolic extracts of *Adenium obesum* demonstrated in vitro anti-influenza viral activity (H1N1). Oleandrogenin-Dglucosyl (14)-D-digitalose was found as the isolated active ingredient [34].

Antibacterial Activity:

Adenium obesum has been shown to exhibit antibacterial properties against a number of bacterial species. According to Adamu et al. [35], *Proteus mirabilis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus*, and *Escherichia coli* are only a few of the hospital-borne pathogenic bacterial strains that the aqueous extract of *A. obesum* stem bark is effective against. *Salmonella typhi*, *Escherichia coli*, and *Neisseria gonorrhoea* were only a few of the pathogenic Gram-negative bacteria strains that were effectively inhibited by methanolic and petroleum ether extracts of the stem-bark of *A. obesum* [36]. The combination of oxytetracycline and a methanolic extract of *A.*

obesum stem-bark shown significant antibacterial action against the pathogenic bacterial isolates, according to Tijjani et al. [37]. In Oman, Hossain et al. [38] assessed the antibacterial effectiveness of several solvent extracts of the stem of *A. obesum* against food-borne pathogenic bacterial strains. They claim that the average range of inhibition potency for crude extracts of various polarity by maceration technique was 0-24% and inhibition potency for soxhlet method was 0-17%. According to Hossain et al. [39], several crude extracts of *A. obesum* leaves also shown potent antibacterial properties against various pathogenic bacterial strains. According to Sharma et al. [40], methanolic extract from *A. obesum* leaves is highly efficient against the Gram-positive bacteria *Staphylococcus aureus* and *Bacillus amyloliquefaciens* but ineffective against the Gram-negative bacteria *Pseudomonas aeruginosa* and *Escherichia coli*. Their research revealed that the leaves of the *A. obesum* plant can be used as a powerful antibacterial agent that might be used as a treatment for many infectious disorders.

Parts of <i>Adenium obesum</i> used	Solvent used for extraction	Bacteria tested
Stem bark	Aqueous	<i>Escherichia coli</i> , <i>Proteus mirabilis</i> , <i>Pseudomonas aeruginosa</i> , <i>Staphylococcus aureus</i>
Stem bark	Methanol, Petroleum ether	<i>Escherichia coli</i> , <i>Klebsiella pneumoniae</i> , <i>Neisseria gonorrhoea</i> , <i>Pseudomonas aeruginosa</i> , <i>Salmonella typhi</i>
Stem bark	Methanol	<i>Bacillus subtilis</i> , <i>Corynebacterium ulcerans</i> , <i>Escherichia coli</i> , <i>Klebsiella pneumoniae</i> , <i>Pseudomonas aeruginosa</i> , <i>Salmonella typhi</i> , <i>Staphylococcus aureus</i> , <i>Streptococcus pyogenes</i>
Stem	Methanol	<i>Escherichia coli</i> , <i>Proteus vulgaris</i> , <i>Pseudomonas aeruginosa</i> , <i>Staphylococcus aureus</i>
Leaves	Methanol	<i>Escherichia coli</i> , <i>Proteus vulgaris</i> , <i>Pseudomonas aeruginosa</i> , <i>Staphylococcus aureus</i>
Leaves	Aqueous, Methanol	<i>Bacillus amyloliquefaciens</i> , <i>Escherichia coli</i> , <i>Pseudomonas aeruginosa</i> , <i>Staphylococcus aureus</i>

Fig. 3: Antibacterial activity of different extracts of *Adenium obesum*

Trypanocidal Activity:

Significant trypanocidal activity was shown by a methanol extract of the stem bark of *Adenium obesum* against *Trypanosoma brucei*. *T. brucei*'s motility was reduced by 50% in vitro at a concentration of 4 mg/mL after being exposed for 1 hour to methanol extracts of *A. obesum* stem bark [46].

Larvicidal Activity:

Adenium obesum tuber dichloromethane extract shown promising larvicidal action against *Aedes aegypti* mosquito larvae, the vector of dengue haemorrhagic fever and yellow fever [30].

Acaricidal Activity:

The ticks *Boophilus* and *Amblyomma* were effectively killed by an aqueous stem bark preparation of *Adenium obesum* [47].

Molluscicidal Activity:

Because it suppresses the snail's biochemistry and physiology, methanol extracts of *Adenium obesum* at sublethal concentrations may be utilised to regulate the snail *Bulinus truncatus* [48].

Piscicidal Activity:

One plant known to be piscicidal is *Adenium obesum* [49]. In order to protect native species and/or the intended fish species that have been stocked, the plant extract can be used to manage aquaculture ponds against some undesired weeds and predatory aquatic creatures [50]. Abalaka et al. [51] examined the ethanol extract of *Adenium obesum* stem bark as a tool for management of aquaculture pond before stocking of desired fish species in *Clarias gariepinus*. According to Abalaka et al. [52], fish treated with plant extracts showed symptoms of behavioural alterations, including respiratory discomfort, adaptive responses, neurological compromise, and death in certain cases.

II. CONCLUSION:

To gather data on the biological activities of *Adenium obesum* for the current inquiry, pertinent literatures were read. *Adenium obesum* is a very significant and intriguing herbal medicine with a great deal of potential as anticancer, antibacterial, antiviral, and other therapeutic agents. It is also a rich source of phytochemicals with antioxidant properties. This conclusion can be drawn based on the information provided in the current analysis. The bioactive components

displayed by this plant point to the potential production of therapeutic pharmaceuticals for use by humans. More research is needed to improve the extraction and phytochemical analysis techniques so that the plant's medicinal potential may be fully realised.

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