

Dioscorea Bulbifera Medicinal Plant: Phytochemistry and Salutory Potential

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ABSTRACT

Seventy percent of the world's population is treated for a range of ailments using conventional primary healthcare. Globally, the use of herbal medications by pharmaceutical, cosmeceutical, and biopharmaceutical businesses is becoming more and more common. Out of 600 species, *Dioscorea bulbifera* is one of the the *Dioscoreaceae* family, which have been used globally in traditional medicine. It's also recognised as parsnip yam, potato yam, air yam, cheeky yam, and bitter yam. Among *Dioscorea bulbifera*'s medicinal and preventative qualities against a range of illnesses, including diabetes, arthritis, and cancer. The plant's potential for therapeutic use is due to the presence of bioactive chemicals. The current review emphasises current findings in toxicology, pharmacology, and ethnomedical applications. *Dioscorea bulbifera* bulbils are used to cure a variety of conditions, including cancer, diabetes, asthma, ulcers, leprosy, dysentery, and ulcers. It is one of the most popular yam species, particularly in the West, and is used as a raw material for contraceptives. South Africa. Regretfully, due to rising harvest for therapeutic use. The purpose of this review is to offer current information. Regarding its photochemistry, therapeutic advantages, state of conservation, and optimal strategies for preserving this plant for usage in the future. Search databases for literature was used, and the results show that although *Dioscorea bulbifera* is of Despite its many therapeutic and ethnomedical advantages, it is in danger of going extinct.

Key words *dioscorea bulbifera*; pharmacological activity; anti-cancerous activity, anti- diabetic activity, anti- inflammatory activity, anti-fungal activity, Anti-leishmanial activity, Antiviral activity

I. INTRODUCTION

Plants were used as a source for herbal remedies far before antiquity [1]. The first mention of using medicinal plants was found in the Rig Veda. Later, between 2,500 and 500 B.C.,

Ayurvedic medicine solidified the use of medicinal herbs. Therapeutic regimen [2]. There is widespread historic use of medicinal herbs for healing purposes. Recorded in the Unani, Mediterranean, and Ayurvedic traditions. They've made use of medicinal herbs in the form of conventional concoctions to address a range of medical conditions. In addition, there is proof that Chinese literature, Egyptian papyruses, and Unani writings Have been treating themselves with herbs [1]. Medicinal herbs are an extremely abundant source of several phy-Multifaceted therapeutic potential of tochemicals [3]. They are round in shape and have a dark brown hue. Flowers are arranged in single, axillary, or hanging spikes [6]. The accomplice The flowers have a somewhat greenish-white colour. The capsules are in Seeds have two winged semicircular flat lobes [5]. "Air potatoes Chinese medicine has utilized *Dioscorea bulbifera* to treat problems with the kidneys, lungs, spleen, and also useful in numerous types of diarrhoea. Historically, these plants have been utilised to lower the glycemic index and provide longer-lasting energy and enhanced defence against obesity and diabetes [8]. It is reported that the yam species contains a high concentration of diosgenin, a steroid saponin, among other therapeutic compounds. It features preventive and Therapeutic potential against a range of illnesses, including cancer, Gastrointestinal issues, diabetes (also mentioned above), arthritis, Elevated cholesterol and inflammation [4]. In Indian traditional medicine, it is used for a variety of conditions, such as piles, ulcers, pain, and inflammation. Crushed tubers are used to treat sinus infections and ulcers. And decoction were combined to create oil. Often, it is utilised as a natural remedy for rectum carcinoma, stomach cancer, and goitre in Chinese and Indian phytomedicine. Toxins exist. Dried yam to dissolve it, and it is used to treat carbuncles, scrofula as well as purulent illnesses. It is used to treat dog bites in China. Food poisoning, snake stings, and hepatic fibrosis by preproviding for the liver [9]. One well-known bioactive component of synthetic birth

control tablets is diosgenin, also known as steroid saponin [4]. Moreover, it has been used to coagulate blood to stop

bleeding and detoxify pollutants. Numerous investigations of phytoconstituents have verified the presence of Tuber phytochemical components that bear close resemblance to var-Applications in ious therapeutics [1]. This plant is unique because, as was previously mentioned, its rhizomes contain diosgenin, a phytoestrogen that converts into the chemical proges-Theone. Diosgenin is the reason why contraceptive pills are discouraged. Such as preventative medications and sexual hormones like testosterone and sup-Jocks use supplements to increase their testosterone levels. And build up your muscular strength. Diosgenin is also investigated To demonstrate the chemopreventive and regenerative effects on tumours of a A few organs, further demonstrating the particle's great significance. As a potential agent against cancer. The amount of starch in Dioscorearhi-It is 75% zomes. Their incredibly bitter flaw makes them inedible.Ardour. Rhizomes contain the enzyme sapogenase. The glycosides and Tubers are also rich in phenolic compounds [7]. It's interesting to note that Dioscoreabulbifera formulation has been used to improve memory, prevent maturing, blockage, and fever, as well as Been used as a concoction to treat wounds and sores due to its High tannin organisation speeds up the healing of wounds in a Burning membrane. Dioscoreabulbifera emits a subtle fragrance and a

se-Very strong flavour. When compared to, it has more health benefits. Other Dioscorea species with the highest calcium concentrations, Zinc, magnesium, and sodium are the three nutrients with the most upsides. B1, B3, C, and the protein content that is most notable. In spite of The remarkable medicinal use and wellbeing advantages of Dioscoreabulbifera, dietary preference is mostly determined by the Sort of different species of sweet potatoes [10].

PLACE IN THE TAXONOMY [7]

Kingdom: Angiosperms; Clade: Plantae
Group: Monocots
Sequence:Dioscoreales
Discordance family
The Dioscorea genus
Kind:Bulbifera

Vernacular Names [36,37]

English: Potato Yam, Air potato
Sanskrit:Varahikanda, Aluka, Shukara
Hindi:Varahikanda, Kadu Kanda, Ratalu
Gujarati:Dukkarkanda
Bengali:Ratalu, Ban Alu
Tamil:Kodikilanga, Kaattu-k-kaay-valli
Marathi:Manakund, Kadu-karanda, Varahi
Kannada:Kuntagenasu
Konkani :Karamdo
Malayalam:Pannikizhangu, Kattukachil
Oriya: Pita Alu
Telugu:AdaviDumpa

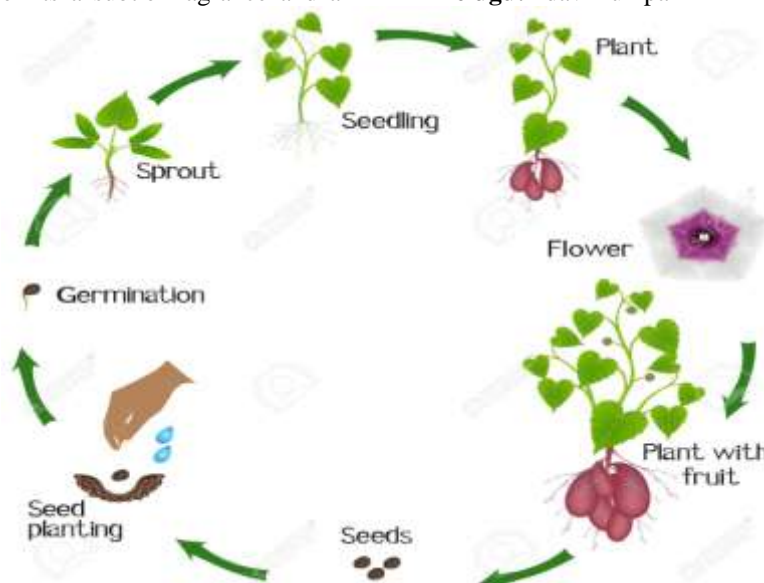


Figure 1: life cycle of dioscireabulblifera plant

Morphology



Figure 2.

Dioscorea bulbifera is a long-stemmed, furiously twining perennial vine with non-spiny stems that grow to a length of 20 metres or more and freely branch above; the internodes are rounded or slightly inclined. Anticlockwise, and they twine in a cross section. Plant has two kinds of organs for storage. In the leaf axils, the plant produces bulbils. Of the underground tubers and twining stems. Tubers are similar to little, rectangular potatoes with a harsh flavour. Noticeable aerial tubers, also known as bulbils, are whitish, globose to spherical, and up to 1.5 cm in diameter. *D. bulbifera*'s inflorescence, which is 13 cm broad and gives it the popular call it "air potato." The leaves have a heart-shaped shape, are arranged in an appealing pattern, and are joined by long petioles. Ovoid-suborbicular leaves, measuring 10–15 × 7.5–10 cm, with a deeply cordate base and an acuminate apex. Short caudate, glabrous, membranous, with 9–11 ribs at the base; up to a 20 cm long petiole. They are separated into lobes longitudinally. By striking veins that arch outward

from a single point. Origin, the point on the leaf where the petiole affixes. Rarely, flowers exist in *D. bulbifera*; they are tiny, pale green when they do and aromatic, emerging from the axils of leaves. Male flowers are thin, panicle spikes, pendulous, up to 18 cm long, with bracteoles in the axilla sharp and ovate [34,35]. Light green perianth; six biseriata, linear-oblong, 2.5 mm long lobes. Free stamens six. Female ovary triquetrous, 3-locular, ovules 2-per locule, spikes 1-3 together, staminodes 3; styles 3; stigma 2-fid that is reflexive. Capsules, oblong, 1.5–2.3 × 1-1.5 cm, three wings. The seeds are somewhat winged, and the fruit is a capsule. This species reproduces both vegetatively and sexually through seeds. By aerial and subterranean tubers (bulbils), which allow it to expand quickly and take over whole forests in a single growing season year. During the winter, air potato aerial stems wither away. However, underground tubers and bulbils are the source of resprouting. [34,35]

Phytochemicals composition of *Dioscorea bulbifera*

Sr. No	Phytochemical Constituents	Class of Phytochemical	Part of the Plant	Uses
1	Diosgenin	Steroid	Corm, Bulb	Antidiabetic, Antibacterial

2	Dioscin	Steroid derivative	Rhizome	Hepatoprotective, Anti-obesity, Antitumor, Antifungal
3	Pennogenin	Steroid derivative	Rhizome	Antitumor, Antifungal
4	Stigmasterol	Steroid derivative	Tuber	Anti-Alzheimer's
5	Daucosterol	Steroid	Rhizome	Anti-cancerous
6	Diosbulbin A, B, C	Naphthofurans	Tuber, stem, leaf	Emulsifier, Surfactant
7	Diosbulbin E, G	Naphthopyrans	Leaf, stem, rhizome	Emulsifier, Surfactant
8	Diosbulbin D	Carboxylic acids	Tuber, stem, leaf	Emulsifier, Surfactant
9	Diosbulbin F	Prenol lipid	Tuber, rhizome, leaf, stem	Emulsifier, Surfactant
10	Kaempferol-3,5-dimethylether	Flavonoid	Rhizome	Anti-tumorous
11	Kaempferol	Flavonoids	Rhizome	Anti-tumor
12	Caryatin	Flavonoids	Rhizome	Anti-tumorous
13	Myricetin	Flavonoids	Rhizome	Anti-tumorous
14	Hyperoside	Flavonoids	Rhizome	Anti-tumorous, Anti-inflammatory, Anti-oxidant, Anti-viral and Anti-fungal
15	Quercetin	Flavonoids	Tuber	Neuroprotective, Chemopreventive
16	Isorhamnetin	Flavonoids	Tuber	Anti-tumor, Anti-inflammatory

17	Vanillic acid	Benzene derivatives	Rhizome	Anti-hypertension,
18	Protocatechuic acid	Benzene derivatives	Rhizome	Anti-cancerous, Cardioprotective
19	Palmitic acid	Fatty acid	Rhizome	Nutrition and Food
20	Bafoudiosbulbin	Diterpenoids	Tuber, bulbils	Anti-Salmonella

Table 1: Table showing phytochemical compounds present in Dioscoreabulbifera

Dioscoreabulbifera’s phytochemical study reveals a varying degree of variation based on the plant’s topography, individual components, and extraction solvent [9]. As an example, in A research extraction using soluble ethyl acetic acid derivation A portion of the Chinese Dioscoreabulbifera 75% ethanol concentration Has proven that flavanoglycones are present, particularly Caryatin, 5-dimethyl ether, catechin, and kaempferol-3.[10] Diosgenin a chemical substance which is basically an glycine found in Dioscoreabulbifera and are utilized commercially

in drug industry. Aside from diosgenin, dioscin, dioscorin, and different types of alkaloids are additionally found in Dioscoreabulbifera. Roots of the herb contains alkaloids, tannin, some phytoosterols, and rich wellspring of starch. Other organic and inorganic substance found are beta-carotene, ascorbic corrosive, debris, nia-cin, protein, riboflavin, thiamine, highest level of-sodium, calcium, magnesium, zinc. Some extra organic substances present are- potassium, aluminium, chromium, cobalt, iron, manganese, selenium, silicone.[2,10]

Therapeutic potential of Dioscoreabulbifera

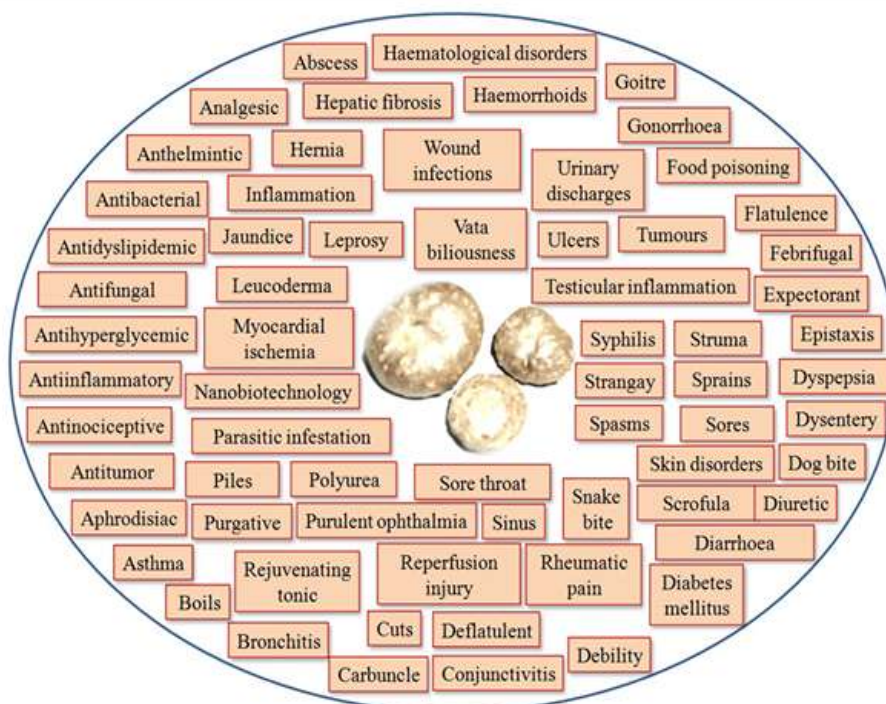


Figure 3. Medicinal uses of D. Bulbifera

Place	Medicinal uses
India	<p>It is a prime staple medicinal-food substitute for the majority of rural and local people of the state of India. The rural and local people who use them as food supplements make them edible by different traditional practices. Tubers are mostly soaked overnight in water or left overnight in stream and subjected to successive boiling to remove the bitterness. Tubers are roasted, cooked as vegetable. Shushruta mentioned it as Rasayana. Tuber powder prescribed with honey and milk for anti aging effect and causes cell and tissue rejuvenation. It improves sperm and semen quantity and quality and used for impotency and infertility, as Male/female reproductive tonic. It also improves voice, digestion, strength and immunity with balancing Kapha and Vata. Tubers are used in leprosy, asthma, cough, cold, tuberculosis, contraceptive, constipation, indigestion, abdominal pain, muscular pain, bone fracture, dysentery, sore throat, struma, wounds, boils, cuts, injury, carbuncle, tumour and also used as refrigerant to reduce body heat during summer. Tubers are also used for the treatment of purgative, deflatulent, aphrodisiac, rejuvenating and tonic anthelmintic, haemorrhoids, scrofula, worm infestations, general debility and polyuric. Fresh tuber decoction cures laryngitis in children, insect bite, ring worm, goitre, and fever. Root powder is used as component of local medicine for tuberculosis. It maintains kidney function. Also used in diseases of lungs, spleen, diarrhoea, improving digestion and metabolism. Bulbils cure typhoid of children.</p>
Bangladesh	Tubers are used for treatment of leprosy and tumours
China	Tubers are used for sore throat, struma, dog bites, snake bites, food poisoning, hepatic fibrosis, gastric cancer and carcinoma of rectum, and goiter.
Zimbabwe	Tubers are applied on cuts and sores as infusion
Java, Brazil	Tubers are used in dysentery, diarrhoea and syphilis
Latin America	Tubers are used treat diarrhoea, dysentery, conjunctivitis, fatigue and depression among other ailments.
Africa	Bulbils as hunting poison and tubers as fishing poison. External application as a medication for skin disease, boils and ulcers as well as lice and rheumatism.
Zaire	Apply a grilled leaf with little palm oil to an infected wound
Tanzania	Tubers are used leaves for eye steam bath.

Congo	Plant juice is drunk as a medication for snakebite and suppurating eye inflammation.
Benin	The leaf juice is give orally in case of difficult birth.
Cameroon	Decoctions of pseudobulbs are used for hookworm and mawwarm and the scrapping of bulbils as a poultice for treatment of abscesses, boils and wound infections.
Madagascar	Pulp of pounded bulbils for treatment of abscesses, boils and wound infections

Table 2. Traditional uses

Anti-cancerous activity

Scientists and researchers are finding that using steroidal chemicals to treat cancer is a compelling possibility; multiple active molecules have shown this effect. The native people in *Dioscorea bulbifera* is used in Northern Queensland's Tully district. Mixture as a skin cancer treatment. In traditional Chinese, it's also used. Drug therapy for cancer. The compounds' anticancer properties On mouse epidermal cells, kaempferol, caryatin, myricetin, and quercetin Cell lines JB6 were reported. Diosgenin is also being researched for its anti-carcinogenic activity against cancers of different organs, which has led to the development of the molecule's significance as a possible anticancer drug [9,7,18].

Anti-diabetic activity

Dioscorea bulbifera has traditionally been used to lower the Sugar levels in people suffering with diabetes [9]. *Dioscorea bulbifera*, which is widely used in Chinese and Indian conventional Healers for its anticancer, antioxidant, analgesic, and anti-inflammatory properties, was found to have anti-diabetic characteristics In studies [12]. Numerous studies have demonstrated that sources

Of food that included the Diosgenin, such as fenugreek and yam rhizome, have anti-diabetic impacts in preclinical animals. Diosgenin Significantly reduced glucose concentration in stz-induced diabetic Rats when compared to certain other diabetic controls. The steroid Present in *Dioscorea bulbifera* leads to activation of key enzymes Involved in glucose metabolism, which is significantly changed by Diabetes [7,8]. Diabetes sufferers have long employed *Dioscorea bulbifera* to reduce their blood sugar levels [9]. *Dioscorea bulbifera*, commonly utilised in traditional Chinese and Indian medicine Healers for its anti-inflammatory, anti-cancer, and antioxidant properties It was discovered to possess anti-diabetic effects. In research [12]. Several investigations have shown that sources Some foods like fenugreek and yam rhizome that contained the Diosgenin, when applied to preclinical animals, has anti-diabetic effects. Dimensin Much lower glucose levels in diabetic mice produced by stzRats in contrast to a few other diabetic reference cases. The hormone Found in *Dioscorea bulbifera* causes important enzymes to be activated Engaged in the metabolism of glucose, which is profoundly altered by Insulin [7,8].

Anti- inflammatory and analgesic activitie

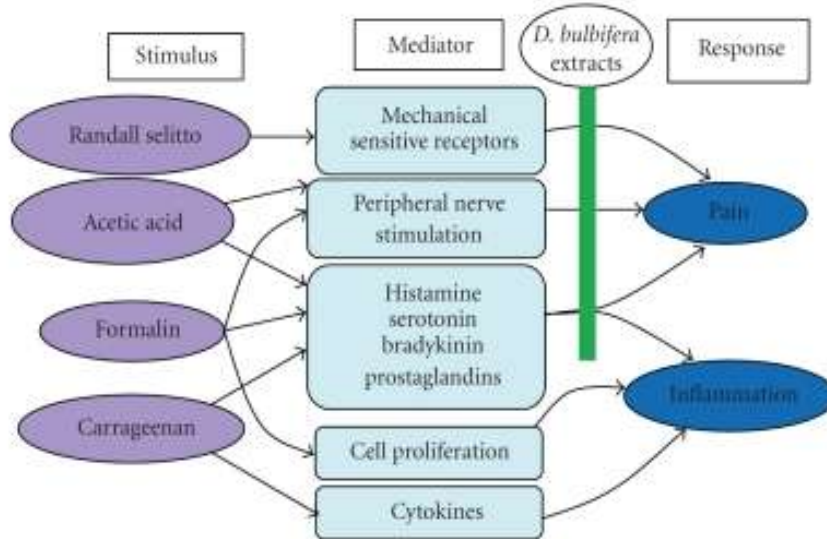


Figure 4.

D. bulbifera is commonly used in China to treat inflammation linked to hernias, stress fractures, multiple injuries, displacement of “lumps,” and inflammatory disorders of the testicles [3]. Bulbil Dios Aterpenoid called B that comes from D. Bulbifera has also been demonstrated to An inflammation that is both severe and subacute [18]. The water The crude extract of Dioscoreabulbifera bulbils in ous and

methanol has Analgesic actions that are so potent against chemical pain and discomfort Weak action and fortified by formalin or acetic acid Against pressure-induced mechanical discomfort. These raw materials Additionally produced notable anti-inflammatory effects in severe oe-Dema brought on by formalin, histamine, carrageenan, and serotonin, As well as formalininduced persistent oedema [19].

Antifungal and Antiviral activitiefy

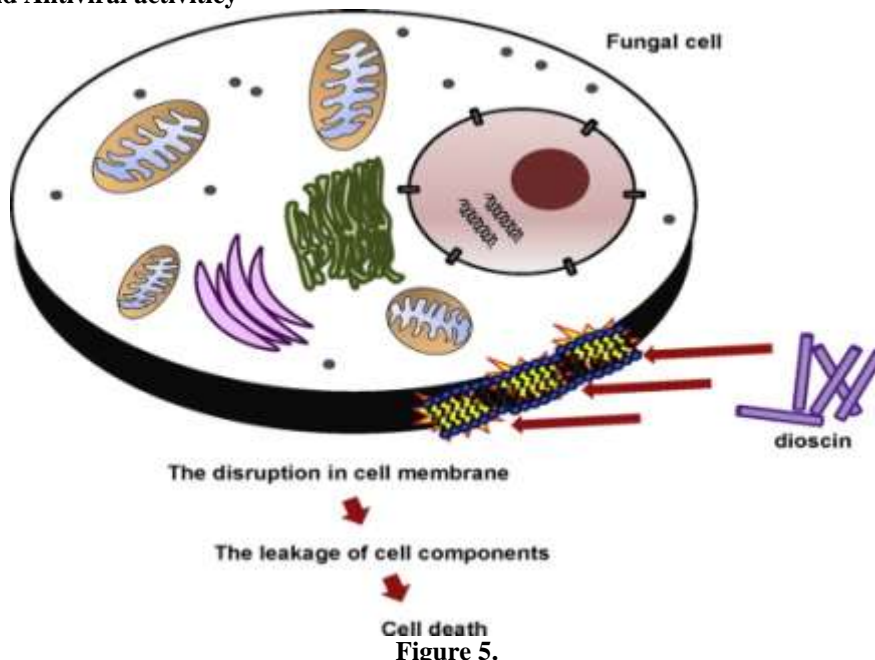


Figure 5.

Plant extracts, in particular the phytochemical found in *Dioscorea bulbifera*, offer a fresh supply of bioactive compounds that may be utilised to create novel antifungal and antibacterial treatments. How effective Anethanolic peel extract from *Dioscorea bulbifera* with antiviral properties Was additionally created [20]. Its fluid concentration demonstrated superior While ethanol extraction was being observed, action was taken against *Escherichia coli*. Equally effective against *Staphylococcus aureus* and *Candida albicans* [9].

Contraceptive Properties

Diosgenin is utilised in the manufacture of sex hormones, cortisteroids, and contraceptive medications [24], as well as Dioscrine and Diosgenin is a key component in the synthesis of Medication for control.[25,26]

Cytotoxic Properties

There have been some reports of DB poisoning instances in patients in recent years. It has been observed that both in vivo and in vitro

Antioxidant and Scavenging Properties

liver damage can result from prolonged usage of higher dosages of DB.Research. It's been shown that database extracts have Possibility for hepatotoxicity.[54] NonclerodaneDiosbulbin-D (Diterpene) shows direct damage to hepatocytes. It is Increases the release of hepatic enzymes, including alanine Aspartate aminotransferase and aminotransferase These characteristics dictate diosbulbin's harmful action.D. (27)

Dyslipidemic Properties

A metabolic disease known as dyslipidemia causes low levels of HDL and high levels of LDL and total cholesterol. Reducing the elevated cholesterol in the Serum HDL and LDL levels are crucial components of Diosmin.Diosgenin from *Dioscorea bulbifera* [28,29]Causes the breakdown of cholesterol without interfering The protein Neimann-Pick C1-Like 1 is a regulator of Absorption of cholesterol) of the intestine apical membrane of Absorbent intestinal cells. [30]

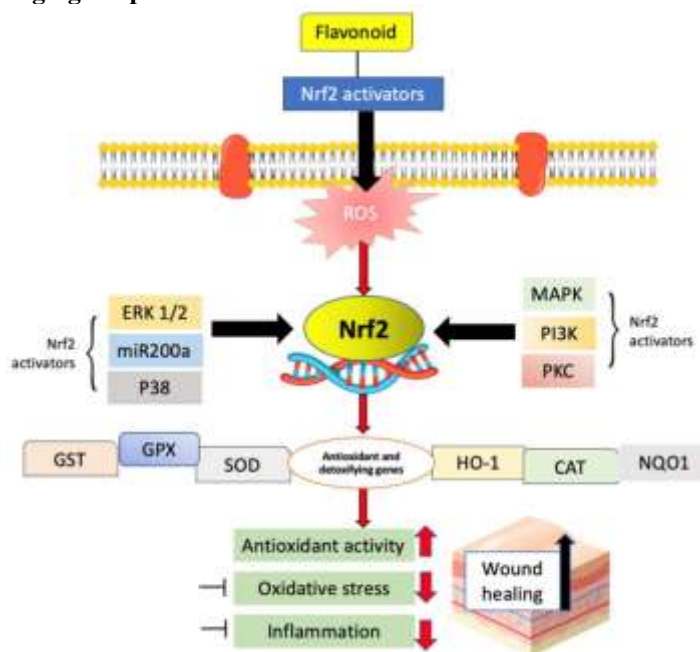


Figure 6.

Because of the constant metabolic activities occurring in our bodies, free radicals are produced, which have a negative impact on proteins, cell membranes, and nucleic acids. And so forth. This damage is what causes ageing and cardiac Cancer and issues.[31] Antioxidants are

therefore helpful in protecting us against a variety of serious illnesses.These free radicals can be decreased by antioxidant molecules by Processes for scavenging, reduction, and chelating. DB Contains an abundance of antioxidants (carotenoids, phenols, and Calcium, etc.).A. D.

Bholay [33]. Employed DPPH in [32] Test to determine the percentage of DB scavenging activity Extract from various sections at varying concentrations.

Immune system effects

Mice's immune responses were examined following oral administration of *D. Bulbifera* decoction (1000, 490, and 240 g/kg). For a period of fifteen days. Findings indicated that at high doses Group was able to considerably reduce the phagocytosis activity of Solitary nucleated macrophages. But the group receiving a medium dose Significantly increased natural killer cell activity, the B cell antibody production as well as the number and growth of T cells in the spleen. This study showed that elevated dosages Of *D. Bulbifera* may inhibit mice's immunological system, Although immunological function may be enhanced by medium dosages [43] Polysaccharides from *Dioscorea bulbifera* (100 or 150 mg/kg) decreased CD4+/CD8+ ratio of the peripheral blood T-cell subpopulation, and Polysaccharides from *Dioscorea bulbifera* with cyclophosphamide Combination reduced the lifting effect of cyclophosphamide Ratio of CD4+/CD8+ [44].

Thyroid gland effects

It has been observed that *D. Bulbifera* is effective in treating subacute thyroiditis [47]. Another study found that thyroxine (T4) Concentration and the degree of triiodothyronine (T3) absorption dropped In sodium levothyroxine-treated Sprague-Dawley (SD) rats (160 lg/kg for five days) and *D. Bulbifera* extract (0.75 or 1.5 g/kg). According to the findings, *D. Bulbifera* reduced excess thyroid Hormone and accelerated metabolic rate, leading to enhancement [48]. Of the hyperthyroid condition.

Antiviral Instance

D. bulbifera alcohol extract (0.017–0.034 mg/ml) has been shown to block RNA transcription and destroy DNA viruses. Viral in studies involving direct or indirect inhibition. From various Portions of the *D. Bulbifera* ethanol extracts (butanol fraction, The inhibition of the ethyl acetate, acetone, and ether fractions Impact of ethyl acetate and butanol fraction on Cocksackie B I–VI Virus was superior to the two other sections. Yet, their Herpes simplex virus affects I was almost the same. Upon Removing the virus, the cells can still proliferate and become Subcultured, suggesting that the substance is safe. And successful.

However, the *D. Bulbifera* decoction exhibited no inhibiting Impact on diverse viral species [49].

II. CONCLUSION

In summary, *Dioscorea bulbifera* has long been employed in traditional medicine to treat a range of medical ailments. Sentiments across the globe. The enormous health advantages As said in this assessment, of *Dioscorea bulbifera* is a representation of its Vast potential for global restorative use. Several pharmaceutical Activities based on reasoning have shown that *Dioscorea bulbifera* Possesses global therapeutic potential [18]. As stated by the Results show that *Dioscorea bulbifera* has a wide range of phytochemicals. Or secondary metabolites such as diosgenin, saponin, and flavonoids, Dioscorin, quercetin, and other important components. Such Substances have a variety of effects, including as antidiabetic, an-Anti-inflammatory, antibacterial, anti-tumor, and many more (7) *D. Bulbifera* exhibits significant resistance to both pure α -glucosidase and swine pancreatic amylase as well as rough murine glucosidase. This could be beneficial therapeutically for the treatment of type-2 Diabetes and might be used as a potent herbal remedy in Combinatorial treatment, which can be investigated further, Statements [22]

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