Journal of Advances in Science and Technology
Vol. 22, Issue No. 1, March-2025, ISSN 2230-9659

DOI: https://doi.org/10.29070/3qxhh568

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Unveiling Amorphophallus Paeoniifolius: A Review of its Ethnobotany, Phytochemistry and Pharmacological Potential

Charul Thakur [1] * , Dr. Pardeep Kumar [2]

1. Research Scholar, Department of Plant Science, Central University of Himachal Pradesh, India
charulthakur998@gmail.com ,
2. Professor, Department of Plant Science, Central University of Himachal Pradesh, India

Abstract: People have been using herbal treatments for longer than it has been chronicled in writing. Consumers and hunters first harvested them from the woods and used them for various purposes. They were utilized as a cuisine seasoning, an important source of sustenance, and a type of medicine. Elephant foot yam, also known as Amorphophallus paeoniifolius, belongs to a popular crop in Asia. It is often known as "Suran" or "Zimmikand" in India. It has tannic, stimulatory, anti-allergic, antispasmodic, anti-inflammatory, antirheumatic, purgative, digestive, appetizers, antiscorbutic, aphrodisiac, energetic, hepatic therapeutic, antiparasitic and tonic qualities. Undermined conditions such as Vata or Kapha, along with their associated symptoms, inflammatory diseases, elephantiasis, peptic ulcers, cancers, internal bleeding, nausea, coughing, breathing difficulties, an eating disorder, gastrointestinal disorders, contractions, bowel problems, intestinal parasites, splenopathy or irregular menstrual cycles can all benefit from these. Their higher docked score indicates that the substance amblyone would bind to this Bcl-2 protein's loop, by selective binding and sequestration. These are based on previously released research that evaluated the plant's strength. Following this investigation, the reliability of the whole plant was determined. Kingdom: Plantae, Phylum: Tracheophyta, Class: Liliopsida, Order: Alismatales, Family: Araceae, Genus: Amorphophallus, Species: Paeoniifolius

Keywords: Amorphophallus paeoniifolius, Amblyone, Suran, Pharmacology

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INTRODUCTION

The increasing use of alternative treatments in India these days presents a special opportunity to investigate pharmaceutical bioactive ingredients in our conventional medical approaches. New pharmaceuticals could be developed using Ayurvedic remedies. More than half of traditional drugs are derived from natural ingredients, and drug development initiatives in the biopharmaceutical industry mostly depend on them. Recently, the use of adjunctive therapies has grown in popularity. Almost 50% of all modern drugs contain organic chemicals, which makes them necessary for biomedical drug research. The elephant yum species of plants, which belongs to the Araceae family, is a well-known medicinal plant with healing properties that is extensively utilized by people in the natural habitats of the country. Amorphophallus paeoniifolius, commonly known as elephant foot tubers, is mostly a widespread plant in south Asia. In Indian language acquisition, that's commonly called "Suran" or "Zimmikand". It grows natively in the Philippines, Malaysia, Indonesia, and a few other South Asian countries. (4) The majority of people consume this yam as food. It is extensively utilized in several Ayurvedic medicines. In the south of India, conventional medicine often uses the rhizome for the treatment of acute arthritis, cancer, lung swelling, allergies and asthma, vomiting, and stomach pains. Determining the number of phenolic compounds of an alcohol-based extract prepared

from A. paeoniifolius is the goal of the current work. Although native starch is tasty and nutritious, it is believed to be detrimental to those who have obesity or diabetes. In order to address this, heat and moist treatment (HMT) of the starch obtained from elephant foot tuber are conducted using a variety of energy methods. The rate of corrosion endurance for environmental A. paeoniifolius leaflets (APL) processing on a metal backing utilizing a 1 M hydrochloric solution is being studied utilizing molecular, electrical chemistry and exterior layer simulation methodologies. The reason for the extent of metallic corrosion on the surface in solutions of acid was found to be the high calcium oxalate concentration found in the roots of plants, which are not only exceptionally bitter but additionally have the potential to aggravate the soft palate and esophagus. The nutritional and stabilizing properties of the tuber may be beneficial to dishes prepared with a combination of starch and dairy. (8)

Vernacular Names

Hindi Oal, Gandira, Jangli suran

Sanskrit- arshaghna, arsoghna

Marathi- Suran

Telugu – ghemikhanda

English –Elephant yam foot

MORPHOLOGY

Suweg blades are 50–100 cm broad and have an oblong or egg-like shape that has an arching midrib. There seems to be a lot of sores, rough ad ridges on the surface of its petiole. While the stalks of cultivated forms are a yellow green, those of wild variations are dark green and deep brown, somewhat warty or softer. The tuber of that type of plant is indefinite, bulbiferous, generally qualitative, depressed, measuring 20-25 x 15-20 cm, and covered in a deep brown epidermis.

A. paeoniifolius has a yellow orange yam core, and its rhizome skin has a brown and black look. These characteristics explain why suweg grows roots with blossoming eyes, a matte appearance, a yellow outside as well as an interior of rosy or white rhizomes, and doesn't appear irritable. further states that the suweg tuber weighs fifteen kilograms, the shade is a rich brown. The four parts of Suweg spikes are called cataphylls, petiolate, the spades and the remaining until, each has a unique purpose, design, structure, and color. (13)

Suweg's bloom had a bell- or campanulate-shaped arrangement. The spikelet, an extension, separated the sections of blossoming that were female, male or barren male. Fruits are formed by the sexually active ovary present in both male and female blooms, even after they have been pollinated. During the female blooming stage, the appendix may release an unpleasant odor through its tiny pores. Picture tubers with the main buds in the middle, a 5-cm-long inflorescence that solely contains the plant's flowering with the sepals split apart to display the spadix.

GEOGRAPHICAL DISTRIBUTION

A. paeoniifolius is a tropical plant native to India, New Guinea, and Australia. It may be found in tropical Melbourne and the Northern Sections of the country in areas with high levels of activity and drought. It was unlikely that the Asian populace would continue to be panmictic. Phylogenetic connections were used to classify the ethnic groups into nations of origin notable exception of the Medan inhabitants of Indonesia. It was evident that there had been recent mutations within the regions, but only in those specific geographical areas. According to the present inquiry, there may be more biological pool centers among the populations of Thailand, Malaysia, and perhaps India. Gene ecological preservation and propagation should always be combined with regional activities to develop new, widely accepted varieties projects as well as global dissemination. (2)

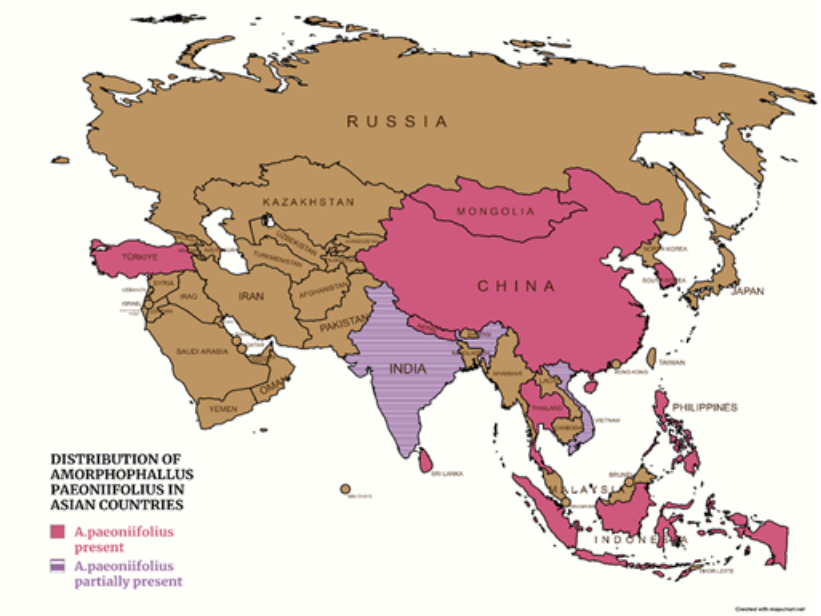
This kind of plant is capable of being grown in a restricted number of places since it needs humidity as well as heat to survive. The species is grown in several Indian civilizations for the corms. This occurs since they are incredibly rich in a range of vitamin and mineral content that can be difficult to find in many other foods. Though to a significantly smaller extent, they are also found in Africa and Southeast Asia. EFY is extensively farmed, primarily in the states of Madhya Pradesh, Kerala, Maharashtra West Bengal, Gujarat, Maharashtra, and Uttar Pradesh. It can be discovered in plain territories in the northern parts of the country, where it usually grows alone or in clusters.

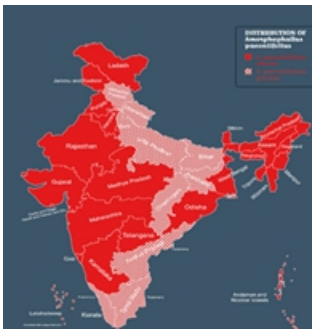
Suweg is spread throughout multiple locations or geographical areas with even a lone or organized existence, which is in alignment with the statement that Suweg spreads across in several locales or territories with either a solo or grouped life. Multiple observation stations found Suweg with different individual values. The geographical distribution of Araceae species is mostly determined by environmental

factors. Suweg is a plant relatives' member that can spread by itself, in reaction to environmental factors, human activity or both. (7)

Cultural medicine can establish the historical or ecological links that exist between mankind and the flora. Ethnobotanical surveys often provide basic information about the extent to which communities participate in ecological sustainability. However, fears regarding indigenous knowledge stem from the present generation's diminishing understanding of traditional practices.

They often play a vital role in daily existence and are significant for everything from medical purposes to economic development. Understanding the purpose behind the planting of particular plant species is crucial. Tourism authorities have the ability to enhance the environmental state of residential gardens, which is especially important in nearby natural reserves. A growth of exotic species of plant invasions in gardens at home presents a threat to variety. The analysis revealed that landscaping might provide for both socioeconomic and cultural reasons, homeowners that have and maintain home gardens appropriate for cultivation can benefit monetarily from their own backyard ecosystem while also providing ecological functions. It was also noted that this plant species is adaptable to such a system of farming and has extensive ecological agricultural adaption. (10)





COUNTRY/STATE	AILMENT USED	PART USED / DOSAGE	REFERENCE

BANGLADESH	ulcerogenesis of the gastrointestinal tract	fibrous roots	(4)
	Helminthosis	Tubers	
	anti-mycotic	fresh rhizome juice	
	Splenic enlargement	rhizome preparations	
	feed for fish	Suweg's petiole and leaves	
INDONESIA	customary ritual further illnesses	Tubers are served either raw or cooked.	(8)
	treats the remedy for snakebite	Tuber	
SRI LANKA	The leaves can be used to treat illnesses that are waterborne.	Tuber decoction	(2)
MAHARASHTRA	Using herbal remedies to address issues with hunger	Leaf	(6)
	Liver damage is treated by combining dried powders from the entire plant with curd.	The entire plant	
MADHYA PRADESH	Digestive problems are treated with dried corms. Desiccated rhizomes are used to alleviate piles.	Corms that have dried	(11)

	Apical stems are used to treat sinusitis. The rhizome contains blood-purifying properties and is used to treat inflammation.	Corm/Tuber	(5)
UTTRAKHAND	The entire plant is used to treat gastrointestinal disorders. As an appetizer, it has benefits.	dried rhizome	(10)
MANIPUR	inflammation of the dermis after rhizome treatment.	The root	(13)
	To treat stools, the base is made and ingested. It also possesses antibacterial qualities.	Rhizome and petiole	

PHYTOCHEMISTRY

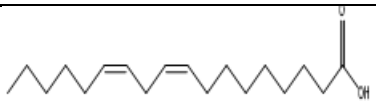
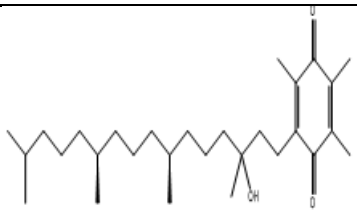
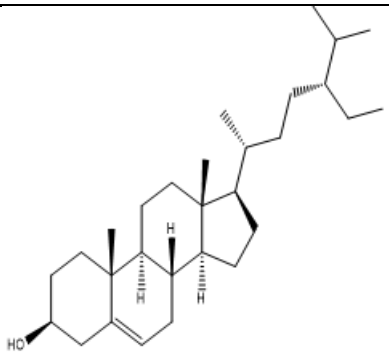
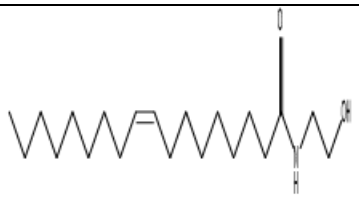
Scientists had already begun examining this plant's phytochemical characteristics. Terpenoids, sterols, gums, albuminoids, alkaloid compounds, sesquiterpenoids, reducing chemicals or alkaloids include around 200 substances. Amongst the active compounds, Amblyone is extremely effective. The table depicts A. paeoniifolius solvent extractions that were subjected to qualitative analysis for the purpose of the current phytoconstituent evaluation. Petroleum ether, chloroform, ethanol, or freshwater were used to determine the presence of phytochemical components. In alongside the alkaloids, a petroleum ether extract also contains lipids, saturated oil, and steroids. (13)

Flavonoids

Fruit and crops, grains, barks, roots, stems, blooms, tea and wine all contain flavonoids, a type of organic substance with a variety of polyphenolic components. The therapeutic properties of such bioactive compounds are well established; hence efforts have been made to isolate these flavonoids from the other ingredients. Flavonoids are currently considered a vital component in a variety of nutritional, pharmacological, and medicinal applications, including cosmetics. It is explained by their potential to alter intracellular activity of enzymes for anti-oxidative, allergic and mutagenic anti-carcinogenic characteristics. The discovery of lower cardiac death rates due to flavonoids received considerable attention. There is still some uncertainty about how flavonoids operate. However, it is widely known.

Terpenoids: Terpenoids are most diverse kinds of secondary chemicals produced by plants. Terpenoids may cure protozoan parasite illnesses such as malaria, Trypanosoma, and leishmania, according to experimental results from in vitro experiments. The primary terpenoid polymeric backbone's adaptability of the primary terpenoid polymeric backbone, allows for structural variety within the class, resulting in a broad range of cellular targets, including anti-parasitic action approaches. The data shows a variety of potential mechanisms, including disruptions in aerobic digestion, changes to the protozoa's cell membrane architecture, and interactions with a wide range of functional proteins. The identification of specific cell receptors and their modes of action will aid in the creation of improved antiparasitic medications. Understanding the precise cell targets will facilitate the development of new, better anti-parasitic medicines. (5)

TECHNIQUE USED	***PART OF PLANT***	***PHYTOCHEMICAL COMPOUNDS***	***REFERENCES***
HPTLC ANALYSIS	Leaves/Tuber/Stem	Quercetin, betulinic acid, proanthocyanidin, gallic acid, cisplatin, p-chlorophenyl alanine, xanthine-/xanthineoxidase, linoleic acid peroxidation, and β-sitosterol	(4)
GC-MS ANALYSIS	Woody portions of the stem, rhizome, and flower tissues	Vitexin, Vitexin 2 -O-glucoside, Isovitexin, Lucenin-2, Orientin, alpha-tocopherol, ascorbic acid, beta carotene, C-glycosylflavones, flavonol, 3,5-diacetyltambulin (7,8,4′-trimethoxy3,5-di acetoxy flavone), Cyanidin 3-O-glucoside, Rutin, Albuminoids, benzodiazepines, anthraquinone, Sterols	(7)

SERIAL NO.	CHEMICAL NAME	STRUCTURE	IUPAC NAME
1.	Linoleic acid		(9Z, 12Z)- Octadeca-9, 12-dienoic acid
2.	Alpha-tocopherol		2- [(7S, 11S)-3-hydroxy-3, 7, 11, 15-tetramethylhexadecyl]-3, 5, 6-trimethylcyclohexa-2, 5-diene-1, 4-Dione
3.	Beta-sitosterol		(3S, 8S, 9S, 10R, 13R, 14S, 17R)-17-[(2R,5R)-5-ethyl-6-methylheptan-2-yl]-10,13-dimethyl-2,3,4,7,8,9,11,12,14,15,16,17-dodecahydro-1H-cyclopenta[a]phenanthren-3-ol
4.	Oleic acid		(Z)-N-(2-hydroxyethyl) octadecyl-9-enamide

PHARMACOLOGICAL ACTIVITIES

Anthelmintic Activity

The anthelmintic action exhibited by the extract of methanol from A. paeoniifolius tuber was compared to Pheretimaposthuma and Tubifex tubifex. The experiment, which involved both temporal immobility and larval death, began with extracts at concentrations of 25, 50, and one hundred milligrams per milliliter. Extraction at an ml can effectively decrease tapeworm. First, comparison standards, piperazine citrate (10 mg/ml), were introduced, with water acting as the order. These substances have been found to destroy and paralyze (vermifuge) the earthworms that were captured. (13)

Antibacterial Activity: Tetracycline hcl plus paeoniifolius components in aqueous and ethanol form were examined for minimum inhibitory concentration (MIC) versus P. gingivalis, P. intermedia, and F.

nucleatum. When subjected to an aqueous extract containing A. paeoniifolius at 0.4 percent mg/ml, all of the bacteria tested demonstrated sensitivity. P. gingivalis and F. nucleatum were reactive to ethanol-based extracts of A. paeoniifolius at concentrations of 0.2 milligrams per, whilst P. Intermediary concentration was responsive at 0.4 mg/ml. Tetracycline monohydrate has been shown to be immune to P. gingivalis, P. intermedia, and F. nucleatum at doses of 0.2 and 0.4 mg/ml, correspondingly. (11)

- **Antiglycemic Activity**

Elephant foot tubers (EFT) are usually shunned by diabetics due to concerns that they will exacerbate already present hyperglycemia. The preceding assumption was tested in the most recent research. Analyzing phytonutrients along with tracking human tests by combining the dietary intake with an EFYT flake combination for six weeks of success. During the first three weeks, supplemental powder was discontinued, and fasting blood glucose (FBG) levels were regularly examined. The findings unequivocally demonstrated that when tested in mice with alloxan-induced type 2 diabetes, all of the above diets substantially (P 0.001) decreased FBG concentrations. The EFYT continued to offer the strongest antidiabetic benefits after stopping its granules, returning the FBG levels in hypoglycemic mice to their starting points by the conclusion of the 6th week of treatment. (3)

- **CNS Activity**

Pet-ether essential oil administration appears to be significantly more effective than benzodiazepines combined with phenobarbitone in reducing depression of the nervous system, according to additional studies on the possible receptors for *A. paeoniifolius* primary nervous mechanism suppressant events resulting from synergistic interactions between drugs. Albino mice were used to discover an unexpected daily dosage of CNS depressing activity utilizing pet-ether extracts, diazepam, and phenobarbitone. A. Paeoniifolius pet ether preparation that had been purified was injected intravenously at a dose of 100, 300, or 1000 mg/kg body mass. After one hour, the pet-ether extract showed a quantitative decrease of these CNS activities of 16.53%, 73.36%, and 56.77%. The concentration-response curve was used to establish the equivalent dosage (ED50) for CNS depressing effect, which came out to be 250 mg/kg in this case. Benzodiazepines at the recommended doses. The estimated dosage rate (ED50) for CNS depressing effect was 12 mg/kg. One intraperitoneal application of control (5% Tween 80) at a dose of 10 Milliliters/kg exhibited no discernible impact on muscle activity. Furthermore, the synergistic effects of phenobarbitone (12 milligram/kg) and pet-ether isolates (250 milligram/kg) have been investigated. The same percentage of inhibition of the combination's CNS depressive action, which was found to be 59% even 60 minutes after the drugs were administered, was also found to be slightly greater than the percentage of inhibition of the pet-ether isolate and phenobarbitone separately at one's highest concentration when compared to the control population (vehicle). (1)

- **Antifungal/ Microbial Activity**

The ethanolic extract of the root system of A. paeoniifolius was examined for its antibacterial, fungicide-like and cytotoxic capabilities in addition to its anti-microbiological activity. It is known that shrimp from brine nauplii is poisonous. Furthermore, the diluting approach has been used to determine the minimum inhibitory concentration (MIC) to evaluate the antimicrobial property. Six gram-negative and four gram-

positive (Bacillus megaterium, Strep haemolyticus) bacteria (Bacillus subtilis higelladysenteriae, Escherichia coli Salmonella typhi) properties Shigellasonnei, Shigellaflexneri, Pseudomonas aeruginosa, were inhibited from growing by the preparations. MIC ranged from sixteen to one hundred and eighty-eight g/ml against different bacteria. The fungus under investigation had weak antifungal properties. In the context of cytotoxicity, this extract's LC50 value for saltwater shrimp nauplii reached 7.66 grams per milliliter. (12)

ANTICANCER ACTIVITY

Conformance for the connected phenyl analogues of Tetrahydroisoquinoline amide, amblyone, and plant nutrients of A. paeoniifolius. One of the members of this Bcl-2 family (Protein data bank Identifier 2w3l) is close to an interaction position of the intended molecule, wherein all of its natural ligands are likewise placed. Anti-apoptotic drugs and pyrazolole were given. A square container was formed and docked at certain points. The current evaluation indicates that amblyone, a phytoconstituent found in the root of yams, can effectively interact with Bcl-2, an anti-apoptotic protein. Proteins were found to be superior to the anti-tumour drug, with a great docked value of -12.2 kcal/mol. An in-vitro anticancer examination revealed the anticancer effects of this raw material (rhizome A. paeoniifolius). If this tuber is associated with the antiproliferative protein of interest 2w3l, it has an outstanding docking value. Amblyone, one of the botanical compounds in this tuber, may be used for its ability to fight cancer. The high docking score suggests that the substance amblyone may attach to the split of a Bcl-2 protein, which regulates the activity of a pro-apoptotic protein through selective attachment or uptake.(5)

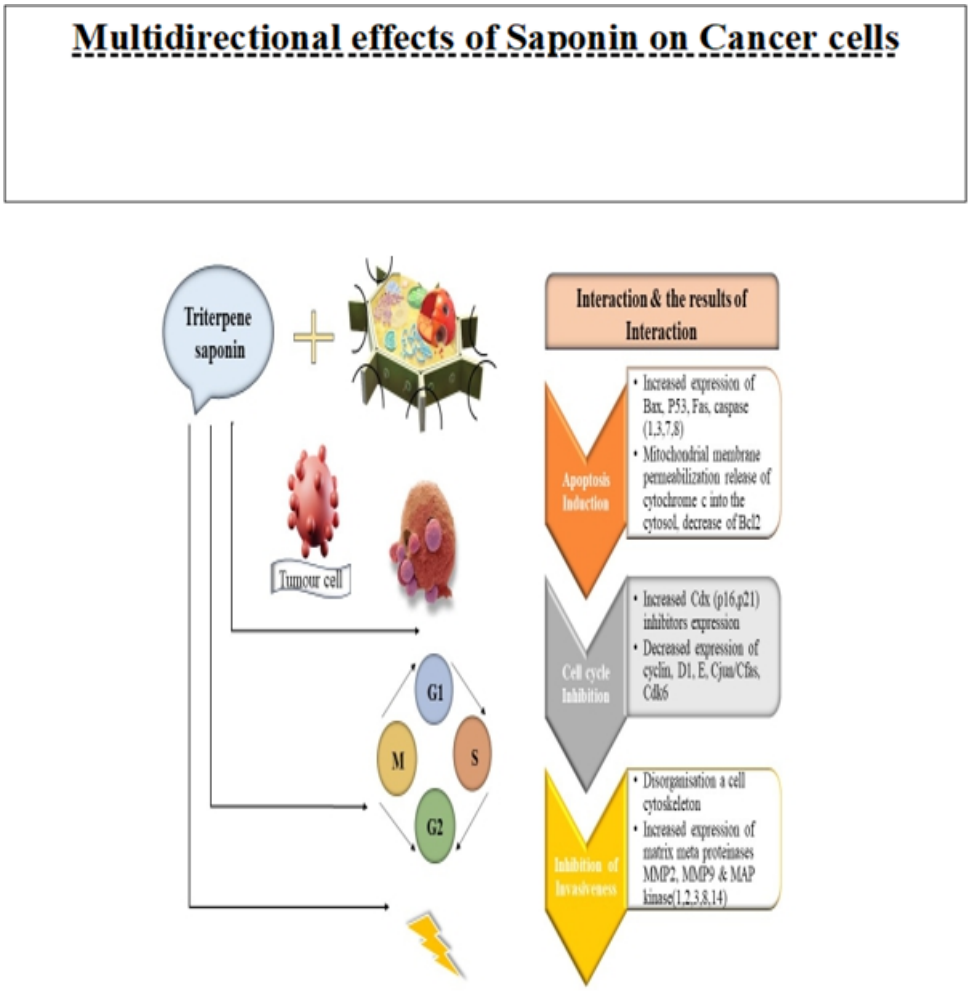
TERPENOIDS FUNCTIONING

Terpenoids are a powerful class of botanical chemicals identified from plants and plant-based diets. Several investigations have shown that they have therapeutic and liver-protective properties in both cultured cells and experimental animals as well as clinical trials. Because it's likely that in the early phases of tumor genesis, epigenetic modifications even take place before genetic abnormalities, epigenetic control is considered a potential target for preventative therapy against cancer using bioactive compounds that regulate gene expression.

Triterpenoids' pro-inflammatory or antioxidant qualities, their capacity to govern cellular division, and their mastery over epigenetic alterations are some of the mechanisms by which their genotoxic effects on health promotion and cancer prevention are achieved. The triterpenoid's pharmaceutical characteristics for tumor chemotherapy early detection and treatment along the chromosomal process.(8)

Amblyone

A. paeoniifolius rhizome, the unprocessed product, exhibited high potential to fight cancer based on an experimental anticancer study. The anti-tumor ability of the rhizome seems to be a reaction caused by its phytoconstituent amblyone, depending on its strong docking value when attached to anti-apoptotic protein targets 2w3l. Due to the high docking value, the amblyone could stick to its Bcl2 loop, which regulates the activity of pro-apoptotic components by binding and sequestration. The drug-targeting nature of this ligand is further corroborated by ADME & cytotoxicity values produced with the preA DMET softwar. (10)



CONCLUSION

Herbal treatments were the only way to treat illnesses prior to the invention of pharmaceutical medications. Around eighty percent of people on the planet, who live in the huge rural regions of emerging and less developed nations, are said to nevertheless primarily use botanical medicines. It is clear that Amorphophallus taxa are extensively utilized in India's conventional healthcare systems and have been demonstrated to have liver-protective, antifungal medication, & antimicrobial properties in addition to being employed for healing lesions. It can be inferred from the evidence that Amorphophallus taxa has significant components for therapeutic purposes because they are abundant in carbs alkaline compounds, phenols, tannins, drugs, flavones as and coumarins. A few toxicological research on Amorphophallus paeoniifolius is reviewed in this article.

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