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**RESEARCH ARTICLE**

# *ASFANJ (SPONGIA OFFICINALIS)* AN ANIMAL ORIGINS DRUG, HISTORICAL, ZOOLOGICAL DESCRIPTION, CHEMICAL CONSTITUENTS AND PHARMACOLOGICAL STUDIES: A REVIEW

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## ABSTRACT

*Asfanj (Spongia officinalis)* is one of the important sea animals which are used as a commoningredient in various Allopathic, Homeopathic, and Unanisystem of medicines. This review article mainly contains the information's onGeographic distribution, History of sponge's, Zoological description, chemical constituents of *Spongia officinalis* and the therapeutic uses of this animal likeAnti-inflammatory activity, Anti-proliferative activity, Anticancer activity, Anti-microbial activity, Anticonvulsant activity, Antiviral activity.

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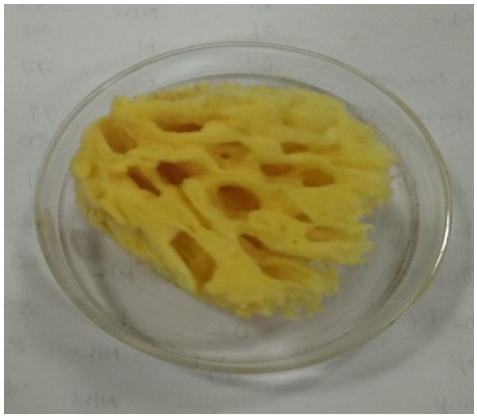
# INTRODUCTION

*Asfanj (Spongia officinalis)* is belongs to phylum porifera. It is sessile, benthic, multicellular, invertebrate hermaphrodite, animal[1]Sponges are currently divided among four distinct classes, 25 orders, 128 families and 680 genera[2] a published paper has quantified the number of sponges described scientifically to be 8553 species.[3] It is collected by divers from submerged rocks to which it is found adhering as a light lump of porous nature. It is yellowish brown, soft elastic and irregular shaped and is believed to be the skeleton of a sea animal. When quite fresh, it is covered with a gelatinous substance[4]It is these chemicals that are sought for potential pharmacological use. Drug discovery from sponges was put into high gear with the isolation and characterization of the nucleosides, spongothymidine and spongouridine, of the marine sponge *Cryptotethya crypta*[5]These were used as templates for the synthesis of Ara-C, an agent used against lymphoma, and the antiviral drug Ara-A used clinically. Subsequently isolated secondary metabolites from sponges showing anti-inflammatory, anti-tumour, immunosuppressive neuro- suppressive, antiviral, antimalarial, antibiotic, antifouling and other activities have been extensively reviewed[6]

**Geographical distribution:** *Asfanj* **(***Spongia officinalis)* is found in Cosmopolitan, Adriatic Sea (Dalmatia, Tremiti, Bari), Ionian Sea (Leuca, Taranto), Tyrrhenian Sea (Stagnone di Marsala, Pan area, Naples, Pozzuoli, Ischia, Policastro, Porto Ercole, Sardinia), Ligurian Sea (Portofino, Bogliasco, San Fruttuoso, Punta Chiappa), Sardinian Sea (Alghero, Bosa), Corsica, Gulf of Lions (Port Cros, Marseille, Cap Ferrat), Balearic Sea (Catalunya, Blanes, Girona, Valencia, Baleares-Cabrera, Medas Islands), Gibraltar, Alboran, Gibraltar, Algeria (La Calle), Tunisia (Tunis, Gabès, Djerba, Kerkennah, Messioua, Hallouf, Zarzis), Libya, Egypt, Lebanon, Syria, Aegean Sea (Greece and Turkey, Karpathos, Sporades, Cyclades), Albania further reports from the Atlantic Ocean (Azores, Canaries, Madeira, Biscay, North Atlantic, Norway, West Indies, Puerto Rico, Puerto Cabello, Southwest Bahia, and West Africa, Congo), Indian Ocean (Red Sea, Mauritius, Sri Lanka), Pacific Ocean (Puerto Cabello, Sulawesi, New Guinea, and Australia), and Eastern-Central Indo- Pacific[7]

**A History of sponges:** Historical studies of sponges begin from the paper of Grant in 1825 publish[8] where for the first time were indicated sponges larvae and eggs in *Spongilla*sp. However the first description of larvae has been made by Lieberkuhn in1856 and in 1859 he published first description of embryos of calcareous sponges[9]. Nevertheless, the first detailed description of sponge's embryonic development has been made 10 years later by Schmidt in 1866 study[10] at *Sycon* (*Sycandra*) *humboldti.* The evolution of sponges has been the subject of regular investigations for more than 150 years. It is possible to allocate three periods in history of studying of sponge's embryology[11]the firstperiod of sponge development studies falls on the last third of the nineteenth century. It was the 'Golden Age' of sponge embryology. There were about 110 published articles on this topic. Uncontested leadership in this research field belonged to German zoologists: Schulze, (1840–1921) Maas (1867–1916), Schmidt, (1823–1886) Keller (1848–1930. and others. The second era spans the first half of the 20th century (1900-1960), the period when interest in the development of sponges decreased. The third period started with the application of electron microscopy and new optical and experimental methods to sponge studies. Spermatogenesis and oogenesis, fertilization and larval structure were investigated ultra-structurally.

## ZOOLOGICAL DESCRIPTION OF *ASFANJ*



**Classification of Sponge**

| | |
|---|---|
| Kingdom | Animalia |
| Phylum | Porifera |
| Class | Demospogiae |
| Order | Dictyoceratida |
| Family | Spongidae |
| Genus | Spongia |
| Species | S. officinalis |

*Asfanjes* have been cellular organization (include Demospongiae, Calcarea and Homoscleromorpha) consists of two epithelial cell layers: the pinacoderm and the choanoderm. The pinacocytes or flattened cells that line the canals of the aquiferous system and some interior cavities, serve as the representation of the pinacoderm. They also create the exterior cover. The flagellated collar cells that line the choanocyte chambers, or choanocytes, create the choanoderm. The space between the external layer of pinacocytes and the aquiferous system is filled with the mesohyl[12] sponge mesohyl should not be considered as an inert scaffold but as an intricate and dynamic web of chemicals that controls cell behavior. The mesohyl contains over ten types of highly mobile cells, as well as skeletal elements and microbial symbionts [13, 14, 15]

**Aquiferous System:** The circulatory aquiferous system is the most characteristic feature of the poriferan organization. It comprises the following elements, ostia, inhalant canals, apopyle, choanocyte chambers, prosopyle, exhalant canals and osculum. Water drawn into the inhalant canals via small pores called *ostia* moves to *choanocyte chambers* and then, via the system of the exhalant canals, to the large excurrent *osculum*. The unidirectional flow of water is ensured by the coordinated beating of the choanocytes' flagella. In the sponges with cellular organization, food particles and oxygen are captured from water by various cells, including choanocytes. The cells that are not included into the epithelia participate in the transportof the food particles and oxygen inside the sponge body. The aquiferous system is a modular, easily rearranged system[16, 17, 18]:its main physiological functions are transport and excretion offood particles, respiration and the release of the gametes and the larvae. At the sametime, some representatives of the families Cladorhizidae and Esperiopsidae (Poecilosclerida, Demospongiae) lack all the elements of the aquiferous system[19, 20, 21].

**Tissue Organization:** *Asfanj* is multicellular animals; tissues of the multicellular animalsare divided into two categories: the epithelial ones and the parenchymal ones. According to Fawcett (1994), a tissue in histology is a system of cells and the intercellular structures they form that have been historically formed and are connected by a shared function and structural-chemical order. Tissues can be divided into four categories: (1) the tissues that border (epithelial), (2) the interior environment's tissues (blood, interstitial, and skeletal tissues), and (3) the tissues of the nervous system and (4) muscular tissues[22]Since sponges lack the latter two types, we will analyze their bordering (epithelial) tissues and the tissues of the internal environment.

**Reproduction system:** *Asfanj* is hermaphrodite, it have found sexual and asexual reproduction. It is broadly considered that one of the first differentiations in the evolution of multicellular animals was the separation of the sexual and the somatic cell lines[23, 24]asexualreproductions occurs in all poriferan clades. It may proceed by fragmentation, gemmulogenesis and budding [25, 14, 26]

## CHEMICAL CONSTITUENTS

*Spongia officinalis* have mainly chemical constituents, like alkaloids, glycosides, steroids, sesterterpenoid, aliphatic compound, essential oil, mixture of fatty acid, and nucleotide, proteins, terpinoids, benzenoids, lipids, sterols, amino acid, lactons. The alkaloids include Nucleosides spongothymidine and spongouridine[27, 28] the major chemical constituent in Spongeinclude Xestospongin C, Spongothymidine, discorhabdin D, Contignasterol, Jaspamide, agelasphin.

Anti-inflammatory compounds; Manoalide, Dysidotronic acid, Ircinin-1 and -2, Petrosaspongiolides, Spongidines A-D, Topsentin, Scalaradial, Cacospongionolide B, Jaspaquinol, Subersic acid. Antitumor compounds;BRS1, Isoaaptamine, Debromohymenialdisine, Adociasulfates, Discodermolide, Laulimalide, Peloruside A, Hemiasterlin, Dictyostatin, Spongistatin 1, Halichondrin B, Arenastatin A, Latrunculin A, Swinholide A, Mycalolide B, Jaspamide, Elenic acid, Naamine D, Agelasphin, Agosterol A, Salicylihalamide A, Chondropsin A and B, 6-Hydroximino-4-en-3-one steroids, Crambescidins 1-4, Haligramides A and B, Discorhabdin D. Immuno

suppressive compounds; Simplexides, Polyoxygenated, Contignasterol, Xestobergsterols A and B Pentacyclic, Taurodispacamide A, Pateamine A. Blood affected compounds; Cyclotheonamide A, Halichlorine, Callyspongynic acid, (Detmer Sipkema, *et al*, 2005) Neuro-suppressive and Muscle Relaxants compounds; Dysiherbaine, Keramadine, 1-Methylisoguanosine, Xestospongin C, Okinonellin B, Bromotopsentin, Penaresidin A, S1319, Antiviral compounds from Sponges; Dragmacidin F, Papuamides C and D, Mololipids, Haplosamates A and B, Hamigeran B, Weinbersterols A and B, Variolin B, Avarol, 2-5A. Antimalarial compounds from Sponges; Axisonitrile, Manzamine A, Kalihinol Antibacterial and Antifungal compounds from Sponges; Discodermins B, C, and D Antibacterial/ antifungal (D and E), Arenosclerins A, B, and C Antibacterial, Axinellamines B–D Antifungal, Oceanapiside Antifungal, Spongistatin Antifungal, Leucascandrolide A Antifungal, Antifouling compounds from Sponges; Kalihinene X, Kalihipyran B, 10b-Formarnidokalihinol, Pseudoceratidine 2, Ceratinamide A and B, C22 ceramide, Formoside, Axinyssimides.[29] Callystatin, Tedanolide, Glaciasterols A and B, Axinellins A and B, Incrustasterols A and B Unknown, a Also has anti-inflammatory activity. b Also has immunosuppressive activity.[29]

## PHARMACOLOGICAL STUDIES

**Anti-inflammatory activity:** Methanol extract of *Spongia officinalis* experiment on Carrageenan rat paw edema, (25, 50, 100 mg/kg) produced a significant reduction of edema throughout the entire period of observation in a dose related manner. It's interesting to note that the maximum edema reduction occurred after 3 hours, with 42.5, 52.7, and 61.71%, respectively. The present results indicate that methanol extract exhibit anti-inflammatory effects. [30]

**Anti-proliferative activity:** In the study, F2 and F3 fractions of Mediterranean sponge, *Spongia officinalis* showed, in vitro, a significant anti-proliferative activity against three human cancer cell lines A549, HCT15, and MCF7. The IC50 values clearly indicated that the semi- purified fraction F3 had a much more potent effect on the three human tumor cell lines than F2 and should be tested on several other cancer cell lines.[30]

**Anticancer activity:** Dichloromethen and methanol mixture extract of *Spongia officinalis* experiment on lung cancer cells (A549). It is seen that the extract causes apoptosis of the A549 cells. The flow cytometric analysis of the sponge extract shows cell cycle arrest at the G2/M phase of the cell cycle [31]

**Anti-microbial activity:** Chloroform extract of *Spongia officinalis* showed the highest inhibiting activity against bacterial pathogens. *S.aureus, S. faecalis and P.aeruginosa, E.coli.* Gram-negative bacteria *(P. aeruginosa)* highly susceptible to crud extract of *Spongia officinalis*[32] Methanol extract of sponge found antimicrobial activity. It found antifungal activity against *Candida albicans, Cryptococcus neoformans, Sporothrix schenckii, Aspergillus fumigatus* and *Candida parapsilosis*. Antibacterial activity was found against *Streptococous feacalis, Klebsiella pneumonia, Escherichia coli, Pseudomonas aeruginosa, and Staphylococcus aureus.*[33]

**Anti-amoebic activity:** The effects of *S. officinalis* extracts on trophozoites of *E. histolytica in vitro* and against caecal amoebiasis of rats Its was observed, it was found that the methanol extract when administered at a dose of 250 mg /kg body weight for five days 100% cures the condition. The *n*-butanol and aqueous fractions of the same extract exhibited high efficacy with 100% cures at 100 mg/kg dose bodyweight[33]

**Anticonvulsant activity:** Dellai, *et al*, study on mice anticonvulsant activity described. Swiss mice of either sex (20–30 g) were used. Three groups of six mice each were used to divide the animals. The first group was given a subcutaneous injection of 10 ml/kg of saline as a control, the second group obtained phenobarbital (120 mg/kg) as a reference medication; and the third group received treatment with a crude extract of the defensive secretion from Spongia officinalis (100, 200, and 400 mg/kg) and its semi-purified fractions (F1-F3) at 200 mg/kg (s/c), 30 min before the intra-peritoneal (i.p.) injection of pentylenetetrazole (PTZ) (90 mg/ml). The time taken before the onset of colonic convulsions, the duration of colonic convulsions, and the percentage of seizure and mortality protection were recorded. These parameters were compared in treated animals with those of control animals, in order to assess the anticonvulsant activity[30]

**Anti-analgesic activity:** The analgesic activity was performed extract of *Spongia officinalis*; Swiss mice (20–30 g) were selected one day prior to each test and were divided into three groups of six mice each. One group served as control (saline 10 ml/kg) (s/c). The second group was given the lysine acetylsalicylate (ASL) (200 mg/kg) by the same route, as a reference drug. The crude extract of Spongia officinalis' defensive secretion (100, 200, and 400 mg/kg) and its semi-purified fractions F1, F3 (200 mg/kg), and F2 (50, 100, and 200 mg/kg) (s/c) were administered to the remaining group. All animals received 10 ml/kg (intraperitoneal) of 1% acetic acid 30 min after treatment. The number of writhing was recorded during 30 min commencing 5 min after the acetic acid injection. A writhe is indicated by abdominal constriction and stretching of at least one hind limb. [33]

**Antioxidant Activity:** K.A. Athira Krishnan and T.R. Keerthi have studied the antioxidant activity of *Spongia officinalis*. It has been observed that *Spongia officinalis* exhibited excellent antioxidant activity in methanol extract. The observed antioxidant activities of the extracts indicate the potential natural antioxidants or nutraceuticals to reduce oxidative stress with consequent health benefits.[34]

**Immunomodulatory Activity:** K. A. Athira Krishnan and T. R. Keerthi have studied the Immunomodulatory activities of the extracts were analyzed by phagocytosis and Nitroblue tetrazolium indicate the extracts possess immuno-stimulatory activity.[34]

**Acetylcholinesterase Activity:** The extracts of the sponges exhibited significant percentage inhibition IC 50 values and percentage inhibition indicated that Sigmadocia was more active. Methanolic extract of Sigmadocia showed a low IC 50 value of 684.36µg. AChE inhibitory activityexhibited by both the extracts indicate that these extract may serve as good candidates for development of drugs against cancer and Alzheimer's disease since AChE inhibitors act on cholinergic system. Acetone, butanol and methanolic extracts of marine sponge *Agelasclathrodes* exhibited substantial AChE inhibitory activity [35]Methanolic extracts of *Ircinia* and *Dysidea*

species displayed promising results in AChE inhibition test over 50% [36]. Strong AChE activity was demonstrated by a steroidal alkaloid extracted from pure methanol fractions of Corticium species. [37]

**Antiviral Activity:** Avarol (33) and avarone (34) were reported to inhibit humanimmunodeficiency virus at doses of 0.1-1 μg/ml *in vitro* and thus are of potentialuse in treatment of AIDS [38] Extracted from the sponge *Disideaavara,* Avarol and avarone are of particular interest in the development of clinical application because of their high therapeutic indices and ability to cross the blood-brain barrier [38]

***Asfanj* is used in Unani system of medicine:** It various medicinal properties viz styptic, astringent, anti-inflammatory, wound healing, anti-diarrheal, and anti-dysenteric. It is use for absorbing secretion, washing and dilating cavities and supporting prolapsed parts.[4,39, 40]*Asfanj* is burned in closed vessel, ash is obtained by burned. Ash is mixed in oil and applied to swollen glands. It is used as 'SURMA' for improving eye sight [39]

# CONCLUSION

Sponges have been discovered to possess various anti-inflammatory, Anti-proliferative activity, Anti-amoebic activity, Antiviral, Anti-analgesic antioxidant, antimicrobial properties which allow them to protect themselves from oxidative stress or aquatic pathogens in their habitat. Moreover, knowledge on the antiviral, antioxidant and antimicrobial properties in sponges is important for therapeutic benefits in biomedical area and aquaculture field. Future studies should be carried out to examine the possible uses of antimicrobial peptides as antiviral, anticancer and anti-inflammatory agents. This includes possible applications of pharmaceutical, cosmetics, and other industries.

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