



# A BRIEF REVIEW ON NATURAL SURFACTANT

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## ABSTRACT:

Natural surfactants or biosurfactants square measure amphiphilic biological compounds, typically animate thing, created by form of microorganisms from numerous substances as well as waste materials. there's Associate in Nursing increasing interest on this subject attributable to their distinctive properties like low toxicity, practicality underneath extreme conditions, supported renewable substances and biologically degradable nature. the range of those molecules supports them for his or her potential application within the field of fossil oil, medicine, agriculture, food, cosmetics etc. they're conjointly regulative in curtailing green-house effect by reducing the emission of greenhouse emission. they will be termed as 'green' attributable to their low toxicity, biodegradability and relative stability underneath a good vary of chemical science environments. In spite of possessing various structures and higher chemical science properties than chemical surfactants, biosurfactants aren't ready to contend with their artificial counterparts attributable to their high production & downstream prices. The business realization of those ecofriendly bimolecular square measure restricted by low productivity, dearly-won downstream process and lack of applicable understanding of the bioreactor systems for his or her production. however we tend to expect that in future higher reactor style and products recovery technology would be developed and overproducer microbe strain would be screened. Then cost would be attenuated and yield would be multiplied i.e. the assembly would be each ecologically & economically favored. the current review deals with Associate in Nursing overall read on biosurfactants, their properties.

## KEY WORDS:

Bio - surfactant, Applied Aspects, Productions, Bio-Degradibility, Future Trends

## INDRODUCTION:

The term 'natural surfactant' isn't unambiguous. Taken strictly a natural surface-active agent may be a chemical agent taken directly from a natural supply. The supply could be of either plant or animal origin and therefore the product should be obtained by some reasonably separation procedure like extraction, precipitation or distillation. No organic synthesis ought to be concerned, not at the same time as an after-treatment. There are if truth be told not several surfactants in use nowadays that fulfill these needs. Lecithin, obtained either from soybean or from egg yolk, is maybe the most effective example of a really natural surfactant.

The main reason why natural surfactants within the real sense of the word are therefore scarce isn't an absence of availability. Amphiphiles are long in each the plant and therefore the animally wherever they're usually referred to as polar lipids. In biological systems the surface active agents are utilized in pretty much identical way as surfactants are used in technical systems: to overcome solubility issues, as emulsifiers, as dispersants, to change surfaces, etc. The issue that works against production of actually natural surfactants is that the value of work-up. The products are sometimes gift in little quantities and the separation method tends to be tedious. In most instances the price of separation isolation can far and away exceed the producing value of equivalent artificial surfactants. The unfavorable value scenario for actually natural surfactants could modification if fermentation processes will be developed that yield biosurfactants in high yields. Both yeast and bacterium may be economical producers of surface active agents and there's extended current interest in biotechnological processes for production of amphiphilic compounds. These substances will be either low relative molecular mass, like acylated

**BIO SURFACTANT IS THE GREEN SURFACTANT:**

Biosurfactants show tons of benefits over with chemicals synthesized surfactants. They're less deadly, extremely effective, and easily perishable. Therefore biosurfactants square measure thought-about to be "green" alternatives to surfactants of artificial origin.

**CLASSIFICATION OF NATURAL SURFACTANT OR BIO SURFACTANT**

Chemically synthesized surfactants square measure typically classified according to the character of their polar teams (cationic, anionic, zwitterionic and non-ionic). Biosurfactants square measure typically categorized in the main by their chemical structure and microorganism origin. Structurally, they're amphiphilic containing a deliquescent moiety (comprising associate degree acid, alcohol, amide captions, or anions, mono-, did- or polysaccharides) and a hydrophobic moiety (made up of unsaturated or saturated organic compound chains or fatty acids). The deliquescent a part of biosurfactants is liable for their rate of solubility in water. The oleophilic half is accountable for capillary activity. These 2 components square measure joined by organic compound linkage (including lactones) with organic and inorganic acids or organic compound linkage (single and peptide) or glycoside linkage (sugar–sugar and sugar-hydroxyl fatty acids).Rosenberg and Ron biosurfactants in 2 classes in line with molecular mass.

**1. Low-molecular weight surface active agents:**

Having an Efficiently Lower Surface and Surface Tension. Major category includes glycolipids, lipopeptides and phospholipids.

**2. High-molecular weight surface active agents:**

Effective as Emulsion-Stabilizing Agents. Major categories embody compound and particulate surfactants.



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Table 1 Classification of biosurfactant and important types of microbial origin

Biosurfactant			
Group	Sub-group	Class	Microorganism
Low-molecular weight surface active agents	Glycolipids	Rhamnolipids	<i>P. aeruginosa, Pseudomonas</i> sp.
		Sophorolipids	<i>T. bombicola, T. apicola</i>
		Trehalolipids	<i>R. erythropolis, Mycobacterium</i> sp.
	Lipopeptides & lipoproteins	Cellobiolipids	<i>U. zeae, U. maydis</i>
		Surfactin	<i>B. subtilis</i>
		Viscosin	<i>P. fluorescens</i>
Fatty acids, neutral lipids and phospholipids	Peptide-lipid	<i>B. licheniformis</i>	
	Fatty acids	<i>C. lepus</i>	
	Neutral lipids	<i>N. erythropolis</i>	
	Phospholipids	<i>T. thiooxidans</i>	
High-molecular weight surface active agents	Polymeric surfactants	Emulsan	<i>A. calcoaceticus</i>
		Biodispersan	<i>A. calcoaceticus</i>
		Alasan	<i>A. radioresistens</i>
	Particulate surfactants	Liposan	<i>C. lipolytica</i>
		Vesicles and fimbriae	<i>A. calcoaceticus</i>
		Whole cells	Variety of bacteria

Table 1: classification of biosurfactant and important types of microbial origin

**APPLICATION OF BIOSURFACTANT:**

Biosurfactants thanks to their distinctive practical properties have numerous applications in much microbe increased oil recovery (MEOR).

**1. MICROBIAL ENHANCE OIL RECOVERY [MEOR]**

Could be a powerful technique to recover oil remaining in reservoirs with low porosity or oil with high body. The remaining oil within the reservoir is often settled in locations that area unit arduous to access and also the oil remains treed within the pores by capillary pressure.

**2. SOIL LAUNDRY TECHNOLOGY AND BIOREMEDIATION OF CRUDE OIL**

Contaminated environments Highly hydrophobic contaminants have ability to bind terribly tightly with soil, thereby inaccessible to biodegradation. Surfactants probably have the flexibility to push natural action of the contaminants from soil. Biosurfactant like rhamnolipids were effective in removing polycyclic aromatic hydrocarbons (PAHs) and pentachlorophenol from soil with removal efficiency of 60–80%.

**3. METALS RECTIFICATION:**

Contamination of soil with heavy metals is incredibly hazardous for human and alternative living organisms during this scheme. Due to their exceptionally toxic nature, presence of even low concentrations of significant metals within the soils has been found to own serious danger. Manybiosurfactant has the power of metal remediation. Rhamnolipids are far-famed to possess ability to get rid of heavy metals.

**4. BIOMEDICAL FIELD:**

The biological surfactants are extensively helpful within thebiomedical grounds. Many biosurfactants have robust anti-bacterial, antifungal and antiviral activity. These surfactants act as anti-adhesive agents to pathogens so they're helpful for treating several diseases. thus they will be used as therapeutic and probiotic agents .

**5. AGRICULTURAL FIELD**

Use of chemicals and pesticides in agricultural held for arthropod management management turn out undesirable effects. But bio-surfactant conjointly shows antimicrobial and insecticidal activity. Moreover, no adverse effects on the environments or human beings area unit anticipated from them. Lipopeptide biosurfactants produced by many bacterium show insecticidal activity against fruit pomade fly and thus they will be used as biopesticide.

**6. LAUNDRY INDUSTRY**

Almost all surfactants that square measure being employed as industrial laundry detergents square measure with chemicals synthesized and exert nephrotoxic effects to fresh water living organisms. However biosurfactants square measure eco-friendly. They conjointly show sensible emulsion formation capability with vegetable oils. Moreover, biosurfactants like CLP (Cyclic Lipopeptide) are stable over a good pH scale vary (7.0 to 12.0) and no loss of their surface-active property happens once they square measure heated at high temperature.

**7. FOOD PROCESSING INDUSTRY**

Biosurfactants also are getting used in food industries typically as food additives (emulsifiers). As an example, carboxylic acid esters containing glycerin, glycoprotein and its derivatives, Sorbian or ethylene glycol and ethoxylated derivatives of monoglycerides along with recently synthesized oligopeptid.

**8. COSMETIC INDUSTRY**

Biosurfactant have found a distinct segment within the health care and cosmetic industry because of their skin friendly properties. Sphorolipids will be eateries or amalgamated with olefin chemical compound and might be used as skin

moisturizers. Kao Corporation ([www.kao.com/jp/](http://www.kao.com/jp/)) in Edo, Japan uses them within the attention sector. Biosurfactants aroused as foaming agents, emulsifiers, Solubilizers, wetting agents, cleansers, antimicrobial agents, mediators of protein action, in insect repellents, acne pads, antacids, tub merchandise, anti- dandruff merchandise, contact solutions, baby merchandise, mascara, lipsticks, dentifrice,etc.

## 9. REDUCTION OF A CO<sub>2</sub> EMISSION

Atmospheric gases like greenhouse emission, water vapors and alkanet arable to absorb radio emission radiation (infra-red) emitted from the earth's surface. This aids in heating the layer (green-house effect). Studies have shown that biosurfactants a have a role to play within the reduction of greenhouse emission emission. About 1.5 million tons of greenhouse emission emissions were avoided in 1998 by the assembly of oleochemical surfactant.

### AJ REETHA



figure:1 reetha

### INTRODUCTION:

Reetha, scientifically referred to as genus *Sapindusmukorossi*, could be a giant deciduous tree of the magnoliopsid family family. It unremarkably breath, scientifically referred to as genus *Sapindusmukorossi*, could be a giant deciduous tree of the magnoliopsid family family. It's unremarkably proverbial by several names like tree, soap nut, washout, Aretha, doodad, and domain. In countries like Japan and China, Reetha has been used for hundreds of years. In Japan, it's been used as a life-prolonging seed vessel (the a part of a fruit enclosure the seeds) and in China as a fruit for managing sicknesses. The plant is accepted for its people ancient values.

1 Reetha is found within the rough regions of the chain of mountains in Asian nation. The fruit of Reith has been employed in Indian Ayurvedic drugs for many years.

2 Reetha could be a standard ingredient of the many Ayurvedic shampoos and cleansers.

### NUTRITIONAL VALUE:

Spooning, sugar, and mucilage are the main ingredients in Reetha According to the World Health Organization, the Reetha seed kernels are an expensive source of proteins and have a balanced aminoalkanoic acid composition. In addition to proteins, sugars and fibers are also available. Spooning and polyphones are examples of gifted photochemical. Beta-sit sterol and vitamin E are both present in the seed oil. The table includes a price for the organic process.

Nutritional component	Content (g/100 g) (approx.)
Oil (seed kernel oil)	3.9
Protein	33.4
Sugar	10.8
Soluble fibre	3.8
Insoluble fibre	2.2
Polysaccharides	18.1

table:2 nutritional value

### Specifications of Reetha:

The following benefits of Reetha may exist.

- It might have tanning-removing qualities.
- It might have antifungal properties.
- It might have antimicrobial properties.
- It might have expectorant effects (may help remove sputum from air passages).
- It could have anti-protozoa properties (may kill head lice)
- It might have anti-inflammatory properties.
- It might have wound-healing properties.
- It might lessen joint discomfort.

### Applications for Reetha

#### Reetha potential benefits for cancer:

Reetha includes important substances like spooning. These substances might have antitumor and anticancer properties. Reetha efficiently halted the development of tumors and the multiplication of cancer cells in cancer cell lines, according to numerous laboratory investigations. Reetha might therefore be able to cause cancer cells to die. However, because it was conducted in a lab rather than on actual people, this study is insufficient. Therefore, extensive human studies are necessary to demonstrate Reetha's full potential for treating cancer in humans.

#### Reetha's potential as an antibacterial agent:

An animal study found that oral administration of Reetha extract inhibited the growth of the bacteria *Helicobacter pylori*. In an in-vivo research, the extract was also helpful in eradicating the *Helicobacter pylori* infection. To support the possible use of Reetha in people for treating bacterial infections, more research is needed and is not yet available.

**How Does Reetha Work?**

The powdered dried fruit can be utilized as a foaming agent.

It is a common component of Ayurvedic cleansers and shampoos.

Before taking herbal supplements consisting of Reetha, you should speak with an Ayurvedic physician. Additionally, we caution you against substituting or stopping your current prescriptions with ayurvedic or herbal remedies without first visiting a licensed medical professional.

**Negative effects:**

The extract's spooning might be suitable for use in cosmetics.

- However, animal investigations including the oral administration of Reetha spooning revealed symptoms of toxicity, including enlarged stomach and intestines.
- There are no noteworthy reports pointing to Reetha human side effects.

Therefore, if you have any negative effects, get quick medical attention from the doctor who prescribed it and receive the necessary care.

**SHIKAKAI:**

figure: 2 shikakai

**INTRODUCTION:**

Shikakai also called Shiva in Tamil, Seekaaya in Telugu, and Soap Pod in English, is a potent ayurvedic plant that has been used for centuries as a cleanser for long, healthy hair, as a treatment for dandruff, and as a soother for skin conditions.

Shikakai is a shrub-like tree that is indigenous to Central India and is also known by the scientific name *Acaciaconcinna* (Leguminosae), a climbing shrub with pink flowers, bipinnate leaves, and oblong-shaped dark brown pods. It is typically found in the tropical forests of the Indian subcontinent

**Characteristics of Shikakai**

This plant's potential effects on diseases like leprosy, jaundice, gum infections, constipation, malaria, and as an ingredient in contraceptives have all been researched.

Shikakai is well known for having a number of beneficial qualities including:

- Possibility of acting as an anti-dandruff agent
- May speed up wound healing
- Possesses the capacity to stop hair loss
- May be anti-inflammatory
- Potential for antifungal action
- Possesses possible antimicrobial qualities
- Potentially a good antioxidant
- Potential treatment for baldness

### **Possible Applications for Shikakai in Hair Lice:**

An embarrassing and serious problem are head lice. Fortunately, shitake may also be able to aid with head lice. Shikakai may be able to aid with the hair lice problem due to its low pH value and probable antifungal and antibacterial properties.

### **Shikakai's Potential Applications for Dry Scalp**

Shikakai may function as a natural cleaning that doesn't remove essential oils, making it useful for treating dry scalp.

**Read also:** Five Ayurvedic herbs that are excellent for hair

### **Potential Skin Benefits from Shikakai:**

To eliminate dead skin cells and give skin a natural glow, mix a tablespoon of shitake powder with a tablespoon of cream, almond powder, and turmeric. Before utilising shikakai for any skin problems, you must consult your dermatologist.

### **Shikakai may be used to treat constipation**

Shikakai pods may be useful in relieving constipation and decreasing indigestion, stomach cramps, and flatulence due to their purgative (laxative) and suppository potential. It facilitates faces movement through the body and food digestion. To understand the full potential of shitake for treating human problems like constipation, these characteristics of the plant can be further investigated.

### **How Should I Use Shikakai?**

There are five possible ways to get shitake.

1. Shikakai powder
2. Shikakai hair soap Shikakai oil
3. Shikakai body wash, Shikakai shampoo, and Shikakai hair pack

Before ingesting any herbal supplements, you must seek the advice of a licensed physician. Without first consulting a licensed physician, never stop or substitute an ongoing modern medicine treatment with an ayurvedic/herbal preparation. Based on your particular needs, your doctor will advise you on the best course of action.

### **Shikakai side effects include**

Most research indicate that shitake may be safe to consume. However, abusing shitake can result in some of the following side effects.

- Shikakai may exacerbate respiratory problems and asthma if used excessively.
- If used frequently, it could make the scalp oily.
- Shikakai overeating may cause nausea and even loose stools.
- After being boiled in lukewarm water, these remaining seeds can be harmful to consume.
- If Shikakai is consumed frequently, dry skin can result.
- Shikakai is thought to be the cause of acidity, and bloating is another adverse effect that has been connected to anxiety.

### Conclusion:

Despite numerous successes in the manufacturing of biosurfactants in laboratories, doing it on an industrial scale is still a difficult problem. Any product's commercial production is influenced by the market's demand, the ease with which raw materials can be obtained, and the cost of manufacturing. The main obstacles to producing biosurfactant include low productivity, expensive downstream processing, and a lack of proper knowledge of the bioreactor systems. We anticipate that in the future, genetic manipulation will be used to create super-active microbial strains for their industrial production. Future developments include the finding of more dependable sources and contemporary techniques. Thus, yields would rise, production costs would drop, new biosurfactants would keep being found, and the chemistry of these molecules would improve.

### REFERENCE:

1. S. K. Ritter, Chem. Eng. News, 2004, 82, 25–30.
2. E. Rosenberg and E. Z. Ron, Appl. Microbial. Biotechnol., 1999, 52, 154–162.
3. R. Sen., Prig. Energy Combust. Sci., 2008, 34, 714–724.
4. M. Garcia-junco, C. Gomez-halos, J. L. Naquin-arroyo and. J. Ortega-calvo, Environ. Sci. Technol., 2003, 37, 2988–2996.
5. C. N. Mulligan and F. Eckhart, Eng. Geol., 2003, 70, 269–279.
6. S. Wang and C. N. Mulligan, Water, Air, Soil Pollute., 2004, 157, 315–330.
7. I. M. Banat, Bioresour. Technol., 1995, 51, 1–12.
8. C. N. Mulligan, Environ. Pollute., 2005, 133, 183–198.
9. A. K. Mukherjee, Lett. Appl. Microbiol., 2007, 45, 330–335.
10. G. Bloomberg, Lebensmitteltechnologie, 1991, 24, 130–131.
11. E. Gharaei-Fathabad, Am. J. Drug Discovery Dev., 2010, 1, 58–69.
12. M. Patel, J. Ind. Ecol., 2003, 7, 47–62.
13. Upadhyay A, Singh DK. Pharmacological effects of Sapindusmukorossi. Revista do Instituto de Medicina Tropical de Sao Paulo [Internet]. 2012 Sep [cited 2022 Mar 17];54(5):273–80. Available from: <https://pubmed.ncbi.nlm.nih.gov/22983291>.
14. Chaudhary SK, Mandal AB, Bhar R, Gopi M, Kannan A, Jadhav SE, et al. Effect of graded levels of soap nut (Sapindusmukorossi) shell powder on reproductive performance in broiler breeders. Asian-Australasian Journal of Animal Sciences [Internet]. 2019 [cited 2022 Mar 17];32(1):118. Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6325405/>.
15. (PDF) Sapindusmukorossi (areetha): An overview [Internet]. [cited 2022 Mar 17]. Available from: [https://www.researchgate.net/publication/267698560\\_Sapindus\\_mukorossi\\_areetha\\_An\\_overview](https://www.researchgate.net/publication/267698560_Sapindus_mukorossi_areetha_An_overview)
16. Chavan RS, Rathod VK. Evaluation of nutritional and medicinal potential of defatted Sapindusmukorossi seed kernel. Preparative biochemistry & biotechnology [Internet]. 2022 [cited 2022 Mar 21];52(1):56–61. Available from:
17. Chen CC, Nien CJ, Chen LG, Huang KY, Chang WJ, Huang HM. Effects of Sapindusmukorossi Seed Oil on Skin Wound Healing: In Vivo and in Vitro Testing. International Journal of Molecular Sciences [Internet]. 2019 May 2 [cited 2022 Mar 21];20(10). Available from: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6567820>.
18. Lodha G. Formulation and Evaluation of Polyherbal Shampoo to Promote Hair Growth and Provide Antidandruff Action. Journal of Drug Delivery and Therapeutics [Internet]. 2019 Aug 30 [cited 2022 Mar

from:[https://www.researchgate.net/publication/335843667\\_Formulation\\_and\\_Evaluation\\_of\\_Polyherbal\\_Shaampoo\\_to\\_Promote\\_Hair\\_Growth\\_and\\_Provide\\_Antidandruff\\_Action](https://www.researchgate.net/publication/335843667_Formulation_and_Evaluation_of_Polyherbal_Shaampoo_to_Promote_Hair_Growth_and_Provide_Antidandruff_Action).

19. Du M, Huang S, Zhang J, Wang J, Hu L, Jiang J. Toxicological Test of Spooning from *Sapindusmukorossi* Gaertn. *Open Journal of Forestry* [Internet]. 2015 [cited 2022 Mar 21];05(07):749–53. Available from: <https://www.scirp.org/journal/paperinformation.aspx?paperid=604>.
20. Raja AXV, Sama K. Phytochemical and biochemical analysis of the plant extract of *Acacia concinna* (wild). *International Journal of Pharmaceutical Research & Development*. 2012; 3(12): 136-139.
21. Balkrishna A. *Acacia* Miller Fabaceae (*Acacia concinna* Willd. DC). *World Herbal Encyclopedia (Angiosperms Part-1)*. 2017; 349-354.
22. Khanpara K, Renuka V, Harisha CR. A detailed investigation on shitake (*Acacia concinna* Linn.) fruit. *Journal of Current Pharmaceutical Research*. 2012;9(10):06-10.
23. Hazra J, Panda AK. Concept of beauty and ayurveda medicine. *J Clin Exp Dermatol Res*. 2013; 4(3):14.