Journal of the Andaman Science Association Vol. 27(1):26-33 (2022)
ISSN 0970-4183, Printed in India

Bio-Formulation of Natural soap from the floral extracts of *Senna auriculata*

R. Saranya Kumari[1], M Tilak[1]*& K.Sivakumar[2]
[1] *Forest College and Research Institute, Tamil Nadu Agricultural University, Mettupalayam, Tamil Nadu.*
[2] *Dept of Remote sensing & GIS, TNAU,Coimbatore*

Abstract

I wonder, why do people call natural medicines as "alternative medicine" when it is the 'original medicine' that humans have been using for thousands of years. Nature provides various tangible and intangible benefits to the mankind. Plants hold rich medicinal as well as cosmetic values. There are various organic products in the market. Still the wild flowers are being underexploited from their varied uses. *Sennaauriculata*, commonly called as Tanner's cassia (in Tamil:Avaram)comes under the Family Caesalpiniaceae. It is a shrub with large bright yellow flowers which is distributed throughout the hot deciduous forests of India and holds a very prestigious position in Ayurveda and Siddha systems of medicine. The plant has been reported to possess anti-pyretic, anti-diabetic, anti-peroxidative, anti-tanning, anti-ageing and microbicidal activity. It is traditionally being used as floral powder for application on faces to get glowing skin. Commercial flowers are being used as major source for the cosmetic industries and why not the wild flowers. In present study we have formulated a herbal soap using floral extracts of *Sennaauriculata*. It has exhibited potential antimicrobial activity and thereby can be utilizedas a potent antimicrobial agent and as cosmetic product by the formulation of herbal soap.

Key words: *Senna flower, herbal soap, anti-bacterial, anti-fungal and anti-oxidant.*

Introduction

Nature provides numerous benefits to the humankind. A plant having medicinal, pharmaceutical and cosmetic potential, can be exploited to design innovative products. There are various organic products in the market. Still the wild flowers are being underexploited and still remains enlarge. Natural products could be found in the treatment of almost all diseases and skin problems owing to their high medicinal value, cost-effectiveness, availability and compatibility (Saikia et al., 2006)

The active constituents responsible for such medicinal values are isolated and employed topically as creams, soaps, oils and ointments for treating skin related ailments like acne, wounds (Batubara *et al*., 2009), eczemas, ring-worms, as an anti-microbial agent and for cosmetic purposes (Gray and Flatt, 1999). The plants like *Cassia alata* (Benjamin and Lamikanra, 1981), *Acalyphawilkesiana, Acacia senegal, Phyllanthus emblica* (Chaudhuri and Emblica, 2002) are employed in skin care. The medicinal properties of the plants are being exploited in various formulations both in medical terms and cosmetic series. The non-nutritive phytochemical in plants have protective effect against various diseases and disorders (Gurudeeban, 2013).

*Senna auriculata*L. (Family: Caesalpiniaceae) is an ethno botanically important shrub with attractive yellow flowers and commonly known as "Avaram" in Tamil (Thulasi *et al.,* 2012).The aerial parts of the plant used as a traditional medicine to treat diabetes, conjunctivitis, rheumatism, astringent, antihelminthic, eye troubles, body odor, leprosy and liver disorders diseases (Anandan *et al*., 2011). There are some reports available on antidiabetic, acute toxicity, hyperlipidemic, cardioprotective, antioxidant, antimicrobial and hepatoprotective activity (Chauhan *et al.,* 2009; Raj *et al.,* 2012). Chemical constituents such as protein, carbohydrate, alkaloids, flavonoids and tannin were reported from various parts of the plant (Purushotham *et al.,* 2014).

Most of the polyphenols are extracted in the petroleum ether, therefore petroleum ether was used as solvents for extraction in the soxhlet apparatus. Purushotham *et al.,* (2014) investigated the flowers of *Senna auriculata* which revealed the presence of anthroquinones, aloe emodin and sitosterols. In present study, we used Senna

floral extracts with potential antibacterial activity and thereby establishing them as a potent antimicrobial agent in the formulation of herbal soap. Skin, especially hands are needed to protect from bacterial pathogens as they are the most exposed part of the body (Jayant *et al.,* 2015).

Materials and Methods

Raw material

The Flowers of *Senna auriculata* were collected from the forests of Forest College and Research Institute. The collected flowers were cleaned and dried for one week under shade. The dried flowers were soft powdered using electronic mixer grinder and sieved . The fine powder of the flowers of Avaram was stored in an air tight container.

Extract preparation

25g of the soft powdered flowers were used for the Solvent extraction process. The 25g powdered flowers were filled in the thimble of Soxhlet apparatus using Petroleum ether and Methanol as solvents and the process of extraction continued for 4 hrs at 55° C. The solvent extracts obtained are collected separately in air tight containers and were preserved in refrigerated condition at 5° C for further use. Before completion of this process the initial weight of floral powder as taken and after completion of the extraction remaining residues are oven dried and weighed. The difference of weight is calculated (initial weight – oven dry weight) the weight difference shows that amount of saponin extract

Other ingredients preparation

Organic soap base of Glycerol is made and stored in refrigerator. Rose water was prepared and stored in air tight containers and kept in refrigerator for further use. Turmeric powder was prepared by drying turmeric followed by powdering using electric mixer grinder and sieved using 100 mesh sieve.

Observing the foaming properties

Prepared soap is taken and gently rubbed using both hands. Glycosides present in the floral extract creates foamingwhen added with water. This enhances the quality of soap. If the foaming covers full area of in hand, then it is considered as 100% foaming. If 80% of the palm area is covered with foam, then foaming % is considered as 80% .

Observing the yield of saponin from flower powder by different extraction methods

To observe the yield of saponin from different extraction methods viz., Normal water, water bath, cold water, Autoclaving. 10 gm of flower powder is taken in all the cases and 250ml of water is added and observation was made for their saponin yield in the case of Normal and cold water. In the case of Autoclaving sample was kept at 120 ° c for 15 min at 15 lbs pressure. In water bath the sample was kept for 90 minutes. Initial weight of the sample (Senna floral powder) taken was noted and after extraction of saponin, the remaining residues were oven dried and weighed. The difference in weight (initial weight - oven dry weight) was calculated to estimate the yield of saponin content.

Quantittative phytochemical analysis using GC-MS

Quantitative Phytochemical analysis was done by using GC-MS. Gas Chromatography and Mass Spectroscopy is an analytical method that combines the features of gas-chromatography and mass spectrometry to identify different substances within a test sample.It can identify trace elements in materials that were previously thought to have disintegrated beyond identification. Like liquid chromatography–mass spectrometry, it allows analysis and detection even of tiny amounts of a substance.

A sample of 3ml of methanol extract of *Senna auriculata* flower is taken and subjected to GC-MS for quantifying the Phytochemicals present in the floral extract.

Antimicrobial studies

Agar well diffusion method was carried out with floral extracts of *Senna auriculata* flowers loaded on the discs and the diameter of zone of inhibition surrounding the discs and well were measured.

Final product preparation:

The methodology is given in the flow chart (Fig. 1)

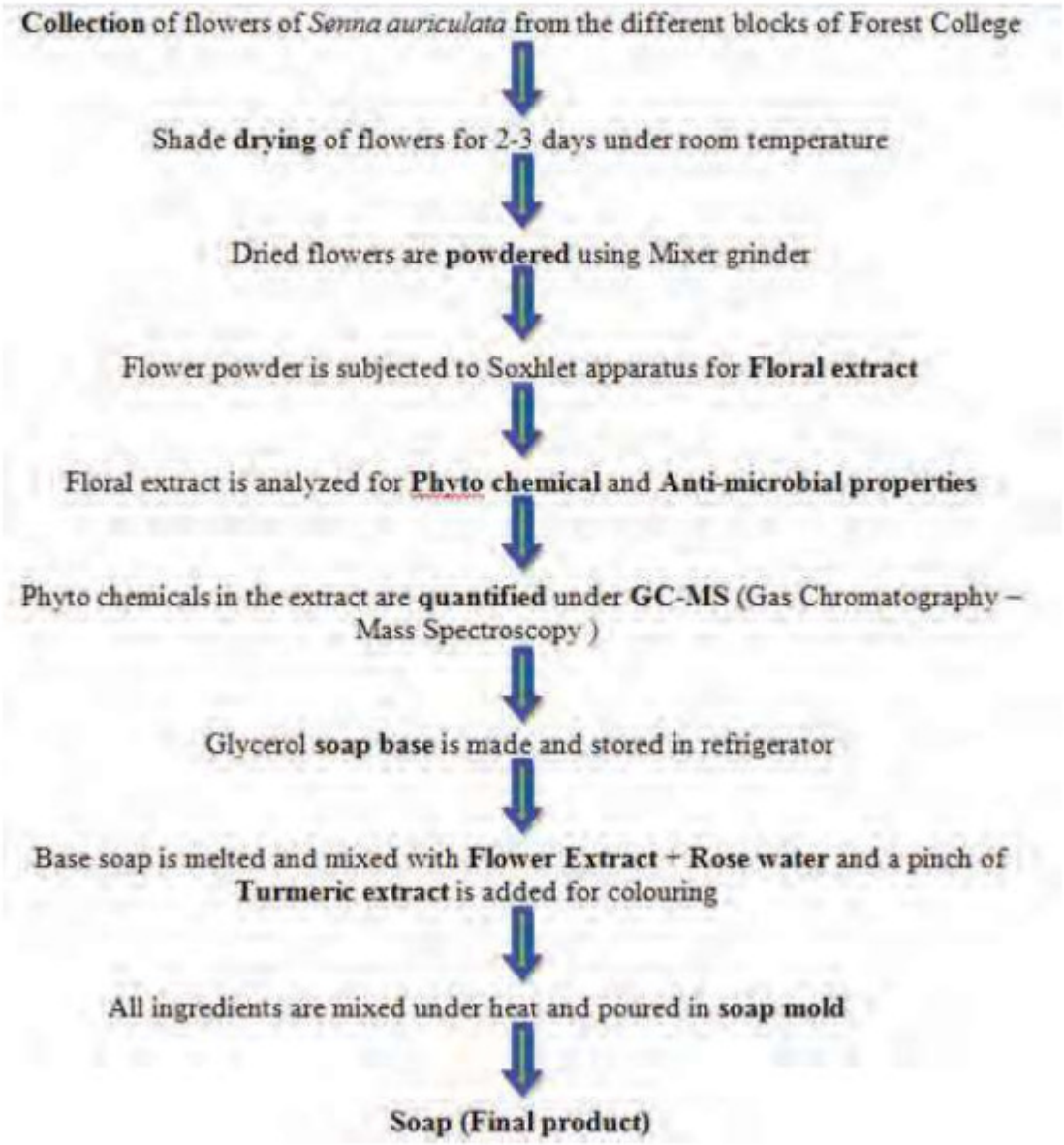

Fig. 1. Methodology for product preparation

Results

Yield of saponin from the extract using various solvents

The yield of saponin differed with the solvents used. The highest yield of saponin was observed while using petroleum ether extract. Final results showed that the saponin yield was high from petroleum ether extract and it is about 5.48 g (Table 1).

results of phytochemical quantification of methanol floral extracts of *senna auriculata* using GC-MS

The studies show that conformation of various phytochemical properties quantitatively on methanol extract of *Senna auriculata* (Table 2, Fig. 2).

Studies on antimicrobial activity of floral extractives & soap

Agar well diffusion method - bacteria - soap

The studies showed that using Senna flower powder extract the zone of inhibition on bacterial plates was high 1.2 cm at concentration of 10 µl of soap (Table 3).

Agar well diffusion method - bacteria - methanol extract

The studies show that using Senna flower extract the zone of inhibition on bacterial plates showed the higher inhibition zone is 1.4 cm at concentration of 10 µl of floral extract (Table 4).

Agar well diffusion method - fungi - soap

The studies showed that using soap the zone of inhibition on fungal plates exhibited higher inhibition zone of 1.4 cm at concentration of 10 µl of soap (Table 5).

Agar well diffusion method - fungi - methanol extract

The studies show that using Senna flower powder extract the zone of inhibition on fungal plates exhibited higher inhibition zone of 2.0 cm at concentration of 10 µl of floral extract (Table 6).

Table 1. Yield of saponin from the extract using various solvents

S.No	Pericarp powder	Initial Weight Pericarp powder	Oven dry weight	Saponin Yield	Percentage %
1.	Petroleum ether extract	25g	14g	11g	44.00
2.	Methanol extract	25g	21.7g	3.3g	13.20

Table 2. Results of phytochemical quantification of methanol floral extracts of *senna auriculata* using GC-MS

S.no	R. Time	Name of the compound	Peak Area (%)
1	2.602	2,2-Dimethoxybutane	0.60
2	5.625	Dichlorobenzoyl peroxide	0.40
3	8.490	Naphthalene	0.79
4	9.837	4-Vinylphenol	1.83
5	10.309	Cyclohexane	0.42
6	**10.760**	**1,3-Benzenediol**	**19.37**
7	12.191	1-(2-oxiranyl)-1-dodecanol	0.47
8	12.511	1-Tetradecene	1.31
9	15.198	Cetene	2.82
10	**16.109**	**Mome inositol**	**43.44**
11	17.604	1-Docosanol	2.33
12	**19.399**	**Dibutyl phthalate**	**8.61**
13	19.779	1-Hexacosanol	1.10
14	20.852	Heneicosane	0.33
15	**22.605**	**Methyl commate D**	**8.48**
16	22.745	Pentacosane	2.09

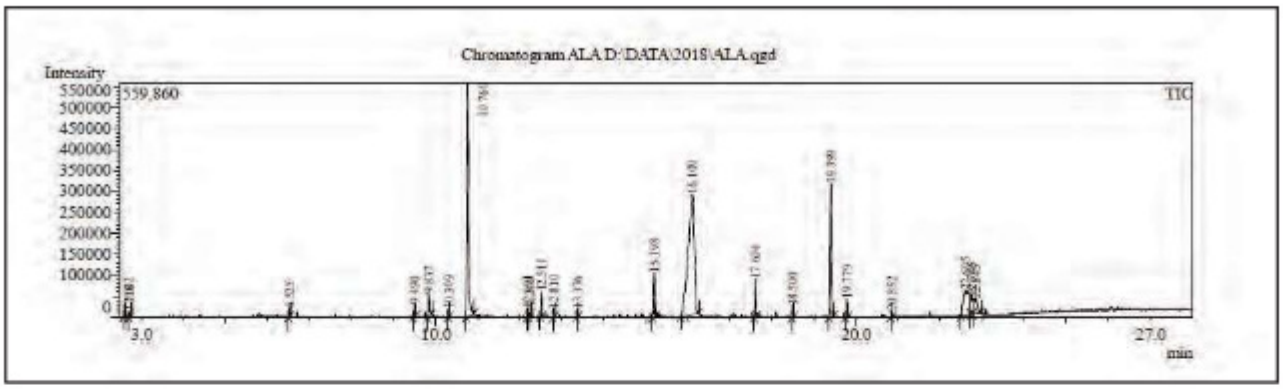

Fig. 2. GC-MS Chromatogram of Methyl extracts of *Senna auriculara* flower

Table 3. Studies exhibiting zone of inhibition by Agar well diffusion method for bacteria

S.No	Concentration of Soap (µl)	Zone of inhibition (cm)
1.	6	0.7 ± 0.1
2.	7	0.9 ± 0.1
3.	8	0.9 ± 0.1
4.	9	0.10 ± 0.1
5.	10	0.11 ± 0.1

Table 4. Studies exhibiting zone of inhibition by Agar well diffusion method for bacteria using Senna floral extract

S.No	Concentration of floral extract (µl)	Zone of inhibition (Cm)
1.	6	0.8 ± 0.1
2.	7	0.8 ± 0.1
3.	8	0.9 ± 0.1
4.	9	0.11 ± 0.1
5.	10	0.13 ± 0.1

Table5. Studies exhibiting zone of inhibition by Agar well diffusion method for fungi using soap

S.No	Concentration of Soap (µl)	Zone of inhibition (Cm)
1.	6	0.8 ± 0.1
2.	7	0.9 ± 0.1
3.	8	0.10 ± 0.1
4.	9	0.11 ± 0.1
5.	10	0.13 ± 0.1

Table 6. Studies exhibiting zone of inhibition by Agar well diffusion method for fungi using Floral extract

S.No	Concentration of solution (µl) floral extract	Zone of inhibition (Cm)
1.	6	0.9 ± 0.1
2.	7	0.10 ± 0.1
3.	8	0.13 ± 0.1
4.	9	0.17 ± 0.1
5.	10	1.19 ± 0.1

Plate 1. Plate showing the extracts obtained using different solvents

Petroleum ether extract **Methanol extract**

Plate 2. Plate showing the Foaming observation of Floral Extract

Plate 3. Plate showing the FINAL PRODUCT prepared using Senna flower powder

SENNA SOAP

Plate 4. Plate showing the Lathering of soap

Discussion

The yield of saponin differs from the solvent used for an extraction, among the two solvents the petroleum ether and methanol, the petroleum ether solvent recorded the highest yield of saponin when compared with that of methanol extract. The yield percentage is being 13.2% and 44.0% . Recovery percentage of saponin is very high by petroleum ether solvent extraction. The yield is 44%.

The phytochemicals occupies the top lists are Mome inositol, 1,3- Benzene diol, Dibutyl phthalate and Methyl commate – D. GC-MS results revealed the presence of 16 compounds from the Fractions 1 and the peak area ranges from 0.33 to 43.44%. The retention time, percentage of peak area and the name of each compound was showed in Table 2.

- **Mome-inositol,**it can be applied to 'before-tanning' formulations such as sunscreens, day facial creams and 'after-tanning' formulations such as tan-prolonging products, after-sun creams and lotions.
- **1,3- Benzene diol** a highly efficient lightening agent. It is the most potent inhibitor of melanin synthesis. It is a stable and safe skin lightener.
- **Cetene,** a well known antioxidant. It is also used to protect your body's cells from damage. There are many more phytochemicals present in the flowers of *Sennaauriculata*.

Such phytochemicals are pooled up in the formulation of soap as that they have improved the biological properties of soap. We have also harnessed these properties.

The effect of floral extract against bacterial culture as exhibited by the inhibition zone in the Petri plates around the well, when the well loaded with floral extract of 10 µl . The zone measures upto 1.3cm (Table 4). The extract against the fungal culture was found to have the inhibition zone in the Petri plates around the well by 1.9 cm (Table 6) where as the soap exhibited inhibition zone of 1.1 and 1.3 cm for bacteria and fungi.

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Received : 10th February 2022 Accepted : 26th June 2022