



CODEN [USA]: IAJ PBB

ISSN : 2349-7750

**INDO AMERICAN JOURNAL OF  
PHARMACEUTICAL SCIENCES**

SJIF Impact Factor: 7.187

<https://doi.org/10.5281/zenodo.7544232>Available online at: <http://www.iajps.com>

Research Article

**FORMULATION, DEVELOPMENT AND EVALUATION OF  
HERBAL SHAMPOO OF RICINUS COMMUNIS**Nilesh Makhodiya, Dr. Vivekanand Katare\*<sup>1</sup>, Mr. Shivam Nema<sup>1</sup>, Mr. Prabhat Kumar Jain<sup>2</sup><sup>1</sup>Vivekanand College of Pharmacy, Bhopal (M.P.), <sup>2</sup>Scan Research Laboratories, Bhopal (M.P.)**Article Received:** December 2022    **Accepted:** December 2022    **Published:** January 2023**Abstract:**

*There are large numbers of medicinal plants which are reported to have beneficial effects on hair and are commonly used in formulation of shampoo. These plant products may be used in their powdered form, crude form, purified extracts, or derivative form. The plant Ricinus communis, the castor bean or castor oil plant, is a species of perennial flowering plant in the spurge family, Euphorbiaceae. Castor oil has many uses in medicine and other applications. Castor oil and the plant's roots and leaves are used in the Indian Indigenous Medicinal System of Ayurveda for various diseases, and it has been investigated in a few limited studies for its potential as an anti-nociceptive and anti-inflammatory herbal medicine. This study deals with formulation, development and evaluation of Herbal Shampoo of Ricinus communis. The plant material specially aerial parts was collected and subjected to hydroalcoholic extraction. The formulated shampoo was further analyzed for all the parameters along with antimicrobial activity. The results showed that The yields were found to be 8.30g (8.30% w/w of crude drug) of Hydroalcoholic extract with orange black colour semisolid mass, for Ricinus (aerial part). The phytochemical test revealed the presence of alkaloid, Glycosides, saponins, terpenoids, phenols, flavonoid, proteins & amino acid. Prepared shampoo was transparent, light green and had good odor. No significant difference was observed in terms of odor, transparency and foaming characteristics between commercial and formulated shampoo except for color. The pH of tested shampoo was 7.02. The percent solid contents of all the tested shampoo was found within the range of 22-25% and are expected to wash out easily. Shampoo exhibited satisfactory cleaning & foaming ability and actual effectiveness. Wetting time of shampoo was found to be 187. The shampoo at the concentration of 100mg/ml showed zone of inhibition of 8±0.5mm & 10±0.9mm for Klebsiella pneumoniae & E. coli respectively. Thus, it can be concluded that the shampoo exhibited all the ideal characteristics with potent antimicrobial effect.*

**Keywords:** Ricinus communis, Shampoo, Antimicrobial activity, Herbal medicine**Corresponding author:****Vivekanand Katare,**

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Please cite this article in press Vivekanand Katare *et al*, *Formulation, Development And Evaluation Of Herbal Shampoo Of Ricinus Communis.*, Indo Am. J. P. Sci, 2023; 10(01).

**INTRODUCTION:**

From ancient time beyond memory, mankind have been borrowing abundantly from nature to care for their health, skin and hair, as natural ingredients that have preventive, protective and corrective action. The warehouse of cosmetics, nature provides such versatile natural ingredients that enhance beauty of the skin and hair.

Hair is one of the external barometers of internal body conditions. Shampooing is the most common form of hair treatment. The primary function of shampoo is aimed at cleansing of the hair necessitated due to accumulated sebum, dust, scalp debris etc. Various shampoo formulations are associated with hair quality, hair care habit and specific problems such as treatment of oily hairs, dandruff and for androgenic alopecia. Shampoos are liquid, creamy or gel like preparations. The consistency of the preparation depends on the inclusion of traditional soaps saturated with glycerides and natural or synthetic fatty alcohols or the thickening agents (e.g. gum, resin and PEG). Indian women use herbals such as shikkakai and reetha that are natural cleansing agents without harmful effects (Suriyprakash *et al.*, 2011; Dubey *et al.*, 2004)

There are large numbers of medicinal plants which are reported to have beneficial effects on hair and are commonly used in formulation of shampoo. These plant products may be used in their powdered form, crude form, purified extracts, or derivative form (Sutar *et al.*, 2013)

*Ricinus communis*, the castor bean or castor oil plant, is a species of perennial flowering plant in the spurge family, Euphorbiaceae. Castor oil has many uses in medicine and other applications. An alcoholic extract of the leaf was shown, in laboratory rats, to protect the liver from damage from certain poisons. Methanolic extracts of the leaves of *Ricinus communis* were used in antimicrobial testing against eight pathogenic bacteria in rats and showed antimicrobial properties (Jena & Gupta, 2012; Khan *et al.*, 2017)

The pericarp of *Ricinus* showed central nervous system effects in mice at low doses. At high doses mice quickly died. A water extract of the root bark showed analgesic activity in rats. Antihistamine and anti-inflammatory properties were found in ethanolic extract of *Ricinus communis* root bark. Castor oil and the plant's roots and leaves are used in the Indian Indigenous Medicinal System of Ayurveda for various diseases, and it has been investigated in a few

limited studies for its potential as an anti-nociceptive and anti-inflammatory herbal medicine (Preeti & Verma, 2014). By keeping in view of medicinal properties of *Ricinus communis* an attempt has been for formulation, development and evaluation of Herbal Shampoo of *Ricinus communis*

**MATERIAL AND METHODS:****Collection of plant:**

The selected plant namely *Ricinus communis* was identified and collected from various areas of Madhya Pradesh on the basis of geographical availability. The entire plant drug was authenticated by expert botanist of Department of Botany Geetanjali College Bhopal. All collected plant drug were cleaned, shade dried, pulverized into moderately coarse powder and stored in airtight container for further use.

**Pathogenic microbes used:**

The pathogenic bacteria and fungus used in the current study obtained from Microbial Culture collection, J.P.Hospital, Bhopal, Madhya Pradesh (India).

**Methods:****Extraction:**

The plant Material (Leaves) was extracted with Hydroalcoholic (40°-60°C) for about 12 hrs. The plant drug was subjected to extraction by Methanol & water (75:25) as solvent. The liquid extracts were collected in a tarred conical flask. The solvent removed by distillation. Last traces of solvent being removed under vacuum. The extracts obtained with each solvent were weighed to a constant weight and percentage w/w basis was calculated.

**Preliminary Phytochemical Screening:**

Preliminary phytochemical screening means to investigate the plant material in terms of its active constituents. In order to detect the various constituents present in the different extracts of *Ricinus*, was subjected to the phytochemical tests as per standard methods

**Formulation of herbal shampoo:**

The plant extracts were mixed in different proportions to obtain a shampoo whose formula is shown in Table 1. Herbal extracts were added to 10% gelatin solution and were mixed by shaking for 20 min. Lemon juice (1 mL) and Methyl paraben were also added with stirring. Finally the pH of the solution was adjusted by adding sufficient quantity of 1% citric acid solution. Few drops of rose essential oil were also added to impart aroma to the prepared

shampoo and the final volume was made to 100 mL with gelatin solution.

#### Evaluation of formulated and commercial shampoo:

To evaluate the quality of commercial and prepared formulations, several quality control tests including visual assessment, physicochemical controls conditioning performance tests were performed (Ashok and Rakesh, 2010).

#### Physical appearance/visual inspection:

The formulation prepared was evaluated for the clarity, color, odor and foam producing ability (Aghel *et al.*, 2007).

#### Determination of pH:

The pH of 10% v/v shampoo solution in distilled water was measured by using pH meter (Mi 151, Martini instruments) at room temperature (Tarun *et al.*, 2014).

#### Determination of % of solid contents:

4 grams of shampoo were placed in a previously clean, dry and weighed evaporating dish. The dish and shampoo was weighed again to confirm the exact weight of the shampoo. The liquid portion of the shampoo was evaporated by placing the evaporating dish on the hot plate. The weight and thus % of the solid contents of shampoo left after complete drying was calculated.

**Table 1: Composition of formulated herbal shampoo**

| Material         | Quantity               |
|------------------|------------------------|
| <i>Ricinus</i>   | 4ml                    |
| Lemon juice      | 1 mL                   |
| Methyl paraben   | 1 mL of 0.05% solution |
| Gelatin solution | q.s                    |
| Citric acid      | q.s                    |
| Essential oil    | 0.1 m                  |

**Table 2 : Physicochemical evaluation of formulated and marketed shampoo.**

| Formulated shampoo         |              |
|----------------------------|--------------|
| Color                      | Light green  |
| Transparency               | Clear        |
| Odor                       | Good         |
| pH (10% solution)          | 7.02 ± 0.09  |
| % Solid contents           | 22.75        |
| Foam type                  | Small, dense |
| Surface tension (dynes/cm) | 38.72 ± 1.77 |
| Wetting time (sec)         | 187 ± 4      |

#### Dirt dispersion test:

Two drops of shampoo were added to 10 mL of distilled water taken in a large test tube. To this solution, one drop of India ink was added and the test tube was stoppered and shaken ten times. The amount of ink in the foam was indicated by the rubric such as None, Light, Moderate or Heavy (Ali and Kadhim, 2011).

#### Surface tension measurement:

The surface tension of 10% w/v shampoo in distilled water was measured using stalagmometer at room temperature (Gaud and Gupta, 2001).

#### Test to evaluate foaming ability and foam stability:

Foaming ability was determined by using cylinder shake method. Briefly, 50 mL of the 1% commercial

or formulated shampoo solution was placed into a 250 mL graduated cylinder; it was covered with one hand and shaken 10 times. The total volume of the foam content after 1 min of shaking was recorded. Foam stability was evaluated by recording the foam volume after 1 min and 4 min of shake test (Klein, 2004).

#### Wetting time test:

A canvas paper was cut into 1-inch diameter discs having an average weight of 0.44 g. The smooth surface of disc was placed on the surface of 1% v/v shampoo solution and the stopwatch started. The time required for the disc to begin to sink was noted down as the wetting time (Manikar and Jolly, 2000).

#### Evaluation of conditioning performance:

A hair tress of an Asian woman was obtained from a local salon. It was cut into four swatches of the tresses with approximately the length of 10 cm and the weight of 5 g. A swatch without washing served as the control. Other three tresses were washed with the commercial and formulated shampoos in an identical manner. For each cycle, each tress was shaken with the mixture of 10 g of a sample and 15 g of water in a conical flask for 2 min and then rinsed with 50 mL water. Afterward, each tress was left for air drying at room temperature. The tresses were washed for maximum ten cycles. The conditioning performance of the shampoos i.e smoothness and softness was evaluated by a blind touch test, administered to twenty randomly selected student volunteers (Boonme et al., 2011). All the students were blind folded and asked to touch and rate the four tresses for conditioning performance from score 1 to 4 (1 ¼ poor; 2 ¼ satisfactory; 3 ¼ good; 4 ¼ excellent).

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#### Antimicrobial activity:

The antimicrobial activity of shampoo was tested by well diffusion method. The organism against which the shampoo was tested are *Klebsiella pneumoniae* and *Escherichia coli*.

#### RESULTS AND DISCUSSION:

The yields were found to be 8.30g (8.30% w/w of crude drug) of Hydroacoholic extract with orange black colour semisolid mass, for *Ricinus* (aerial part). The phytochemical test revealed the presence of alkaloid, Glycosides, saponins, terpenoids, phenols, flavonoid, proteins & amino acid. Prepared shampoo was transparent, light green and had good odor. No significant difference was observed in terms of odor, transparency and foaming characteristics between commercial and formulated shampoo except for color. The pH of tested shampoo was 7.02. The percent solid contents of all the tested shampoo was found within the range of 22-25% and are expected to wash out easily. Shampoo exhibited satisfactory cleaning & foaming ability and actual effectiveness. Wetting time of shampoo was found to be 187. The shampoo at the concentration of 100mg/ml showed zone of inhibition of 8±0.5mm & 10±0.9mm for *Klebsiella pneumoniae* & *E. coli* respectively.

**Table 3: Extractive values obtained from *Ricinus* (aerial part) using different solvents**

| S.N. | Solvent                  | Time of extraction (Hours) | Color of extract | Yield | % Yield |
|------|--------------------------|----------------------------|------------------|-------|---------|
| 1    | Methanol + water (75:25) | 12                         | Brown            | 8.30g | 8.30%   |

**Table 4: Preliminary phytochemical screening of *Ricinus* (aerial part)**

| S. No. | Phytoconstituents      | Test Name            | Hydroacoholic Extract |
|--------|------------------------|----------------------|-----------------------|
| 1      | Alkaloids              | Hanger's Test        | +                     |
|        | Tannins                | Gelatin Test         | -                     |
| 2      | Glycosides             | Leagel's test        | +                     |
| 3      | saponins               | Froth test           | +                     |
| 4      | terpenoids             | Salwaski's test      | +                     |
| 5      | phenols                | Ferric chloride test | +                     |
| 6      | Carbohydrates          | Gelatin Test         | -                     |
| 7      | Flavonoids             | Lead acetate         | +                     |
| 8      | Proteins & Amino acids | Precipitation test   | +                     |

**Physical appearance/visual inspection:**

A shampoo like any other cosmetic preparation should have good appealing physical appearance. The formulated and marketed shampoos were evaluated for physical characteristics such as color, odor and transparency. Prepared shampoo was transparent, light green and had good odor. No significant difference was observed in terms of odor, transparency and foaming characteristics between commercial and formulated shampoo except for color.

**pH:**

The pH of tested shampoos was found within the preferred range (between 7 and 5). The pH of formulated shampoo was found to be nearly neutral (7.02).

**% of solid contents:**

The percent solid contents of all the tested shampoo was found within the range of 22-25% and are expected to wash out easily .

**Dirt dispersion**

Formulated shampoo concentrated the ink in the water portion, ensuring their satisfactory cleaning ability and actual effectiveness.

**Foaming ability and foaming stability**

The foams generated by formulated shampoo were small, compact, uniform, denser and stable similar to commercial samples. All tested shampoo had the same foam volume for 5 min showing that their foam has good stability. The higher foaming property of formulated shampoo may be due to the combination of soap nut, Sheekakai and Ziziphus (Sarath *et al.*, 2013).

**Wetting time**

The wetting time of three shampoo was found in the order 141 < 157 < 187 s for dove, herbal essences and formulated shampoo respectively.

**Results of antimicrobial activity of Hydroalcoholic extract of Ricinus (aerial part) Shampoo.****Table 5: Antimicrobial activity of Ricinus shampoo against selected microbes**

| S. No. | Name of microbes             | Zone of inhibition |          |          |
|--------|------------------------------|--------------------|----------|----------|
|        |                              | 25mg/ml            | 50 mg/ml | 100mg/ml |
| 1.     | <i>Klebsiella pneumoniae</i> |                    |          |          |
|        | <i>Ricinus</i> shampoo       | 6±0.4              | 7±0.6    | 8±0.5    |
| 2.     | <i>Escherichia coli</i>      |                    |          |          |
|        | <i>Ricinus</i> shampoo       | 8±0.1              | 9±0.4    | 10±0.9   |

**CONCLUSION:**

The aim of this study was to formulate a completely herbal shampoo which is at par with the synthetic shampoo available in the market. Formulated a herbal shampoo by using plant extracts which are commonly used traditionally. All the ingredients used to formulate shampoo are safer than silicones and polyquaterniums synthetic conditioning agents and vis a vis can greatly reduce the hair or protein loss during combing. Our prepared shampoo showed comparable result with that of marketed shampoo for quality control tests but further research and development is required to improve it's over all quality.

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