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Formulation and Evaluation of Polyherbal Dry Shampoo

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1. Abstract-

The Aim of the present research is to create and assess a herbal dry shampoo with natural components, focusing on its effectiveness and safety. Shampoos are used to preserve the manageability and oiliness of hair in addition to its washing properties. Shampoos come in several varieties, such as lotion shampoo, solid gel shampoo, medicinal shampoo, powder shampoo, clear liquid shampoo, liquid herbal shampoo, and more. Using conventional medications for hair treatment, the herbal shampoo powder was created in this experiment. In order to assess the preparation's organoleptic qualities, powder properties, foam test, and physical assessment, Shikakai, Reetha, Shatavari, fenugreek, curry laves and manjistha were used in its formulation. The prepared shampoo produced perfect results in the physicochemical analysis. However, further research and development were needed to enhance its quality, product performance, and safety. Shampoo is a hair care product that is packaged carefully for usage. Its purpose is to clean the hair and get rid of accumulated sebum, oils, grime, and debris from the scalp. For extended usage, the shampoo's ingredients needs to be both safe and effective. In addition, it acts as a conditioning agent, all of which helps without harming or destroying hair. General powder properties, physicochemical analysis, ash and alcohol solubility, and organoleptic investigations were performed on all three formulations (F1–F3). extractives, measuring moisture content, determining pH, cleaning efficacy, foaming capabilities, filth dispersion, soaking time, and research on the characteristics of cleansed hair.

Keywords: polyherbal dry shampoo, Shikakai, Reetha, Shatavari, Fenugreek, Curry leaves and Manjistha.

2. Introduction-

A polyherbal dry shampoo is a kind of hair care product that uses a combination of many herbal extracts and natural substances, sometimes in powder form, to absorb oil and grease while cleansing and restoring hair without the need for water.
A crucial component of the body, hair is generated from the ectoderm of the skin and serves as a protective appendage. It is regarded as an accessory structure of the integument, along with sweat glands, sebaceous glands, and nails[1].

Shampoos and hair cleansers serve various purposes, including maintaining hair's manageability and oiliness and adding shine to the hair. Shampoos are available in a variety of types, including lotion shampoo, clear liquid shampoo, medicinal shampoo, powder shampoo, solid gel shampoo, and liquid herbal shampoo, among others[2].

Now a days people are conscious of its effects on their eyes, skin, and hair. Because of their low cost and little adverse effects, the population is becoming more interested in herbal products. There is a high demand for herbal cosmetics these days due to the broad expansion in the usage of herbs in cosmeceutical manufacture[3].

In contrast to their conventional counterparts, herbal shampoos use plant-based ingredients such as botanical extracts, essential oils, and other organic compounds. This trend in herbal hair care has its roots in ancient civilizations, when various nations and their cultures discovered the value of naturally produced ingredients in maintaining the health and beauty of hair[4].

The herbal shampoo powder was formulated using natural ingredients with Manjistha, Shikakai, Fenugreek, Shatavari, Hibiscus Flower, and Reetha. Indian women use herbal ingredients like shikakai and reetha, which are natural cleansing agents that don't cause any harm. Herbal formulations are becoming more and more popular worldwide, and natural remedies are more widely accepted because they are safe, have fewer side effects, and include nutritional

shampoos that contain vitamins, amino acids, and proteins hydrolyzed[5].

2.1 Ideal Characteristics-

1. Hair should be washed efficiently.
2. A decent volume of foam should be produced.
3. Rinsing with water should make it easy to remove the shampoo.
4. The goal is to leave the hair manageable, silky, shiny, and non-dry.
5. It should give the hair a pleasing scent.

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6. The hand shouldn't get rough and chapped.
7. There shouldn't be any negative effects or irritation of the skin or eyes[6].

2.2 Types-

1. Powder Shampoo
2. Liquid Shampoo
3. Lotion Shampoo Shampoo
4. Jelly Shampoo
5. Aerosol Shampoo
6. Specialized Shampoo
7. Conditioning Shampoo
8. Anti-dandruff Shampoo
9. Baby Shampoo

2.3 Benefits-

1. Decrease itching and dandruff.
2. Reduce irritations of the scalp.
3. Improve the manageability and texture of hair.
4. Add volume and decrease frizz.
5. Preserve the richness and color of your hair.
6. Eco-friendly and biodegradable.

7. More affordable and cost-effective.
8. Shinier and more efficient.
9. A pleasant scent for the hair.
10. Make hair easier to handle by leaving it soft, shiny, and non-dry.
11. As an antioxidant, antimicrobial, and antibacterial.
12. No adverse effects or factors that might irritate the skin or eyes[7].

3. AIM & OBJECTIVE

Aim- Formulation and evaluation of polyherbal dry shampoo.

Objectives-

1. The main objective of present study is to improve hair health and appearance, cleanse the hair and scalp, treat common problems like dandruff and dryness, and offer a safe, natural substitute for traditional shampoos.
2. Natural components that are appropriate for all skin types are used to make herbal shampoos. Therefore, using herbal shampoos does not raise the possibility of skin allergies.
3. Herbal shampoos maintain your hair's natural color and, with consistent use, even brighten it.
4. The herbal shampoo supply minerals, proteins, and vitamins for healthy, nourished hair.
5. The main purpose of present study is to evaluate natural ingredients used in polyherbal shampoo for Safety and efficacy.

4. Plan of work -

1. Collection and authentication of herbs
2. Formulation of polyherbal dry shampoo
3. Evaluation of dry shampoo:

- Appearance
- Irritancy
- pH
- Angle of repose
- Tapped and Bulk density
- Ash value
- Foamability

5. Literature Review-

1. Divya K. Chavan et.al (2024)

The main aim is to investigate ways to remove harmful synthetic ingredients from shampoo formulations and replace them with safe natural ingredients. Herbal Shampoo was created using natural ingredients such as hibiscus flowers and leaves, palas flowers, rose flowers, beets root, and banana root sandalwood powder. The combination of these herbal ingredients created a highly effective powder shampoo that reduces many side effects. The demand for herbal cosmetics is growing because it is widely believed that these products are safe and free of side effects. The current review focuses on the use of herbal ingredients in place of synthetic ingredients. Instead of cationic conditioners, we can use shikakai, hibiscus, and other plant extracts to provide a conditioning effect[8].

2. Mane Swati Mahadev et.al (2023)

Shikakai Heena, Reetha Tulsi, and Neem were used to create the mixture, which was then evaluated for its organoleptic qualities, powder properties, foam test results, and physical examination. These herbs—which include hibiscus, curry leaves, Shikakai, Shatavari, Reetha, Fenugreek, and Manjistha—have been used for hair growth and conditioning, and their non-toxic nature has been shown to reduce allergic reactions. Other quality control parameters were examined, and evaluation parameters such as Organoleptic evaluation, General powder Characters, Physicochemical Evaluation, Cleaning action, foaming, wetting agent, and Nature of hair after wash were found to be within the standard range[9].

3. T. Satyanarayana et.al (2022)

Herbal shampoo powder formulation and evaluation using various plant herbs, including Amla, Shikakai, Reetha, Bhringraj, Tulasi, Neem, Hibiscus, and Curry leaves, was the main goal of the current study. Its main goal was to formulate the herbal shampoo powder using ingredients like hibiscus, Bhringraj, Curry leaves, Neem, Tulasi, Shikkakai, amla, and Rita in the right ratio. Additionally, it acts as a conditioning agent and accomplishes all of these actions without affecting or damaging hair[10].

4.Sajid A. Mulani et.al (2021)

There are many different kinds of shampoos, including lotion shampoos, clear liquid shampoos, medicinal shampoos, powder shampoos, liquid herbal shampoos, and solid gel shampoos. Regarding the stability standards for herbal shampoos. The current study's findings demonstrate that when these medications' active components are combined with shampoo, the resulting products are more stable and aesthetically pleasing[11].

5. Aishwariya Madhavan et.al (2020)

The purpose of this study was to develop a powder shampoo with antioxidant attributes. In vitro tests were conducted to evaluate the compositions' antioxidant and deterrent properties. According to our research, the use of cinnamon bark extract results in a dry powder shampoo formulation with strong antioxidant activity. The antioxidant shampoo formulation with detergents (AOS and SCI) and anti-caking agents covered in this study is a powder formulation that is suitable for storage in eco-friendly packaging materials. As a result, it might provide a way to lessen the burden of using plastic to store hair care products. Before using, the formulation must be suspended in water. We believe that preclinical and clinical settings may be used to investigate the formulation's antioxidant potential[12].

6. Description of Herbs -

1. REETHA

Reetha, commonly known as soapnuts, is also known as "soap nut tree" in India and Arishtak in Ayurveda. It is widely used as a hair cleaner and is well recognized for its traditional medical applications. Because it makes hair glossy, healthy, and shining, reetha is often utilized to manufacture natural hair care products. It is suitable for everyday usage to feed the hair scalp and encourage hair development. Because reetha powder has insecticidal properties, it may be combined with warm water to create a paste that can be applied to the scalp to help control dandruff and get rid of lice. Applying Amla and Reetha powder to the hair can help prevent graying and promote healthier hair development[13].

- Biological Source- Sapindus Mukorossi
- Family- Sapindaceae
- Parts used- Seeds
- Uses- Foam base and Anti-dandruff

Fig.1: Reetha

2. MANJISTHA

Manjistha root powder is used to make medicinal oil and as a hair coloring agent. It also serves as a hair root tonic. Manjistha is a powerful treatment for enhancing the health of hair. Hair issues like greying can be treated with manjistha powder. The natural colour of the hair is enhanced by using Manjistha powder. Manjistha oil works well to reduce hair loss. By controlling dandruff and removing excessive dryness, it helps stop hair loss[14].

- Biological source- Rubia cordifolia
- Family-Rubiaceous
- Parts used- roots
- Uses- hair colouring agent

Fig. 2: Manjistha

3. HIBISCUS

Hibiscus is one of the most well-known herbs in Ayurveda for permitting hair growth. If you are experiencing hair loss, hibiscus flowers and leaves will be the ideal treatment for both you and to stop hair loss. Both hibiscus flowers and leaves are used to treat hair issues, and studies indicate that using hibiscus flowers can result in full recovery from dormant hair follicles and bald patches[15].

- Biological Source- hibiscus rosa-sinensis
- Family- Malvaceae (mallow family)
- Parts used – flower and leaves
- Uses- hair regrowth

Fig. 3: Hibiscus

SHIKAKAI

In India, Shikakai is a herb used to heal skin conditions, dandruff, and long hair. Congestion, jaundice, gum infections, leprosy, malarial fever, and as a component in contraceptives, this plant has been shown to have therapeutic properties. It is also well recognized that Shikakai has a variety of therapeutic uses. These include the following: anti-inflammatory, antifungal, antibacterial, anti-oxidant, anti-dandruff, wound-healing, anti-hair-fall, and hair-growing qualities[16].

- Biological Source -Acacia concinna
- Family- Fabaceae (Pea family)
- Parts used- dried fruit pods
- Uses- Nourish follicles, natural cleanser and conditioner.

Fig. 4: Shikakai

4. FENUGREEK

Methi seeds reduce the chances of baldness and hair thinning because they are effective against hair loss, dandruff, and promote new hair growth. Fenugreek seeds, also known as methi, contain proteins and nicotinic acid, which are major sources of hair growth, as well as high levels of lecithin, which makes our hair strong and healthy and hydrates it. This helps to keep the scalp cool, relieve dryness, reduce dandruff, condition the hair, and treat a variety of scalp problems. Dry and damaged hair can be strengthened using methi's lecithin. The hair is moisturized and regains its bounce and gloss thanks to the natural tonic[17].

- Botanical name- Trigonella foenum-graecum
- Family- Leguminosae
- Parts used- dried seeds
- Uses- Restore shine, decrease split ends

Fig. 5: Fenugreek

5. CURRY LEAVES

Curry leaves are a good source of amino acids, which help to strengthen hair Fibers. Kadi Patta has long been used to prevent greying of the hair. Additionally, it works well for repairing damaged hair, boosting thinning hair, preventing hair loss, and treating dandruff. The best part of this is that curry leaves may be applied to your scalp as a remedy or eaten to help with hair problems. It is believed that curry leaves may strengthen hair roots[18].

- Biological Source- Murraya koenigii Linn. Spreng
- Family- Rutaceae
- Parts used- leaves
- Uses- Strengthening hair follicles and moisturizing the scalp

Fig. 6: Curry leaves

6. SHATAVARI

Shatavari has homogeneous, glossy green, tiny photosynthetic branches that resemble pins and needles. Shatavari is used as a female reproductive tonic as well as a general tonic. Steroids, alkaloids, flavonoids, furan derivatives, and essential oils are only a few of the plant's many secondary metabolites[19].

- Biological Source- Asparagus racemosus
- Family- Liliaceae
- Parts used- roots
- Uses - Promotes hair growth, Smoothe the scalp, Strengthens the roots of hair and Maintain colour and luster.

Fig. 7: Shatavari

7. Material and Method-

7.1 Material-

All the herbal drugs were procured from local market. The herbal shampoo powder was formulated using following natural ingredients, which are tabulated in Table 1.

Table 1: Ingredients

Sr no.	Ingredient	Biological source/family	Uses
1	Reetha	Sapindaceae Mimosaceae	Foaming agent and Anti-dandruff
2	Manjistha	Rubiaceous	Hair colouring agent
3	Hibiscus	Malvaceae	hair regrowth
4	Shikakai	Fabaceae	Natural cleanser
5	Fenugreek	Leguminosae	Restore shine
6	Curry leaves	Rutaceae	Strengthening hair follicles and moisturizing the scalp
7	Shatavari	Liliaceae	Promote hair growth and provide Hydration

7.2 Experimental methods-

- **Formulation of herbal shampoo-**

1) Drying: All the powder are in dry form and grinded.
2) Weighing: All the required herbal powders for shampoo preparation are weighed individually.
3) Size reduction: Crude ingredients are size reduced using a hand-driven mixer individually.
4) Mixing: All these fine ingredients are mixed thoroughly by the mixer to form a homogenous fine powder.
5) Sieving: Then this fine powder is passed through sieve no.80 to get a sufficient quantity of fine powder.
6) Packing and labelling: Then it is packed and labelled suitably.

Table 2: Formulation of herbal dry shampoo (for 20gm)

Sr.no	Ingredient	F1	F2	F3
1.	Curry leaves	0.5gm	1.5gm	2.5gm
2.	Manjistha	4gm	3gm	2gm
3.	Shatavari	4gm	3gm	2gm
4.	Hibiscus	2gm	3gm	4gm

5.	Reetha	3gm	3gm	3gm
6.	Shikakai	3.5gm	3.5gm	3.5gm
7.	Fenugreek	3gm	3gm	3gm

7.3 Evaluation of herbal dry shampoo -

Prepared formulations of shampoos were subjected to following evaluation parameters.

A. Organoleptic Evaluation:

- Colour and Appearance: The colour & appearance of the formulation was observed visually.
- Odour: The odour of the formulation is pleasant/ characteristics.
- Texture: It is found to be solid with visually observation.

Fig. 8: Polyherbal dry shampoo

B. General powder characteristic:

General powder characteristics include evaluation of those parameters which are going to affect the external properties (like flow properties, appearance, packaging criteria, etc.) of the preparation. Characteristics evaluated under this section are powder form, particle size angle of repose, and bulk density. Sample for all these evaluations are taken at three different levels
i.e. from the top, middle and lower levels.

1. Particle Size

Particle size is a parameter, which could affect various properties like spread ability, grittiness, etc., Particle size is determined by the sieving method by using I.P. Standard sieves by mechanical shaking for 10 Min.

2. Angle of Repose

It is defined as the maximum angle possible in between the surface of pile of powder to the horizontal flow.

Funnel method-

Take Required quality of dried powder is taken in a funnel placed at a height of 6 cm from a horizontal base. The powder was allowed to flow to form a heap over the paper on the horizontal plane. The height and radius of the powder was noted and recorded the angle of repose (θ) can be calculated by using the formula. Required amount of dried powder is placed in a cylindrical tube open at both ends is placed on a horizontal surface. Then the funnel should be raised to form a heap. The height and radius of the heap is noted and recorded. For the above two methods, the angle of repose (θ) can be calculated by using the formula.

$\theta = \tan^{-1}(h / r)$

Where, θ–Angle of repose, h– height of the heap,
r– Radius of the base

Fig. 9: Angle of Repose

3. Bulk density

Bulk density is the ratio between the given mass of a powder and its bulk volume. Take the required amount of dried powder and fill it in a 50 ml measuring cylinder up to 50 ml mark. Then drop the cylinder onto a hardwood surface from a height of 1 inch at a 2-second interval. Measure the volume of the powder. Then weigh the powder. This is repeated to get average values. The bulk density is calculated by using the below given formula. Bulk density = mass of the polyherbal powder shampoo Volume of the polyherbal powder shampoo.

$$\text{Bulk density} = \frac{\text{Mass of the polyherbal powder shampoo}}{\text{Volume of the polyherbal powder shampoo}}$$

4. Tapped density

The tapped density is an increased bulk density attained after mechanical tapping a container containing the powder sample. After observing the initial powder volume or mass, the measuring cylinder or vessel is mechanically tapped for 1 min and volume or mass reading are taken until little further volume or mass change was observed. It was expressed in gram per cubic centimetre. (g/cm^3)

$$\text{Tapped density} = \frac{\text{Weight of powder}}{\text{Tapped volume of powder}}$$

Fig. 10: Tapped Density

C. Physicochemical Evaluation-

1. pH

Measure the pH of 10 % shampoo solution in distilled water at room temperature 25°C. the pH is measured by using a digital pH meter.

Fig. 11: pH

2. Washability

Formulations were applied on the skin and then ease and extent of washing with water were checked manually.

3. Solubility

Solubility is defined as the ability of the substance to soluble in a solvent. One gram of the powder is weighed accurately and transferred into a beaker containing 100ml of water. This was shaken well and warmed to increase the solubility. Then cooled and filter it, the residue obtained is weighed and noted.

4. Skin irritation test

The skin irritation tests revealed that the herbal shampoo powder shows no harmful Effect on skin. This is due to the absence of synthetic surfactants. Most of the synthetic surfactants produce inflammation of the eye lid and corneal irritation. But in this formulation of herbal shampoo powder, the uses of all ingredients are obtained naturally. So it does not produce any harmful effect on skin.

5. Ash value

Total ash content Ash value is calculated to determine the inorganic contents which is characteristic for a herb. About 2gm of powder drug was taken in silicon dish previously ignited and weighed. Temperature was increased by gradually increasing the heat not exceeding to red colour. After complete burning, ash is cooled and weighed.

Fig. 12: Ash Value

6. Nature of hair after washes

Nature of hair after wash can be done by collecting the responses of volunteers.

7. Stability Study

Stability and acceptability of organoleptic properties (odour and colour) of formulations during the storage period indicated that they are chemically and physically stable.

8. Nature of hair after washes

Nature of hair after wash Can be done by collecting the responses of volunteers.

9. Foaming ability and foam stability

Cylinder shake method with slight modification was used for determining foaming ability. 50ml of the 1% shampoo solution was put into a 100 ml measuring cylinder and covered with hand. Measuring cylinder was shaken for 1 minute. The total volume of the foam contents after 1 minute shaking was recorded. The procedure

was continued for 5 minutes.

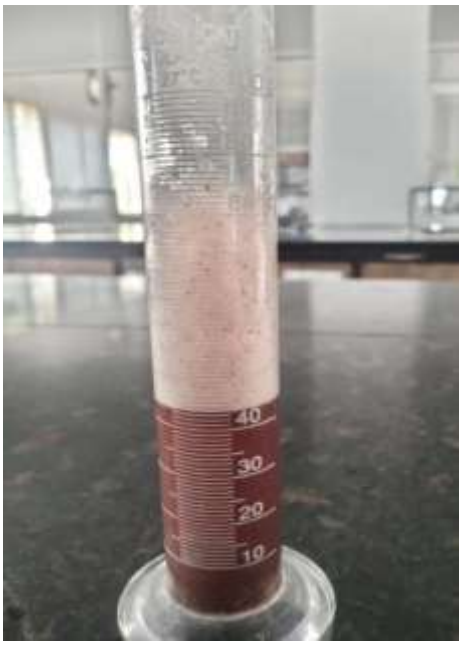

Fig. 13: Foamability

8. Result and Discussion -

The polyherbal shampoo formulation containing Manjistha, Reetha, Shikakai, Hibiscus, Curry Leaves, and Fenugreek was subjected to various tests to evaluate its efficacy, safety, and user satisfaction. The following results were obtained:

Table 3: Organoleptic characteristics

Sr no.	Test	F1	F2	F3
1.	Colour and appearance	Slight brown	Slight brown	Slight brown
2.	Odour	Pleasant	Pleasant	Pleasant
3.	Texture	Fine and smooth	Fine and smooth	Fine and smooth

Table 4: General powder characteristics

Sr no.	Test	F1	F2	F3
1.	Angle of repose	15.6^0	13.1^0	13.9^0
2.	Bulk density	$0.47g/cm^3$	$0.45g/cm^3$	$0.49g/cm^3$
3.	Tapped density	$0.561g/cm^3$	$0.564g/cm^3$	$0.558g/cm^3$

Table 5: Physiochemical evaluation

Sr no.	Test	F1	F2	F3
1.	pH	5.64	5.96	5.54
2	Washability	Washable	Washable	Washable
3	Solubility	Soluble	Soluble	Soluble

4	Skin irritation	No effect	No effect	No effect
5	Ash value	10% w/w	12%w/w	9%w/w
7	Nature of hair after wash	Soft and manageable	Soft and manageable	Soft and manageable
8	Foamability	86cm	84cm	90cm
9	Stability	Stable	Stable	Stable

The polyherbal shampoo showed a synergistic effect of the herbal ingredients, resulting in positive outcomes for both hair and scalp health.

Manjistha, or Rubia cordifolia, is well-known for its anti-inflammatory and cleansing qualities. It has long been used to treat the scalp, helping to lessen dandruff and improve general scalp health[20]. Rich in anthraquinone chemicals, Manjistha promotes a healthy environment for hair development by improving circulation to the hair follicles[21].

Because it contains saponins, Reetha (Sapindus mukorossi) acts as a natural surfactant. These substances have cleaning qualities and aid in clearing the hair and scalp of debris, extra oil, and buildup[22]. Reetha is appropriate for sensitive skin since it doesn't remove the natural oils from the scalp like commercial shampoos do. The traditional herb shikakai (Acacia concinna) is used for its gentle conditioning and cleaning properties. Saponins included in it help cleanse the scalp while preserving its natural moisture balance[23]. According to clinical findings, shikakai also gives hair smoothness and gloss[24].

Rich in vitamins A and C, amino acids, and antioxidants, hibiscus (Hibiscus rosa-sinensis) helps to fortify hair follicles and keep them from breaking. After frequent application, hibiscus reduces frizz and improves hair structure, making it an excellent conditioner as well[25]. Curry leaves (Murraya koenigii) are widely recognized for their ability to stimulate hair growth. Curry leaves contain alkaloids and antioxidants that promote hair follicle regeneration and lessen hair loss[26]. It has also been demonstrated that the high beta-carotene and amino acid content of curry leaves helps to strengthen hair[27].

Rich in protein, nicotinic acid, and lecithin, fenugreek (Trigonella foenum-graecum) is thought to encourage hair development and lessen hair loss. Because of its capacity to improve hair density, lessen dandruff, and nourish the scalp, fenugreek is frequently employed[28].

9. Conclusion -

The present work was performed formulation and evaluation of herbal shampoo powder using different kinds of plant herbs like Shikakai, Reetha, Manjistha, Hibiscus, Shatavari, Curry leaves and also Fenugreek. The awareness and need for cosmetics with the herb on the rise, as it is strongly believed that these products are safe and free from side effect. The formulated shampoos were evaluated for the organoleptic, general powder characteristics and physiochemical study, they are also evaluated for their different properties cleaning action, foaming capacity, wetting time and nature of hair after wash. The various quality control parameters were checked. All parameter gives favourable result. The result obtained on present study shows that the active ingredients of these drugs when in corporate in shampoo gives more Stable products with good aesthetic appeal. The pH of the Shampoo has been shown to be important for improving and enhancing the qualities of hair, minimizing the irritation to the eyes and stabilizing the ecological balance of the scalp. The Evaluation parameters like Organoleptic evaluation, General Powder Characters, Physicochemical Evaluation, Cleaning action, foaming, wetting agent, Nature of hair after wash was carried out and was found to be within the standard range.

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