Section: Research Paper

EVALUATION AND PREPARATION: HERBAL GEL CONTAINING THUJA OCCIDENTALIS AND CURCUMA LONGA EXTRACTS

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ABSTRACT:

Being a source of several beneficial secondary metabolites that serve as a plant's defence strategy against predators like bacteria, insects, and herbivores and have been shown to potentially be active Plant-based medications offer a considerable improvement over traditional treatments. Because microorganisms are growing more and more resistant to antibiotics or just because any drug has a shelf life, there has been a sharp rise in interest in antimicrobial plant extracts. Creating herbal gel formulations employing alcoholic extracts of Curcuma longa and Thuja occidentalis was the goal of the current investigation. Hydroalcoholic extracts of the herbs Curcuma longa and Thuja occidentalis were utilised to create herbal gels using the polymer carbopol 934, which were then tested for physicochemical characteristics like pH, Washability, extrudability, Spreadability, and viscosity. The gel activity of the formulations (F1- F4) was evaluated. The results showed that the gels were reliable and painless.

Key words: Washability, Extrudability, Spreadability, Curcuma longa and Thuja occidentalis.

INTRODUCTION:

The scientific definition of herbal medicine is the use of medicines based on plants to treat disease. The terms herbal medicine and Phytomedicine are frequently used to describe it. As there were no analgesics or antibiotics during the beginning of the 20th century, herbal medicine was the primary type of treatment. Herbal therapy rapidly lost popularity as the

allopathic medical system got more and more common and its success was built on the quick healing effects of synthetic medications **[1]**. The use of herbal treatments has increased significantly over the last few decades. Nature has always offered a breathtaking example of the wonderful symbiosis phenomenon. Almost 80% of people in underdeveloped nations still rely on traditional medicine for their main healthcare, which is primarily based on various plant species. In ancient writings, more than 500 plants are referred to as having therapeutic properties, and 800 species have been used in traditional indigenous medical practises. The various conventional medicinal systems, including Ayurveda, Siddha, and Unani, employ a number of plant species to treat a range of diseases that exhibit symbiotic characteristics. [2]. Skin problems can range greatly in their signs and severity [3]. They could be short-lived or persistent, painful or not. Others may have environmental causes, while some may have hereditary causes. Skin issues can range in severity from minor to severe. Your skin may get damaged by conditions known as skin disorders. Several illnesses can cause skin changes such as rashes, inflammation, itching, and other skin changes. While some skin conditions may run in families, others may result from a person's lifestyle. Pills, lotions, ointments, and changes in lifestyle are all potential treatments for skin disorders. It's possible that underlying medical conditions will also affect your skin. Common causes of skin diseases include-

- bacteria that is stuck in your hair follicles or pores
- illnesses that impact your kidneys, thyroid, or immune system
- exposure to environmental triggers, such as allergens or the skin of another person.
- Fungus or parasites living on your skin.
- Medications, such as the ones that treat inflammatory bowel disease (IBD)
- Viruses [2].

In this outdated medicinal system, the idea of polyherbalism was discussed historically in the "Sarangdhar Samhita" of Ayurveda, which dates back hundreds of years to 1300 A.D. The traditional Indian medicinal system prefers plant mixtures and blended extracts over isolated ones. Ayurvedic herbs can be prepared in a variety of dosage forms, the majority of which are PHF, as is well known. Polyherbalism has some benefits over a single herbal composition because of synergism [1].

MATERIALS:

Plant materials:

From the Dehradun neighbourhood, Curcuma longa and Thuja occidentalis plants were gathered (UK). The plants that were chosen for the study were carefully cleaned with running tap water, rinsed with distilled water, and then let too dry at room temperature for a while. After that, the plant material was thoroughly dried for three to four weeks in the shade without any contamination. The dried plant material was pulverised with an electric grinder. The powdered plant material's colour, scent, flavour, and texture were noted. **Chemical reagents:**

From Central Drug House (p) LT, all the substances utilised in this investigation were purchased (India). The investigation employed only analytical-grade chemicals and solvents [4].

METHODS

Phytochemical studies

The phytochemical analysis of a plant includes the identification and extraction of plant material as well as qualitative and quantitative evaluations.

Physio-Chemical Constants

Shade-dried powdered plant materials are used to determine the physiochemical constants, per WHO standards**.**

i. Calculating ash values: The quality and purity of a powdered form of a crude drug can be evaluated using ash values. Ash content, which simply refers to inorganic salts, naturally existing pharmaceuticals that adhere to it or are added for edibility as a sort of adulteration, is all that is left of the drug after incarnation**.** The inorganic residue left over after cremation, known as the ash value of a crude drug, is made up of inorganic salts that are either naturally present in the drug, connected to it, or purposefully introduced as a type of adulteration. As a result, it is employed to assess the quality and purity of medications in powder form that have not been treated [5] .

a. **Amount of ash**: The total ash method is used to calculate the complete amount of material that is still present after ignition. They are made up of non-physiological ash, which is the by-product of external items adhering to the surface of the plant, as well as physiological ash, which comes from plant tissue. This Silica crucible was heated to an extremely hot temperature for 30 minutes before cooling in the desiccators. A precisely measured amount of 2 to 3 g of the ground medicine should be burnt at a maximum temperature of 4500C in a tarred silica dish until the sample is carbon-free, then cooled in desiccators and weighed. Weighing was done on the collected ash. The entire amount of ash was determined [4,6] .

b. Water soluble ash: the difference in weight between the whole ash and the water-treated residue. This method involves boiling the entire amount of recovered ash for five minutes with 25 millilitres of water, collecting the insoluble parts in ashless filter paper, rinsing with hot water, and setting fire to them for fifteen minutes at a temperature no higher than 4500. Calculate the weight of this residue in mg by deducting the total weight of the ash. Find out how much water-soluble ash there is in each gramme of air-dried material [7].

c. Acid insoluble ash: The remaining insoluble materials are burned and quantified in the residue that remains after the total ash has been boiled with diluted hydrochloric acid. This gauges the presence of silica, particularly in the form of sand and siliceous earth. 25 cc of diluted hydrochloric acid are added to the crucible containing the sample's total ash. The ash less filter paper (Whatman 41) is used to capture the insoluble material, and hot water is used to wash it until the filtrate is neutral**.** Put the paper that contained the insoluble material back into the crucible, let it dry on a hot plate, and then light it at a steady weight. Before the residue is immediately weighed, it should be allowed to cool in a suitable desiccator for 30 minutes. The amount of acid-insoluble ash is calculated in relation to the drug that has been air dried [8,9] .

ii. Establishing extractive values: When there are no straightforward methods for determining a drug's composition, extractive values are useful for analysing phytoconstituents. Also, these figures show what kinds of active chemicals are contained in a crude medication [10]

a. .

a. Measurement of water-soluble extractive: Using 100ml of chloroform water and a 5gm sample that had been air dried and ground into a coarse powder, the mixture was macerated for 24 hours in a closed flask (95ml distilled water and 5ml chloroform). Before being allowed to stand for 18 hours of repose, it was repeatedly shaken for six hours. In order to prevent solvent loss, the mixture was promptly filtered. 25 ml of the filtrate was then evaporated to dryness in a shallow dish with a flat bottom and tar coating. After being dried at 105 °C for an hour in a hot air oven, it was weighed after cooling in desiccators for 30 minutes. The process was repeated until a constant weight was reached, and then the percentage of water-soluble extractive value was calculated using the air-dried medicine as a reference [11].

b. Identifying extractives that are soluble in alcohol: A 5gm sample that had been roughly pulverised was weighed, and 100ml of 90% ethanol was added to it and macerated for 24 hours in a closed flask. Before being let to stand for 18 hours, it was continuously shaken for six hours. It was promptly filtered to stop solvent loss, and 25 ml of the filtrate was then evaporated to dryness in a shallow dish with a flat bottom that had been covered in tar. It was dried for an hour at 105°C in a hot air oven. When the meal had cooled in a desiccator, it was weighed. The process was continued until the constant weight was reached. The proportion of the extractive value that is soluble in the air-dried medicine [13].

c. Identifying an extraction that is ether soluble: Either-soluble extractives that are volatile and non-volatile are used to evaluate crude medications. In contrast to non-volatile ether soluble extractives, which stand for resin, fixed oils, or colouring agents included in pharmaceuticals, volatile ether soluble extractives represent the volatile oil component of the medication. How much of the extractive is ether soluble was determined [12,14]?

iii. Determination of moisture content:

a. Loss on drying: 10 g of the sample materials were put on an evaporating plate covered in tar (without first drying them). Avoid preparing the samples in a high-speed mill. In the 105°C drying chamber, the material in the tarred evaporating dish was weighed after five hours. Drying and weighing are kept up at hourly intervals until there is no more than a 0.25 percent difference between two subsequent weights. The weight is regarded as constant when, after drying for 30 minutes and cooling for 30 minutes in a desiccator, there is no more than 0.001 g change between the two consecutive weighing [15]**.**

extraction preparation

Extraction is the initial step in phytochemical study. Based on the solvent's polarity and how quickly its component components dissolve in the solvent, metabolites are extracted. For extraction, the maceration procedure is performed. A container is filled with finely powdered drug material, such as leaves, stem bark, or root bark, in this extraction technique. The drug material is then completely covered with menstruum, which is subsequently poured on top. The container is then sealed and kept in storage for at least three days. We've got two beakers, one for Thuja Occidentalis and one for Curcuma Longa, and we've mixed 50 grammes of unprocessed medication evenly with 250 millilitres of ethanol. Cover the Beakers after stirring and keep them at room temperature.

qualitative examination of phytochemicals:

The findings of the qualitative analysis for different phytoconstituents performed on the dried powders and extracts using various reagents are listed below**.**

a. Detection of alkaloids

Dragendroff's test: The powder or extract was dissolved in 5ml of distilled water, and then 5ml of 2M HCl was added. Dragendroff's reagent was then added in 1 ml, and the development of an orange-red precipitate that followed was carefully observed [16] **.**

b. **Detection of glycosides**

Bontrager's test: The powdered plant material or extract was heated in a test tube with 1ml of sulfuric acid for a brief period of time. While it was still hot, the mixture was agitated with an equivalent volume of chloroform before being filtered. Diluted ammonia was added in half the solvent volume to the separated lower layer and shaken. When the ammoniacal layer is rose pink to crimson in colour, glycosides are present [14] .

c. Detection of steroids

Liebermann-Buchards test: The powdered medicine or extract was heated and cooled with a few drops of acetic anhydride added. Concentrated sulfuric acid was added from the test tube's sides. If a brown ring develops at the junction of two layers and the top layer turns green, steroids are present.

d. Detection of carbohydrates

Molisch's test: Via the test tube's sidewalls, alpha-naphthols alcohol and concentrated sulfuric acid were slowly added to the test solution. A purple to violet colour ring forms at the junction, which indicates the presence of carbohydrates 10] .

e. Detection of phenol

Ferric chloride test: Two millilitres of distilled water were used to dissolve a tiny amount of powdered medication or extract. A few drops of a 10% aqueous ferric chloride solution were also added [1] .

f. Detection of proteins

Biuret test: 1ml of 5% sodium hydroxide and 5-8 drops of a solution of copper sulphate and water were used to treat the sample. Proteins are present when a violet colour forms, which is a sign.

g. Detection of tannins

Lead acetate test: The test solution was mixed with a fundamental lead acetate solution to see if a white precipitate would form.

h. **Detection of saponins**

A drop of sodium bicarbonate solution was added to the sample, and the mixture was vigorously stirred for three minutes. It was investigated how foam that resembled a honeycomb formed.

i. Detection of Fixed Oils and Fats

A small amount of the extract was pressed between two filter sheets. An oily smear on the filter paper is a sign that fixed oils and fats are present [5].

standardisation and formulation of herbal medications

How to create an extract-containing gel (1% w/w)

A variable proportion of methyl paraben and carbopol 934 were dissolved in hot distilled water while being constantly stirred. The solution was chilled, and then propylene glycol 400 was added. The previously mentioned mixture was then combined with the additional required created leaf extracts, and the remaining distilled water was added to bring the volume to 100 ml. Tri-ethanolamine was added drop by drop to the mixture to bring the skin's pH to the correct range (6.8-7) and produce the gel's ideal consistency after completely combining all of the ingredients with steady stirring to make the Carbopol 934 gel.

Table No. 1. Herbal Gel's designed formulation code (100 ml)

Ingredients	F1	F2	F3	F4
Curcuma Longa	1%	2%	1%	1%
Thuja occidentalis	1%	1%	1%	1%
Carbopol 934	0.5%	1%	1.5%	2%
Methyl paraben	0.5%	0.5%	0.5%	0.5%
Polyethylene Glycol	2%	1%	2%	1%
Triethanolamine	2%	2%	2%	3%
Peppermint	0.5%	0.5%	0.5%	0.5%
Distilled water	Qs	Qs	Qs	Qs

Evaluation of herbal gel

a) **Physical appearance:** The physical appearance of the formulation was checked visually which comprised.

Colour: The colour of the formulations was checked out against white background.

Odour: The odour of the face washes was checked by manually.

b) **Consistency:** The consistency was checked by applying on skin.

c) **Greasiness:** The greasiness was assessed by the application onto the skin

d) ph. 20 mg of the formulation was dissolved in a beaker within 24 hours of manufacturing, and the pH was determined using a digital pH metre.

e) Washing prowess: Application of formulations to the skin was followed by an evaluation of the manual simplicity and depth of water washing.

f) Grittiness: At a magnification of 40 x, the formulations were examined microscopically to check for any aggregates or particle debris.

g) Viscosity: The viscosities of synthesised gels were determined using a Brookfield viscometer spindle#64 at 50, 60, and 100 rpm at room temperature. The appropriate dial reading on the viscometer was noted. After that, the spindle was gradually decreased. The dial reading was multiplied by the factor specified in the catalogue.

h) Spreadability: Two glass plates measuring 5 by 2 centimetres are divided between the gels in this method. The mixture was made to fit between the two slides by uniformly attaching a 100 g weight to each slide. When the weight is removed, the extra gel is scraped off. When two slides were held in position at a 45 ° angle without moving, only the lower slide got firmly locked by the clamp, allowing the higher slide to glide off freely with the assistance of a 20 gramme weight attached to the upper slide. The length of time required for the upper slide to separate from the lower glass plate has been calculated.

Spreadability = (Weight × Length) / Time

Where, S = Spreadability

L =Length of the glass plate

W=Weight tied to the upper plate

T = Time taken (sec)

i) **Stability study:** For three months, the thermos ability and shelf life of produced gels have been studied.

RESULT AND DISCUSION:

Physio-Chemical Constants

a) **Ash value**: The main components of ash are typically carbonate, phosphate, and silicates. The main components of ash are typically carbonate, phosphate, and silicates.

i. **Total ash**: The total ash content of the raw materials was calculated using a sample from the materials collected and is displayed in the table below.

S.NO.	Ingredients	Total ash (%w/w)	*Limits (%w/w)
1	Curcuma Longa	8.3±1.4	Not more than 12 1.
2	Thuja	7.6±1.2	Not more than 15

Table No. 2: Total ash value of raw material.

ii. Acid insoluble ash: From the total ash, the acid insoluble ash content of the individual raw materials determined and results enumerated below

S.NO.	Ingredients	Acid insoluble ash (%w/w)	*Limits (%w/w)
1	Curcuma Longa	0.5±1.1	Not more than 0.5
2	Thuja	1.4±1.4	Not more than 2.3

Table No. 3: Acid insoluble ash value of raw material

iv. Sulphated ash: Sulphated content of raw materials was determined, the values obtained and their acceptable limits defined are given in table

S.NO.	Ingredients	Sulphated ash value	*Limits (%w/w)
1	Curcuma Longa	7.2±1.2	Not more than 9
2	Thuja	6.4±1.4	Not more than 7

Table No. 4. Sulphated ash value of raw material

b) Extractive values

i. Water soluble extractive: Water soluble extractive values for the raw materials in water were determined and the results were given in table below

S.NO.	Ingredients	Water Soluble Extractive (%w/w)	*Limits (%w/w)
1	Curcuma Longa	24.5±1.2	Not more than 25
2	Thuja	17.4±1.5	Not more than 18

Table No. 5. Water soluble extractive value of raw material.

ii. Alcohol soluble extractive: Alcohol soluble extractive values for the raw materials in ethanol 95% were determined and the results were given in table

S.NO.	Ingredients	Alcohol Soluble Extractive (%w/w)	*Limits (%w/w)
1	Curcuma Longa	08.5±1.1	Not more than 9
2	Thuja	7.4±1.4	Not more than 7

Table No. 6. Alcohol soluble extractive value of raw material

iii. Ether soluble extractive: Ether soluble extractive values for the raw materials in ether were determined and the results were given in table

S.NO.	Ingredients	Ether Soluble Extractive (%w/w)	*Limits (%w/w)
1	Curcuma Longa	2.4±1.1	Not more than 1
2	Thuja	2.4±1.4	Not more than 3

Table No. 7: Ether soluble extractive value of raw material.

c) Moisture content

i. Loss on drying: Loss on dry analysis in the raw materials were carried out and the results were recorded and results in Table

S.NO.	Ingredients	LOD (%w/w)	*Limits (%w/w)
1	Curcuma Longa	4.5	Not more than 12
2	Thuja	6.3	Not more than 11

Table No. 8: Loss on drying value of raw material

Extracts % yield:

All shade-dried species' raw plant components were extracted in an extractor utilising maceration methods and the universal solvent ethanol. Each and every extract was concentrated using the rotating vacuum evaporator. The dried weight of the plant components was used to calculate the yield percentage for each extract**.** The colour and consistency of the concentrated extracts are given in table below

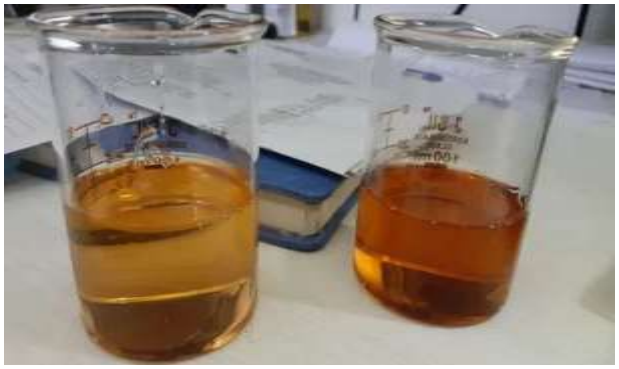

Fig. 1: Pictures of obtained extracts

S.NO.	Plant name	Solvent	Method of extraction	Physical nature	Colour	Yield (%w/w)
1	Curcuma Longa	Ethanol (95%)	Maceration	Semisolid	Dark yellow	5.67
2	Thuja			Semisolid	Dark green	5.5

Table No. 9: Percentage yield of extracts

Qualitative estimation of phytoconstituents:

Analyses of the preliminary phytochemical content of raw materials:

A qualitative phytochemical analysis was carried out in accordance with industry standards to identify the various phytoconstituents present in the raw material powders and all of the extracts**.**

The results are given in the Table.

Chemical constituents	Curcuma Longa		Thuja	
	Powder	Extract	Powder	Extract
Steroids	-	-	-	-
Glycosides	+	-	-	-
Phenols	+	+	+	+
Flavonoid	+	+	+	+
Tannins	-	+	+	+
Protein	+	+	+	+
Alkaloids	-	-	-	+

+ indicates presence, - indicates absence

Table No. 10: Analyses of the preliminary phytochemical content of raw materials

ii. IR spectroscopy of the extracted compounds.

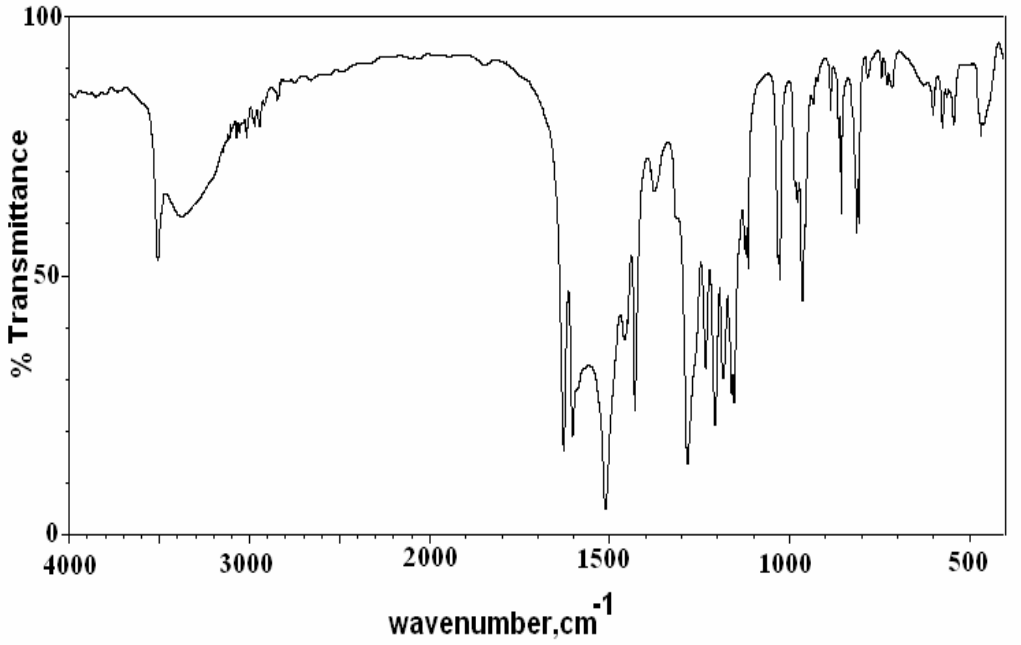

Figure 7: The infrared spectrum of any molecule or medication reveals the groups that are present in that specific compound. With a Perkin Elmer IR Spectrophotometer, the extract of Curcuma longa was measured for its IR spectra. Several IR spectra peaks were observed. Considered to indicate the existence of many groupings

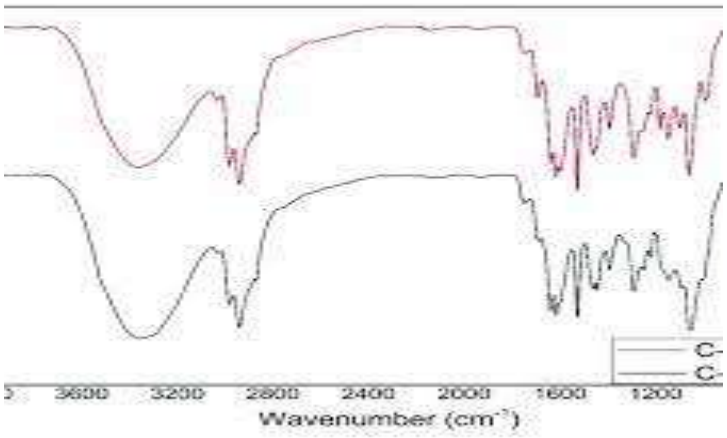

Figure 8 shows the groups that are present in the infrared spectrum of any chemical or medication. Using a Perkin Elmer IR Spectrophotometer, the IR spectra of an extract of Thuja Occidentalis were captured. There were several IR spectra peaks seen. seen as proof that various groups were present.

Fig. 2: Prepared gel without extract

Fig. 3: Prepared gel with extract

EVALUATION OF PREPARED HERBAL GEL

a) **Physical appearance:** The resulting gel's organoleptic properties, including appearance, colour, and odour, were evaluated. The visual appearance of the formulation was evaluated, and the outcomes are shown in the table.

s.no.	Formulation code	**Odour**	**Colour**
1	**F1**	Resinous	Yellowish Green
2	**F2**	Resinous	Yellowish Green
3	**F3**	Resinous	Yellowish Green
4	**F4**	Resinous	Yellowish Green

Table no. 11: Results for organoleptic properties of formulations.

b) **Consistency:** The prepared formulations produce semisolid consistency, as demonstrated by visual examination. The results are shown in a table.

s.no.	Formulation code	Consistency
1	**F1**	Soft
2	**F2**	Soft
3	**F3**	Soft
4	**F4**	Soft

Table no. 12: Results for consistency of formulations.

c) **Greasiness:** The formulated compositions don't feel greasy when applied to the skin. The findings are presented in a table.

s.no.	Formulation code	Greasiness
1	**F1**	No Greasiness
2	**F2**	No Greasiness
3	**F3**	No Greasiness
4	**F4**	No Greasiness

Table no. 13: Results for consistency of formulations.

d) pH: It was determined that the formulation's pH was satisfactory and in the range of 5.6 to 5.8. Since the pH is close to that of the skin, the produced formulation may be compatible with skin. The results are shown in a table**.**

s.no.	Formulation code	PH
1	**F1**	6.7
2	**F2**	6.8
3	**F3**	7
4	**F4**	7.1

Table no. 14: Results for pH of formulations.

g) Washability: Water was easily used to wash the prepared formulations. Table presents the outcomes.

s.no.	Formulation code	Washability
1	**F1**	Easily washed
2	**F2**	Easily washed
3	**F3**	Easily washed
4	**F4**	Easily washed

Table no. 15: Results for wash ability properties of formulation

e) **Homogeneity**: The created formulation was homogenous, free of fibres and particles, and had uniform colour dispersion, according to a visual inspection. The results are shown in a table.

s.no.	Formulation code	Homogeneity
1	**F1**	Good
2	**F2**	Good
3	**F3**	Good
4	**F4**	Good

Table no. 16: Results for homogeneity of formulations

f) **Grittiness:** The prepared formulation are shows no grittiness. The results are shown in table

s.no.	Formulation code	grittiness
1	**F1**	No
2	**F2**	No
3	**F3**	No
4	**F4**	No

Table No. 17: Results for grittiness properties of formulations.

g) **Spreadability**: The Spreadability studies showed that all formulations have better Spreadability.

s.no.	Formulation code	Spreadability
1	**F1**	Good
2	**F2**	Good
3	**F3**	Good
4	**F4**	Good

Table No. 18: Results for Spreadability properties of formulations.

h**) Stability study**: During stability studies all formulation produces good results during 3 months and the results are shown in the table.

S.NO.	Formulation code Parameters	F1	F2	F3	F4
1	COLOUR	Yellowish green	Yellowish green	Yellowish green	Yellowish green
2	ODOUR	Pungent	Pungent	Pungent	Pungent
3	PH	Good	Good	Good	Good
4	HOMOGENEITY	Good	Good	Good	Good
	SPREADABILITY	Good	Good	Good	Good

Table No.19: Results for stability of formulations

CONCLUSION:

Curcuma and Thuja plant powder and extracts underwent phytochemical testing to assure the quality and purity of the priceless medicinal herbs.

To identify the presence of an active principle in plants, preliminary phytochemical screening was done on all of the plants and their extracts. From a variety of plant powders, the active ingredients were extracted using ethanol.

All of the extract's qualitative measurements of its total flavonoid content and total phenolic content using spectrophotometry showed significant amounts of both phenolic and flavonoid components. A water soluble polymer called Carbopol 934 was utilised to make a poly herbal gel that enhances the absorption of plant extracts for topical medication administration.

In this study, semisolid formulations that contained an ethanolic extract of the multi-herbal gel used to treat skin conditions were created and reported. Both the total concentration of flavonoids and phenolic compounds, which served as the study's bioactive markers, were looked at for phytochemical analysis. To guarantee the quality, safety, and effectiveness of the manufactured herbal gel formulation, the viscosity, pH, homogeneity, Spreadability, and content uniformity of the gel were all standardised. The evaluation criteria revealed that HG 1 was the most stable and effective Formulation. The best products overall were found to be

gels. Thus, these can be investigated further for phytochemical analysis and in vitro and in vivo animal models of skin illness.

Conflict of interest:

The author has declared that no conflicts of interest exist.

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List of abbreviations:

Sr. No.	Abbreviations	Full form
1	PEG	Poly ethylene glycol
2	FTIR	Fourier transform infrared
3	DSC	Differential scanning calorimetry
4	F	Formulation
5	A	Ash value
6	C 934	Carbopol 934
7	W/O	Water in oil
8	PDI	Polydispersity index
9	TEM	Transmission electron microscopy
10	S. D	Standard Deviation
11	Min	Minute
12	BCS	Biopharmaceutics Classification System
13	Hrs.	Hours
14	S	Stability
15	w/w	Weight/weight

16	w/v	Weight/volume
17	v/v	Volume/volume
18	ACN	Acetonitrile