FORMULATION AND EVALUATION OF ANTI ARTHRITIC CREAM USING SOLANUM NIGRUM

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ABSTRACT

Joint illness known as arthritis is mostly brought on by persistent swelling around the joint, which results in discomfort, thickening and thickening of the synovial cell membrane, increased joint growth, and morphological changes. Since novel medications can only come from natural sources, the goal of the current study was to assess the methanol extract of Solanum nigrum's phytochemical testing, acute toxicity, anti-arthritic, anti-inflammatory, and analgesic properties. Results from phytochemical studies showed that steroids, alkaloids, flavonoids, and saponins were present. Oral administration of the S. nigrum extract at doses ranging from 100 to 2 g/kg resulted in 10% mortality in the acute toxicity test. When compared to control and arthritis control, the methanol extract of S. nigrum considerably (p<0.05) decreased the edema of the rat joint paw in terms of anti-arthritic activity. The rat paw oedema was considerably (p<0.05) reduced by S. nigrum extract between 1 and 4 hours after carrageenan injection, according to the results. S. nigrum in analgesic actions extract considerably (p<0.05) enhanced the tail's withdrawal time in the tail immersion test and significantly (p<0.05) decreased the number of writhes in the acetic acid-induced writhing test. The extract from S. nigrum was shown to have strong analgesic, anti-inflammatory, and antiarthritic properties.

KEYWORDS: solanum nigrum.:Cream ,Herbals;viscosity; Carbopol 940

INTRODUCTION Drug and polymer profile Plant profile Solanum nigrum

The common plant or shrub known as black nightshade (Solanum nigrum) has black berries and white blooms fashioned like stars. This plant can be found growing in fields, gardens, and along the sides of roadways.



Ayurvedic properties and actions

Habit

An annual or short-lived perennial herbaceous plant or tiny shrub with a maximum height of 1.25 meters. Although it is typically erect, or upright, in habit, plants can eventually become spreading.

EXPERIMENTAL

Methods Pharmacognostic investigation

Collection and Authentication

SOLANUM NIGRUM Collection (Linn)

The fresh leaves of SOLANUM NIGRUM (Linn) were gathered from Coimbatore, Tamil Nadu, India, on October 20, 2024.Reference specimens from the Tamilnadu Agricultural University in Coimbatore (Collection numbers 299, 300, 6711, 12114, 26644) were used to authenticate the plant and are now stored in the Herbarium for future use.

Preliminary phytochemical investigation

For medication development, a qualitative examination of the alcoholic extract revealed important phytochemical components, such as carbohydrates, alkaloids, glycosides, steroids, saponins, flavonoids, triterpenoids, and tannins. Several specialized techniques were used to find these bioactive substances.

TEST FOR CARBOHYDRATES

Molish`s test

Extract of drug and add 2 drop of 20% of alcoholic solution of α naphthol and add conc. H₂So₄ is added along the sides. Formation of purple colour and the presence of carbohydrates is confirmed.

Test for alkaloids

Dragendorff`s test

Extract of drug is dissolved in 5ml of H_2O and add 2M Hcl and add 1ml of dragendorff's reagent is added. Formation of orange red and the presence of alkaloid is confirmed.

Test for steroids, sterols

Libermann-burchard test

1ml of extract was dissolved in 2mL of chloroform. 10 drops of acetic anhydride was added followed by the addition of 2 drops of concentrated sulphuric acid formation bluish green colour was developed, indicating the presence of steroids.

Detection of glycosides

Legal test: Extract was dissolved in pyridine and then sodium nitroprusside solution was added to it and made alkaline. Pink red colour was not produced, Absence of glycosides.

Detection of saponins

Foam test

1 ml solution of the extract was diluted with distilled water to 20 ml and shaken in a graduated cylinder for 15 min. Development of stable foam suggested the presence of saponins.

Detection of flavonoids

Shinoda test

To the extract magnesium turnings and then 5-10drops dil hydrochloric acid (HCl) was added & brown colour was produced. Detection of flavonoids.

Detection of triterpenoids

Nollar's test

In the test tube 2 ml of 0.01%, anhydrous stannous chloride in thionyl chloride solution and test solution was added. No Purple colour formed indicates the absence of Triterpenoids.

Test for tannins

Extract added with ferric chloride and then dark blue colour is produced indicates the presence of tannins.

Detection of Protein and Amino Acids Biuret test

1 ml of 40% NaOH mixed with 2 drops of 1% copper sulphate was added to the extract, a bluish green colour indicated the presence of proteins and amino acids.

Test for resins

Extract was dissolved in acetone and add pour in the distilled water and yellowish green colour is appeared and indicates the presence of resins.

Test for fats and fixed oils

Extract is added in 1ml of 1% copper sulphate and 10% of NaoH IS added and appearance of dark green precipitate and indicates the presence of fats and fixed oils.

Inhibition of protein denaturation

Inhibition of protein denaturation was evaluated by the method of Mizushima and Kobayashi 1968 and Sakat *et al.* 2010 with slight modification. 400 μ L of 1% bovine serum albumin was added to 5, 10, 15, 20 and 25 μ L of plant extract. This mixture was kept at room temperature for 10 minutes, followed by heating at 51°C for 20 minutes. The resulting solution was cooled down to room temperature and absorbance was recorded at 660 nm. Phosphate buffer using as a standard. The experiment was carried out in triplicates and percent inhibition for protein denaturation was calculated using.(Job *et al.*, 1964).

100 - (O.D. of test – O.D. of product control) x

100

PERCENTAGE INHIBITION=

O.D. of Control

CONCENTRATION	ABSORBANCE (UV% INHIBITION ()F
	VISIBLE	SAMPLE	
	SPECTROSCOPY)		
5 µg/ml	0.120	10%	
10 µg/ml	0.125	14.67%	
15 µg/ml	0.144	32%	
20 µg/ml	0.150	37%	
25 µg/ml	0.167	53%	

CONTROL=0.109

FORMULATION OF CREAM PREPARATION:

The formulation of the cream begins with heating liquid paraffin and beeswax in a borosilicate glass beaker to 75°C, maintaining this temperature as it constitutes the oil phase. Simultaneously, in another beaker, borax and methylparaben are dissolved in distilled water, also heated to 75°C, to form a clear aqueous solution. Once both phases are ready, the aqueous phase is slowly added to the heated oily phase with continuous stirring. A measured amount of Solanum nigrum extract is then added, and the mixture is stirred vigorously until a smooth cream is formed.

INGREDIENTS	F1	F2	F3	F4	F5
SOLANUM NIGRUM EXTRACT	2g	2g	2g	2g	1g
BORAX	2g	2g	0.4g	0.5g	2ml
METHYL PARABEN	0.02g	0.02g	0.02g	0.02g	0.5ml
LIQUID PARAFFIN	10ml	10ml	10ml	10ml	3ml
BEES WAX	2g	3g	4g	4.5g	0.1g
DISTELLED WATER	Qs	Qs	Qs	Qs	0.5

EVALUATIONS Physical appearance

Determination of _pH

0.5 g cream was taken and dispersed in 50 ml distilled water and then p" was measured by using digital pH meter.

Instrument: Digital pH Meter (Systronics) - µ pH SYSTEM 361

Viscosity

Viscosity of cream was done by using Brooke field viscometer at a temperature of 25 °C using spindle No. 64 Instrument: Brookfield DV-E Viscometer, spindle 63. Sample – Cream

Spreadability

The spreadability was expressed in terms of time in seconds taken by two slides to slip off from the cream, placed in between the slides, under certain load. Lesser the time taken for separation of the two slides better the spreadability. Two sets of glass slides of standard dimension were taken. Then one slide of suitable dimension was taken and the cream formulation was placed on that slide. Then other slide was placed on the top of the formulation. Then a weight or certain load was placed on the upper slide so that the cream between the two slides was pressed uniformly to form a thin layer then the weight was removed and excess of formulation adhering to the slides was scrapped off. The upper slide was allowed to slip off freely by the force of weight tied to it. The time taken by the upper slide to slip off was noted.

Spread ability=mxl/t

Where, m - Standard weight which is tied to or placed over the upper slide (30g) l-length of a glass slide (5 cm) t-Time taken in seconds.

Bloom strength

Bloom strength measures how firm or soft gelatin is, and is a key indicator of gelatin quality Bloom strength is measured by how much weight (in grams) a specific type of plunger needs to press into the gel's surface by 4mm, at a specified temperature, without breaking the surface.

Extrudability

Extrudability is the amount of force required to squeeze a cream out of a tube. It's a measure of how easy it is to apply a cream.

RESULT AND DISCUSSION

pН

Sample	pH
F4	6.83



Viscosity

Rpm	Centi Poise (cP)	%torque
0.3	1756000	87.8
0.5	1085000	90.4
0.6	828000	82.8
1.0	547800	91.3

Spreadability

Sequence Title	Return to Start (Set Dist)
Test Mode	: Compression
Pre-Test Speed	1.00 mm/sec
Test Speed	3.00 mm/sec
Post-Test Speed	10.00 mm/sec
T.A. Variable No	5: 0.0 g
Target Mode	: Distance
Distance	: 23.0 mm
Strain	10.0 %
Trigger Type	: Button
Trigger Force	: 5.0 g
Points per second	200
Test Run by	Copha



Test ID	Batch		Firmness	Work of Shear
			g	g.sec
			Force 1	Area F-T 1:2
Start Batch Unknown	Unknown			
cream spreadbility1	Unknown		780.436	746.106
End Batch Unknown	Unknown			
Average:	Unknown (F)	AVERAGE("BATCH")	780.436	746.106
S.D.	Unknown (F)	STDEVP("BATCH")	0.000	0.000
C.V.	Unknown (F)	STDEVP("BATCH")/AVERAGE("BATCH")*100	0.000	0.000
End of Test Data				

Bloom strength

Sequence Title	Return to Start (Set Dist)
Test Mode	Compression
Pre-Test Speed	1.00 mm/sec
Test Speed	3.00 mm/sec
Post-Test Speed	10.00 mm/sec
T.A. Variable No	5: 0.0 g
Target Mode	Distance
Distance	5.0 mm
Strain	10.0 %
Trigger Type	Auto (Force)
Trigger Force	5.0 g
Points per second	200
Test Run by	Copha



Excludability

-	
Sequence Title	Return to Start (Set Dist)
Test Mode	Compression
Pre-Test Speed	1.00 mm/sec
Test Speed	1.00 mm/sec
Post-Test Speed	10.00 mm/sec
T.A. Variable No	5: 0.0 g
Target Mode	Distance
Distance	20.0 mm
Strain	10.0 %
Trigger Type	Auto (Force)
Trigger Force	:5.0 g
Points per second	400
Test Run by	Copha



Test ID	Batch		Firmness
			g
			Mean F 1:2
Start Batch Unknown	Unknown		
eam 21.01. extrudability	Unknown		3337.729
End Batch Unknown	Unknown		
Average:	Unknown (F)	AVERAGE("BATCH")	3337.729
S.D.	Unknown (F)	STDEVP("BATCH")	0.000
C.V.	Unknown (F)	STDEVP("BATCH")/AVERAGE("BATCH")*100	0.000
End of Test Data			

CONCLUSION

The herbal cream was light green in color and translucent in appearance and gave smooth feel on application which was maintained long storage period. The plant Solanum nigrum was selected for the study, whose extract is very useful in the treatment of Anti-Arthritic activity. A literature survey revealed that plant is used traditionally for Anti- Arthritic activity. Extensive scientific studies have not been performed on this plant. It is an attempt made to establish a cream containing Solanum nigrum. The studies revealed that the developed single herbal formulation consisting of Solanum nigrum. F4 is comparatively better than other formulations with basic appearance and based on other evaluation studies. It is Anti- Arthritic activity was not undertaken for any scientific study with herbal cream. Hence the present work was performed. This cream formulation may give Anti- Arthritic activity based on further in vitro and Clinical studies.

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