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Research Article

Exploring The Anti-Inflammatory Efficacy of a Novel Polyherbal Churna

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ABSTRACT

Inflammation is a central feature of many chronic diseases including arthritis, immune-mediated disorders, and cardiovascular conditions. This study aims to prepare and evaluate the anti-inflammatory properties of a novel polyherbal churna composed of Ashwagandha, Nirgundi, and Sunthi. The herbs were authenticated and processed as per Ayurvedic procedures. The powdered ingredients were mixed in the ratio 2:1:1 (Ashwagandha: Nirgundi: Sunthi) and evaluated through organoleptic, physicochemical, and phytochemical tests. Anti-inflammatory activity was assessed using protein denaturation assay [1] . The B2 batch showed 53.24% inhibition at 100 µg/ml concentration in protein denaturation assay, compared to 61.68% for Diclofenac sodium. The IC50 of the B2(Ashwagandha and Nirgund) batch was found to be 94.32 µg/ml. The results validate the traditional use of polyherbal churna for anti-inflammatory activity and highlight its potential as a safer alternative to synthetic drugs [2].

INTRODUCTION

1.1 Polyherbal Churna: Definition and Significance in Traditional Medicine Ayurveda and other alternative medicine systems have traditionally used polyherbal churna, a finely ground combination made of several therapeutic plants. Combining several herbs increases medicinal efficacy while reducing side effects, according to the theory of polyherbalism. Polyherbal formulations, as opposed to single-herb therapies, utilize the various bioactive substances found in various plants to provide a wide range of therapeutic benefits [3]

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1.2 Polyherbal churnas are used in traditional medicine, including Ayurveda, to treat a range of diseases, including as immune system imbalances, respiratory disorders, digestive problems, and inflammation. These formulations have a long history of therapeutic use and are frequently made from ancient writings that have been handed down through the generations. These conventional therapies have begun to be tested by modern research, showing their potential in modern medicine.

Historical Churnas and Ayurvedic Texts

Some well-known historical churnas that are mentioned in Ayurvedic literature include:

Triphala Churna: for purifying and digestion

Avipattikar Churna: for digestion and acidity

Sitopaladi Churna -for the sake of respiratory health [4]

2. MATERIAL AND METHOD:

2.1 Herbal Components:

1. Ashwagandha [5]. **–**

Table No.1

Parameter	Details
Common Name	Ashwagandha
Scientific Name	Withania somnifera
Family	Solanaceae
Description of the Plant	This little shrub has yellow flowers and is used medicinally for its roots and berries.
Nutritional Content	Contains withanolides, alkaloids, iron, and amino acids
Pharmacological Properties	Adaptogenic, Anti-stress, Anti-inflammatory, Antioxidant
Uses	Used to reduce stress, boost energy, enhance stamina, and improve immunity

2. Nirgundi [6] **–**

Table No.2

Parameter	Details
Common Name	Nirgundi
Scientific Name	Vitex negundo
Family	Verbenaceae
Plant Description	3 m tall shrub or small tree; trifoliate or pentafoliate leaves with hair
Nutritional Content	High in stable Vitamin C; various bioactive compounds
Pharmacological Properties	Antioxidant, Antihistamine, Anti-inflammatory, Analgesic
Uses	External use for pain relief, antimicrobial protection, wound healing, internal medicinal use

3. Sunthi [7] **–**

Table No.3

Parameter	Details
Common Name	Sunthi (Dry Ginger)
Scientific Name	Zingiber officinale
Family	Zingiberaceae
Plant Description	Underground rhizome of the ginger plant; pale yellow to brown in color
Nutritional Content	Rich in gingerol, shogaol, and essential oils
Pharmacological Properties	Anti-inflammatory, Antioxidant, Digestive aid, Anti-nausea
Uses	Used in digestive disorders, colds, sore throat, inflammation, and as a spice

2.2 How to prepare churna:

The formulation was created using raw materials such 15g of ashwagandha (Withania somnifera), 7.5g of nirgundi (Vitex negundo), and 7.5g of Sunthi (Zingiber officinale). The microscopic features of the powdered medicine are employed for authentication. The material was finally ground. After applying filter number 60, the final powdered raw materials were combined in the proper ratio of 15 grams of ashwagandha, 7.5

grams of nirgundi, and 7.5 grams of Sunthi. An airtight container was used to store the churna [8].

2.3 Preparation Procedure: -

Drying: Powders are dried after grinding.

Size Reduction: Raw materials are ground using a powered mixer.

Weighing: Ingredients are measured some in small, others in large quantities depending on the batch.

Mixing: All weighed ingredients are mixed thoroughly.

Filling: The final churna is transferred to the filling section and measured.

Packaging: Products are packed, labeled with details, and sent to the warehouse for delivery [9] .

2.4 Anti-Inflammatory Assay:

Experimental process:

Protein denaturation technique for in vitro anti-inflammatory activity 0.4 mL of fresh hen's egg albumin, 5.6 mL of phosphate buffered saline (PBS, pH 6.4), and 100 µL of a sample with varying concentrations made up the reaction mixture (10 mL). As a control, a comparable volume of double-distilled water was used. After 15 minutes of incubation at 370°C, the mixtures were heated to 70°C for five minutes. After cooling, the vehicle was used as a blank to measure their absorbance at 660 nm. In order to determine absorbance, diclofenac sodium at the concentration was used as a reference medication and handled identically. Description of the Plant This little shrub has yellow flowers and is used medicinally for its roots and berries.

% Inhibition = C –T/

Where,

T = absorbance of test sample

C = absorbance of control

3. RESULT:

3.1 Observation Table-

Table No.4

Sr. No	Sample Code	Concentrations (µg)
1	B1: B2	500:500 (µg)
2	B2: B3	500:500 (µg)
3	B3: B1	500:500 (µg)

(B1: Sunt Powder B2: Ashwagandha Powder B3: Nirgundi Powder) As indicated in the table below, the various concentrations of the provided samples were first combined and homogenized using a vortex mixer. Following homogenized powder compound production and testing for anti-inflammatory efficacy, the B2 (Ashwagandha and Nirgundi) batch was selected for additional research based on a preliminary screening.

3.2 Observation Table:

Table No.5

			Protein Denaturation Assay					
Sr. No	Sample code	Concentration (µg/ml)	Absorbance at 660nm					
			Test 1	Test 2	Test 3	Mean	% Inhibition	IC50 (µg/ml)

1	Control		1.54	1.54	1.54	1.54	-	76.11
2	Standard (Diclofenac Sodium)	20	1.43	1.44	1.43	1.43	7.14%	
		40	1.20	1.20	1.22	1.20	22.07%	
		60	0.96	0.97	0.98	0.97	37.01%	
		80	0.72	0.72	0.71	0.71	53.89%	
		100	0.59	0.61	0.59	0.59	61.68%	
3	B2 (mix batch)	20	1.33	1.36	1.38	1.35	12.33%	94.32
		40	1.28	1.26	1.30	1.28	16.88%	
		60	0.96	0.98	0.94	0.96	37.66%	
		80	0.84	0.85	0.87	0.85	44.80%	
		100	0.72	0.72	0.72	0.72	53.24%	

3.3 Graphical Data

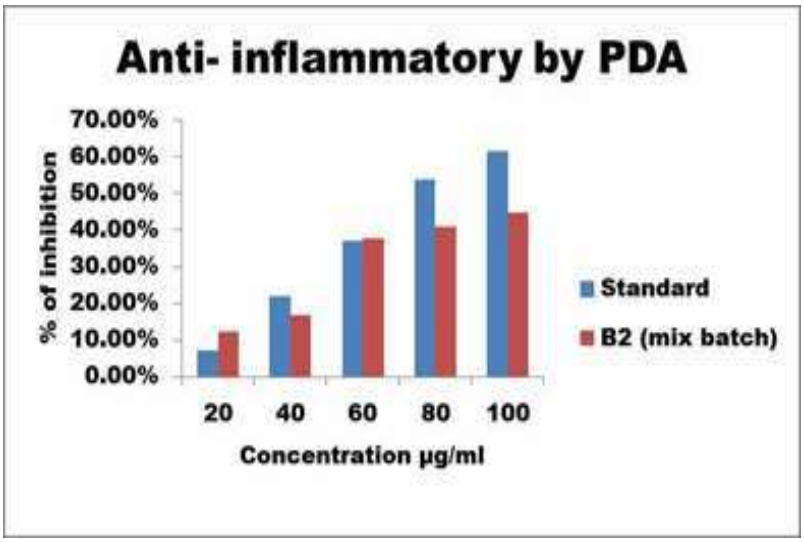

Fig No. 1

3.4 Images of the Activity:

Fig No. 2

Fig.no. 3

3.5 Evaluation Parameters:

1. Ashwagandha [10]

Table No.6

Sr. No.	Phytochemical Test	Reagent/Method	Observation (Positive Result)
1	Mayer's Test (Alkaloids)	Mayer's reagent (Potassium mercuric iodide) + extract	Cream-colored precipitate indicates presence of alkaloids
2	Wagner's Alkaloids	TestIodine in KI, Wagner's reagent, plus extract	The presence of alkaloids is indicated by a reddish-brown precipitate.
3	Dragendorff's Test (Alkaloids)	Dragendorff's reagent + extract	Orange or red precipitate indicates presence of alkaloids
4	Hager's Test (Alkaloids)	Hager's reagent (Saturated picric acid) + extract	Yellow precipitate indicates presence of alkaloids
5	Foam Test (Saponins)	Shake extract with water	Persistent foam indicates presence of saponins

2. Nirgundi [11]

Table No.7

Sr. No.	Phytochemical Test	Reagent/Method	Observation (Positive Result)
1	Mayer's Test (Alkaloids)	Mayer's reagent (Potassium mercuric iodide) + extract	Cream-colored precipitate indicates presence of alkaloids
2	Wagner's Test (Alkaloids)	Wagner's reagent (Iodine in KI) + extract	Reddish-brown precipitate indicates presence of alkaloids
3	Dragendorff's Test (Alkaloids)	Dragendorff's reagent + extract	Orange or red precipitate indicates presence of alkaloids
4	Hager's Test (Alkaloids)	Hager's reagent (Saturated picric acid) + extract	Yellow precipitate indicates presence of alkaloids
5	Foam Test (Saponins)	Shake extract with water	Persistent foam indicates presence of saponins

3.Sunthi [12]

Table No.8

Sr. No.	Phytochemical Test	Reagent/Method	Observation (Positive Result)
1	Mayer's Test (Alkaloids)	Mayer's reagent (Potassium mercuric iodide) + extract	Cream-colored precipitate indicates presence of alkaloids
2	Wagner's Test (Alkaloids)	Wagner's reagent (Iodine in KI) + extract	Reddish-brown precipitate indicates presence of alkaloids
3	Dragendorff's Test (Alkaloids)	Dragendorff's reagent + extract	Orange or red precipitate indicates presence of alkaloids
4	Hager's (Alkaloids) Test	Saturated picric acid, Hager's reagent, plus extract Alkaloids are present	yellow precipitate forms.
5	Saponins Foam Test	Mix the extract with water	The presence of saponins is indicated by persistent froth.

3.6 Moisture content [13]

Table No.9

Parameter	Ashwagandha Powder	Sunthi Powder	Nirgundi Powder
Petri Dish Preparation	105°C for 20 min	105°C for 20 min	105°C for 20 min
Sample Preparation	3 gm	3 gm	3 gm
Using a hot air oven for drying	±35°C for 20 min	±35°C for 20 min	±35°C for 20 min
Weight of Sample + Crucible (Ws)	31 g	31 g	31 g
Drying (Hot Air Oven)	±35°C for 20 min	±35°C for 20 min	±35°C for 20 min
Weight of Sample + Crucible (Ws)	31 g	31 g	31 g
Weight of Crucible (W1)	28 g	28 g	28 g
Weight of Crucible + Dry Sample (W2)	30.40 g	29.92 g	29.68 g
Moisture Content Calculation	Value 1	Value 2	Value 3
((Ws - W2) / (Ws - W1)) × 100 =	93.61%	94.58%	92.25%

3.7 Ash content [14]

Table No.10

Powder	Ash %
Ashwagandha Powder	39.00%
Sunthi Powder	16.33%
Nirgundi Powder	5.00%

4. DISCUSSION:

The polyherbal churna demonstrated significant anti-inflammatory activity, especially the B2 (Ashwagandha and Nirgund) batch, which combined synergistic effects of the three herbs.

The formulation adhered to traditional Ayurvedic methods while undergoing modern analytical validation. The results endorse its use as an effective natural remedy.

5. CONCLUSION:

The study successfully formulated and evaluated a polyherbal churna composed of Ashwagandha (Withania somnifera), Nirgundi (Vitex negundo), and Sunthi (Zingiber officinale) for its anti-inflammatory potential. The formulation process adhered to Ayurvedic principles and included standard authentication and quality control methods. In-vitro protein denaturation assays demonstrated significant anti-inflammatory activity, especially in the B2 (Ashwagandha and Nirgund) batch formulation, which showed notable percentage inhibition compared to the standard drug (Diclofenac sodium). These results support the traditional use of these herbs and suggest that such polyherbal formulations can serve as effective, natural alternatives to synthetic anti-inflammatory drugs with minimal side effects.

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