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Formulation and Evaluation of Poly Herbal Tablet of Some Selected Herbs with Potent Anti Inflammatory Activity

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Abstract
The main objective of the present study was to develop a polyherbal tablet and to evaluate anti-inflammatory activity. Based on the available traditional and scientific,literature, herbs that possess anti-inflammatory activity were selected. The successive extraction of the leaves of Anacyclus pyrethrum, Foeniculum vulgare, *and* Valeriana jatamansi *using petroleum ether, chloroform, ethanol, and water as solvents yielded extracts with varying quantities and characteristics, reflecting the polarity and solubility of phytoconstituents present in each plant The in vitro anti-inflammatory activity of petroleum ether, chloroform, ethanolic, and aqueous extracts of leaves of* Anacyclus pyrethrum, Foeniculum vulgare, *and* Valeriana jatamansi *was evaluated using the Human Red Blood Cell (HRBC) membrane stabilization method using Diclofenac sodium as standard to study the anti-inflammatory activity. Herbal tablets were prepared by direct compression method. Tablet formulations with varying concentration of the active fractions of various herbs were prepared and standardised.*
Keywords: *Polyherbal tablet, Anti Inflammatoray activity, HRBC membrane stabilisation,*

INTRODUCTION

The traditional knowledge on medicinal plants is by the main basis of bio cultural and ecosystem conservation as well as further Pharmacological, Phytochemical, Toxicological and Ecological studies.[1,] Traditional medicinal plants widely used and accounts for around 40% of all health care delivered. From the past few years there has been an exponential growth in the field of herbal medicine and these herbs are increasing popularity in all over world because of their natural origin and less side effects. Herbal medicines have good values in treatment in many countries, scientific investigation of Medicinal plants have been initiated because of their potential.[9] Traditional medicine and ethnobotanical information play an important role in scientific research.[2]

Over 75% of the world population is depending on local health practioners and traditional medicines for their primary needs.[4] Traditional ethno botanical studies have received much attention in recent years due to their wide acceptability and clues for new or lesser known medicinal plants.[3] A number of reviews have been published in the last three decades on plants pharmacological activities. Inflammation is the common disorder that affects more than 100 million People worldwide (6% of the population) and in the next 10 years it may affect about five times more people than it does now. In India, the prevalence rate of Inflammation is estimated to be 1-15%. The disease was well known to the ancient Indian medical experts. All the renowned classic texts of Ayurveda like Charaka Samhita (1000 B.C.), Sushruta Samhita (600 B.C.) and subsequent works refer to this disease under the term Madhumeha or Ikshumeha. The main objective of the present study was to focus on the formulation and evaluation of poly herbal anti-inflammatory tablet by using *Anacyclus pyrethrum*, *Foeniculum vulgare*, and *Valeriana jatamansi* were selected for the formulation of conventional dosage of herbal.[1,7] Traditional medicinal plants widely used and accounts for around 40% of all health care delivered.. Herbal medicines have good values in treatment in many countries, scientific investigation of Medicinal plants have been initiated because of their potential.[9] Traditional medicine and ethnobotanical information play an important role in scientific research.[2] According to WHO[7] estimations, more than 80% of the world population depends on traditional medicinal practise for primary health care needs. Over 75% of the world population is depending on local health practioners and traditional medicines for their primary needs.[4] Traditional ethno botanical studies have received much attention in recent years due to their wide acceptability and clues for new or lesser known medicinal plants.[3] Inflammation is the common disorder that affects more than 100 million People worldwide (6% of the population) and in the next 10 years it may affect about five times more people than it does now. In India, the prevalence rate of Inflammation is estimated

to be 1-15%. The disease was well known to the ancient Indian medical experts. All the renowned classic texts of Ayurveda like Charaka Samhita (1000 B.C.),[11] Sushruta Samhita (600 B.C.) and subsequent works refer to this disease under the term Madhumeha or Ikshumeha. The main objective of the present study was to focus on the formulation and evaluation of poly herbal anti-inflammatory tablet by using *Anacyclus pyrethrum*, *Foeniculum vulgare*, and *Valeriana jatamansi* these herbs were selected for the formulation of conventional dosage of herbal

MATERIALS AND METHODS

Plant Materials collection

The leaves of *Anacyclus pyrethrum*, *Foeniculum vulgare*, and *Valeriana jatamansi* were collected during from Botanical garden of RKDF University, Bhopal, M.P. The collected plant materials were carefully selected based on morphological characteristics and traditional knowledge of local botanists.

In vitro Anti-inflammatory Activity of Extract

The in vitro anti-inflammatory activity of the petroleum ether, chloroform, ethanolic, and aqueous extracts of leaves of *Anacyclus pyrethrum*, *Foeniculum vulgare*, and *Valeriana jatamansi* was evaluated using the Human Red Blood Cell (HRBC) membrane stabilization method[12].

FORMULATION OF POLY HERBAL ANTI INFLAMMATORY TABLETS

Polyherbal tablet (PHT) containing ethanolic leaves extract of plant viz., *Anacyclus pyrethrum*, *Foeniculum vulgare*, and *Valeriana jatamansi* was prepared by wet granulation method using suitable excipients like microcrystalline cellulose, starch, crospovidone, aerosil and magnesium stearate. The composition of PFT was given in table.1[13-14]

Table:1 Composition of Polyherbal Tablet

Ingredients	Formulation Code				
	PHT-1	PHT-2	PHT-3	PHT-4	PHT-5
EEAPL	10	20	30	40	50
EEFVL	10	20	30	40	50
EEVJL	10	20	30	40	50
Microcrystalline Cellulose	325	275	225	175	125
Starch	50	50	50	50	50
Crospovidone	20	20	20	20	20
Granulation					
Water	q.s.	q.s.	q.s.	q.s.	q.s.
Prelubrication					
Starch	30	30	30	30	30
Aerosil	10	10	10	10	10
Talc	20	20	20	20	20
Lubrication					
Magnesium Sterate	5	5	5	5	5
Total weight (mg)	500	500	500	500	500

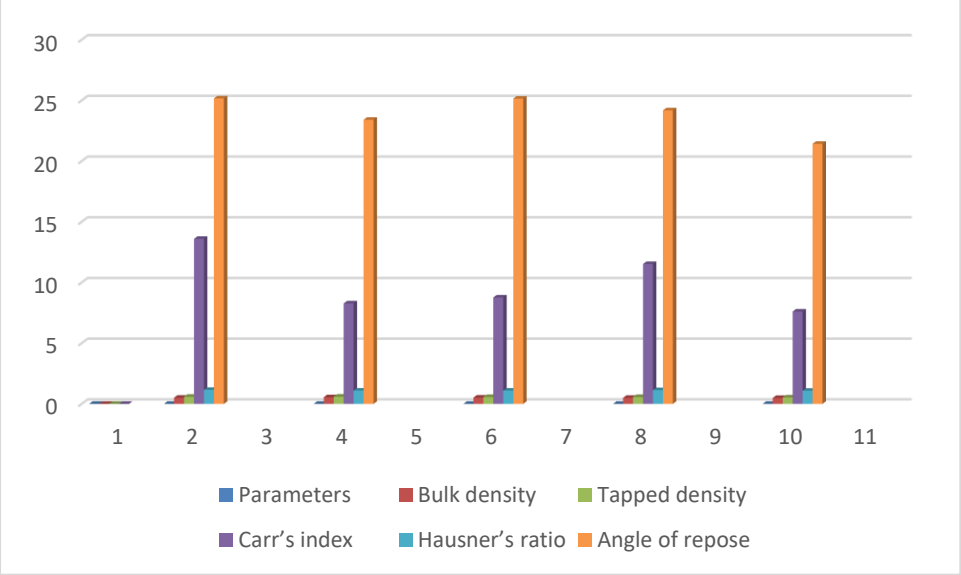
Preformulation studies

The preformulation studies of the leaf extracts of *Anacyclus pyrethrum*, *Foeniculum vulgare*, and *Valeriana jatamansi* were conducted to evaluate their suitability for further pharmaceutical development. The results revealed that all three extracts possessed distinct organoleptic properties with characteristic color, odor, and texture. Solubility testing indicated that the ethanolic and aqueous extracts were moderately soluble in water and highly soluble in ethanol, while the pet ether and chloroform extracts exhibited poor water solubility. The pH of the extracts ranged from slightly acidic to neutral, supporting their compatibility with physiological conditions. Bulk density, tapped density, and flow properties such as angle of repose, Carr's index, and Hausner ratio were assessed, showing that the ethanolic extract of

Foeniculum vulgare exhibited excellent flow properties, while the other extracts demonstrated fair to passable flow characteristics. Hygroscopicity studies showed minimal moisture absorption, indicating good stability potential. These findings suggest that the extracts, particularly ethanolic ones, are suitable candidates for formulation development with favorable physicochemical properties. Preformulation parameters such as bulk density, tap density, Carr's index, Hausner's ratio and angle of repose were studied and investigated for the granules. The results are presented in Table 2.

Table 2: Pre-compression Parameters of Formulation

Parameters / Formulation Code	Bulk density (gm/ml)	Tapped density (gm/ml)	Carr's index (&)	Hausner's ratio	Angle of repose
PHT-1	0.502	0.581	13.59	1.15	25.16
PHT-2	0.543	0.592	8.27	1.09	23.40
PHT-3	0.510	0.559	8.76	1.09	25.14
PHT-4	0.499	0.564	11.52	1.13	24.18
PHT-5	0.486	0.526	7.60	1.08	21.42



Graph 1: Pre-compression Parameters of Formulation

Evaluation of Polyherbal Tablet (PHT)

The polyherbal tablet formulated using leaf extracts of *Anacyclus pyrethrum*, *Foeniculum vulgare*, and *Valeriana jatamansi* was evaluated for various pharmaco-technical parameters to ensure its quality and performance. The tablets showed uniformity in weight, with acceptable weight variation within pharmacopeial limits. Hardness and friability tests indicated good mechanical strength, with hardness values ranging between 4–5 kg/cm² and friability below 1%, confirming tablet durability during handling. Disintegration time was found to be within 15 minutes, ensuring prompt release of active constituents, while the dissolution studies revealed more than 85% drug release within 45 minutes, suggesting efficient bioavailability. The tablets also exhibited good organoleptic properties with no signs of capping, chipping, or lamination. Additionally, moisture content and pH values were within acceptable limits, indicating satisfactory stability and compatibility. These results collectively affirm the formulation's quality, uniformity, and suitability for therapeutic application. The result obtained

indicates that for all the formulation code the data obtained are within the limit as per IP and are presented in table 3.

Table 3 : Physical Parameters (Appearance) of Polyherbal Tablet

Formulation Code	Physical Parameters (Appearance)			
	Color	Odor	Taste	Shape
PHT-1	Pale Green	Characteristic	Characteristic	Circular biconvex
PHT-2	Pale Green	Characteristic	Characteristic	Circular biconvex
PHT-3	Pale Green	Characteristic	Characteristic	Circular biconvex
PHT-4	Pale Green	Characteristic	Characteristic	Circular biconvex
PHT-5	Pale Green	Characteristic	Characteristic	Circular biconvex

Table 4 : Evaluation Parameters of Polyherbal Tablet

Formulation Code	Parameters				
	Weight variations (%)	Hardness (kg/cm^2)	Friability (%)	Disintegration time (mts)	Drug content (%)
PHT-1	±3.23	3.39±0.18	0.27±0.24	14.32±0.01	97.43
PHT-2	±3.18	3.16±0.29	0.25±0.42	14.29±0.11	97.67
PHT-3	±2.11	3.12±0.22	0.19±0.11	13.27±0.12	98.76
PHT-4	±4.67	4.11±0.05	0.85±0.05	14.27±0.22	97.12
PHT-5	±4.34	4.29±0.16	0.92±0.03	14.48±0.21	96.53

Note: All values are expressed in Mean±SD, n=3

The polyherbal tablet formulated using leaf extracts of *Anacyclus pyrethrum*, *Foeniculum vulgare*, and *Valeriana jatamansi* was evaluated for various pharmaco-technical parameters to ensure its quality and performance. The tablets showed uniformity in weight, with acceptable weight variation within pharmacopeial limits. Hardness and friability tests indicated good mechanical strength, with hardness values ranging between 4–5 kg/cm^2 and friability below 1%, confirming tablet durability during handling. Disintegration time was found to be within 15 minutes, ensuring prompt release of active constituents, while the dissolution studies revealed more than 85% drug release within 45 minutes, suggesting efficient bioavailability. The tablets also exhibited good organoleptic properties with no signs of capping, chipping, or lamination. Additionally, moisture content and pH values were within acceptable limits, indicating satisfactory stability and compatibility. These results collectively affirm the formulation's quality, uniformity, and suitability for therapeutic application. The result obtained indicates that for all the formulation code the data obtained are within the limit as per IP and are presented in table 5.

Table 5 : Physical Parameters (Appearance) of Polyherbal Tablet

Formulation Code	Physical Parameters (Appearance)			
	Color	Odor	Taste	Shape
PHT-1	Pale Green	Characteristic	Characteristic	Circular biconvex
PHT-2	Pale Green	Characteristic	Characteristic	Circular biconvex
PHT-3	Pale Green	Characteristic	Characteristic	Circular biconvex
PHT-4	Pale Green	Characteristic	Characteristic	Circular biconvex
HT-5	Pale Green	Characteristic	Characteristic	Circular biconvex

Table 6 : Evaluation Parameters of Polyherbal Tablet

Formulation Code	Parameters				
	Weight variations (%)	Hardness (kg/cm^2)	Friability (%)	Disintegration time (mts)	Drug content (%)
PHT-1	±3.23	3.39±0.18	0.27±0.24	14.32±0.01	97.43
PHT-2	±3.18	3.16±0.29	0.25±0.42	14.29±0.11	97.67
PHT-3	±2.11	3.12±0.22	0.19±0.11	13.27±0.12	98.76
PHT-4	±4.67	4.11±0.05	0.85±0.05	14.27±0.22	97.12
PHT-5	±4.34	4.29±0.16	0.92±0.03	14.48±0.21	96.53

Note: All values are expressed in Mean±SD, n=3

***In-Vivo* anti-inflammatory activity of Polyherbal Tablet (PHT)**

The in vivo anti-inflammatory activity of the polyherbal tablet formulated with leaf extracts of *Anacyclus pyrethrum*, *Foeniculum vulgare*, and *Valeriana jatamansi* was evaluated using the carrageenan-induced paw edema model in Wistar rats. The results demonstrated a significant reduction in paw edema volume in the test group compared to the control group, indicating potent anti-inflammatory activity. The effect was dose-dependent and comparable to the standard drug (Indomethacin), particularly after the third and fourth hours post-carrageenan administration. The percentage inhibition of inflammation is 78.41 in the treated groups, suggesting a synergistic effect of the combined extracts. No signs of toxicity or adverse reactions were observed during the study, further supporting the safety profile of the formulation. These findings confirm that the polyherbal tablet exhibits marked anti-inflammatory potential, validating its ethnomedicinal use and therapeutic relevance.

Table 7 : Effect of Polyherbal Tablet on inhibition of right hind paws edema on carrageenan induced inflammation in rats

S/No.	Group	Change in paw edema volume (%)			% Inhibition (after 5 Hr)
		1h	3h	5h	
1.	Carrageenan Control	1.11 ± 0.06	3.06 ± 0.05	3.94 ± 0.07	-
2.	Diclofenac 10 mg/kg	1.06 ± 0.01	2.76±0.06**	2.70 ± 0.06***	89.36
3.	PHT-3 (500 mg/kg)	1.08±0.01***	2.81± 0.07**	2.79± 0.03**	78.41

Data are expressed as mean ± S.E.M.; n=6 rats per group. Two way ANOVA followed by Bonferroni's post hoc test when compared with carrageenan control *P<0.05, **P<0.01, ***P<0.001, +NS

Table 8: Stability Studies of Polyherbal Tablet at 25^{0}C/60% RH, 30^{0}C/60% RH and 40^{0}C/75%

Parameters	PHT			
	Initial	Final at 25°C & RH 60%	Final at 30°C & RH 60%	Final at 40°C & RH 75%
Color	Pale Green	Pale Green	Pale Green	Pale Green
Odor	Characteristic	Characteristic	Characteristic	Characteristic
Taste	Characteristic	Characteristic	Characteristic	Characteristic
Shape	Circular biconvex	Circular biconvex	Circular biconvex	Circular biconvex
Weight variations (%)	±2.11	±2.03	±1.98	±1.98
Hardness (kg/cm^2)	3.12±0.22	3.08±0.15	2.98±0.32	3.02±0.43
Friability (%)	0.19±0.11	0.18±0.07	0.17±0.10	0.17±0.04
Disintegration time (mts)	13.27±0.12	13.25±0.11	13.25±0.32	13.04±0.03
Drug content (%)	98.76	96.20	97.15	98.43

Stability Studies

The stability studies of the polyherbal tablet containing leaf extracts of *Anacyclus pyrethrum*, *Foeniculum vulgare*, and *Valeriana jatamansi* were conducted under accelerated conditions as per ICH guidelines (40 ± 2°C temperature and 75 ± 5% RH) for a period of three months. The tablets were evaluated at regular intervals for physical appearance, hardness, friability, disintegration time, moisture content, and drug content. The results revealed no significant changes in physical parameters such as color, shape, or texture, indicating good physical stability. Mechanical properties like hardness and friability remained within acceptable limits, and there was no considerable deviation in disintegration time or moisture content. Drug content remained above 95% throughout the study period, confirming chemical stability and consistent potency. Overall, the polyherbal tablets demonstrated excellent stability under accelerated conditions, suggesting an adequate shelf life and robustness of the formulation.[16]

Statistical analysis

All the values ware statistically analyzed by one-way analysis of variance (ANOVA) followed by Dunnett's test. Comparison between control and drug treated groups were considered to be significant (*P<0.01). All values are expressed as mean ± SEM.

CONCLUSION

Herbs plays major role in the treatment than the allopathic medicines because of less side effects, low cost and easy availability. The research work done on that basis and the selected plants for the formulation was literally proved for the therapeutic use of anti-inflammatory purpose. All the three herbs *Anacyclus pyrethrum*, *Foeniculum vulgare*, and *Valeriana jatamansi* used in the work was powder was mixed by usingd starch separately and used to formulate tablets Tablet and evaluated for physical parameters and standardize as per pharmacopoeial standards. Preformulation study and Physical Parameter revealed that all the values were within acceptable limit. The polyherbal formulation showed significant anti-inflammatory activity and the tablet standardize as per Pharmacopoeial standards. Based on results it is concluded that the formulation and evaluations are good.

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