



Formulation and Evaluation of Anthelmintic Suspension by using Bael leaf Extract

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Abstract: The creation and assessment of an anthelmintic suspension with Bael (*Aegle marmelos*) leaf extract are the main objectives of the study. The medicinal qualities of Bael leaf, such as its anthelmintic activity, which aids in the treatment of parasitic worm infestations, have long been utilised in herbal therapy. The Bael leaf extract was made, standardised, and added to an oral suspension formulation for this study. In vitro studies against common intestinal parasites were used to assess the effectiveness of the anthelmintic. The physicochemical characteristics of the suspension were evaluated, including its stability, pH, and viscosity. Significant anthelmintic action was shown by the formulation, offering a safe and natural substitute for synthetic anthelmintic medications. The findings imply that Bael leaf extract is a viable option for creating potent plant-based anthelmintic solutions.

Key Words: Anthelmintic suspension, *Aegle marmelos*, Bael leaf extract, Helminth infections, Herbal medicine, Natural dewormer, Phytopharmacology.

INTRODUCTION

Bael leaves, known as Bilva leaf, is a tropical plant also native to India and widely found in Southeast Asia. The Bael tree produces these leaves, which hold significant cultural, medicinal, and spiritual value, particularly in Hinduism. Bael tree is a significant medicinal species in India. Bael trees are native in India and thrive abundantly in the Himalayan regions, Bengal, Central and South India, as well as in Sri Lanka, Burma, Thailand, Bangladesh, Nepal, Vietnam, Laos, Cambodia, and Pakistan. The leaves of Bael leaves of the Bael tree are offered to the Indian deity, Lord Shiva and thus, the tree is frequently planted in temples. In scientific name of Bael is *Aegle marmelos* L. (Family: Rutaceae), commonly referred to as Bael in Hindi, is a significant food plant in India. Historically, the leaves have been utilized to manage helminthic activity, and other issues. The leaves of *Aegle marmelos* are abundant in alkaloids, flavonoids, tannins, coumarins, carotenoids, and terpenoids. Key bioactive compounds include aegeline, rutin, quercetin, and kaempferol.[1] The leaves are trifoliate and arranged alternately, with each leaflet measuring 5-14 cm (2-5+ ½ in) by 2-6 cm (¾-2=1/4 in). They ovate with a pointed tip tapering to a rounded base, either smooth or have shallow rounded teeth. Young leaves appear pale green or pink and are finely hairy, while mature leaves are dark green and have a completely smooth texture. Each leaf possesses 4-12 pairs of lateral veins that are connected at the edges. The process of collecting, verifying, and extracting *Aegle marmelos* leaves is essential. While bael leaves are generally considered safe, it's important to consult a health care provider before using them for medicinal purposes, especially if you are pregnant, breastfeeding, or have any existing medical conditions.[2]

Bael leaf widely used in traditional Indian medicine (Ayurveda) for their various medicinal properties, including anti-diarrheal, anti-inflammatory, antioxidant, and digestive benefits; they are often used to treat stomach ailments like diarrhea, dysentery, ulcers, and indigestion, with the leaves being consumed as a decoction, poultice, or applied topically; the leaves are also considered to have anti-diabetic potential and can be used to manage blood sugar levels; due to their astringent nature, they may also be used to treat wounds. In the treatment of jaundice, asthma, it is found to be very useful. Bael leaves are a good aid in removing mucilage secretion from bronchial tubes.



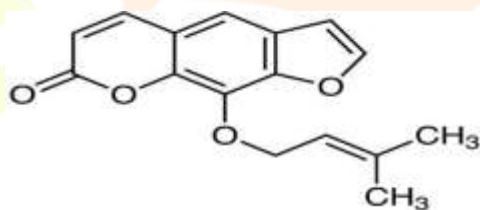
Helminthiasis is a parasitic illness that primarily imparts disadvantaged communities around the globe. The occurrence of this disease is associated with low living standards and inadequate sanitation. Parasitic helminths typically spread, leading to helminthiasis, through the consumption of improperly cooked meat, contaminated vegetables, and polluted water. The most common helminths responsible for helminthiasis in humans include *Ascaris lumbricoides*, *Ancylostoma duodenale*, *Trichuris*, schistosomes, and filarial worms.^[3]

1. BIOMARKER PROFILE

MARMELOSIN:

It is a Coumarin derivative found in the *Aegle marmelos* leaves. Specifically, it is a furanocoumarin. Marmelosin is considered a biomarker for the *Aegle marmelos* fruit and leaves. A biomarker is a unique chemical compound that can be used to identify a specific plant, animal, or substance. In this case, Marmelosin is a distinctive compound found in the *Aegle marmelos* fruit and leaves, making it a useful biomarker for authentication and identification purposes.^[33]

Structure of marmelosin:



Invitro anthelmintic activity of various extracts of target Aegle marmelos leaves on earthworm (Pheretima posthuma)

Groups	Concentration used (mg/ml)	Time taken for paralysis (min)	Time taken for death (min)
Standard (Albendazole)	0.1ml	45	-
	0.01ml	37	-
Suspension prepared with ethanolic extract of the sample	12ml	10	18
	14ml	8	14

Suspension prepared with aqueous extract of the sample	3ml	10	20
	2ml	19	20

P^H OF THE BAEL SUSPENSIONS:

F1	F2	F3	F4
1.9pH	2.6pH	3.7pH	4.8pH

Table.pH of the suspension

VISCOSITY:

S.NO	F1	F2	F3	F4
1	652.2mpa×sec	667.9mpa×sec	675.3mpa×sec	692.9mpa×sec

TABLE.VISCOSITY FOR BAEL SUSPENSION

SEDIMENTATION VOLUME:

TIME	H_u/H_oF1	H_u/H_oF2
0	1	2
5	0.75	0.98
10	0.74	0.97
15	0.72	0.96
20	0.73	0.96
25	0.75	0.95
30	0.73	0.94
45	0.71	0.91
60	0.5	0.8

Table.Sedimentation volume for F1 & F2

TIME	H_u/H_oF3	H_u/H_oF4
0	3	4
5	0.98	1.98
10	0.98	1.96
15	0.97	1.96
20	0.97	1.92
25	0.96	1.9
30	0.9	1.89

45	0.98	1.88
60	0.94	1.87

Table.SedimentationVolumeforF3&F4:
3ComparisonofsedimentationvolumebetweenF3andF4formulation

TIME	F1 (H _U /H _O)	F2 (H _U /H _O)	F3 (H _U /H _O)	F4 (H _U /H _O)
0	1	2	3	4
5	0.75	0.98	0.98	1.98
10	0.74	0.97	0.98	1.96
15	0.72	0.96	0.97	1.96
20	0.73	0.96	0.97	1.92
25	0.75	0.95	0.96	1.9
30	0.73	0.94	0.9	1.89
45	0.71	0.91	0.98	1.88
60	0.5	0.8	0.94	1.87

Table Comparisonofsedimentationvolumeforfourformulations

FLOWPROPERTIES:

S.NO	F1	F2	F3	F4
1	0.56ml/sec	0.64ml/sec	1.166ml/sec	1.204ml/sec

TABLE.FLOWPROPERTIESOFBAELSUSPENSION

ASSAYOFBAELSUSPENSIONS:

F1	F2	F3	F4
92.2%	92.7%	93.9%	96.22%

TABLE. ASSAYOFTHESUSPENSION

STABILITYSTUDIES

PARAMETER	INITIAL MONTHS	AFTER 1 MONTH	AFTER 2 MONTH'S	AFTER 3 MONTHS
Storage Conditions	Room Temp (25°C ± 2°C)	Room Temp (25°C ± 2°C)	Room Temp (25°C ± 2°C)	Room Temp (25°C ± 2°C)

Physical Appearance	Clear, Greenish Brown	Slight settling of particles	Minor color change, slight turbidity	Slight turbidity, slight color fading
Active Ingredient Content	100% (Standardized)	98% (Reduction in bioactive compounds)	95% (Further decrease in active compounds)	93% (Notable reduction in bioactive compounds)
Degradation Products	None	Minor traces detected	Low level of degradation products	Moderate levels of degradation products
Anti-Helminthic Activity	Full Activity (100%)	98% Activity (Slight decrease)	93% Activity (Noticeable decrease)	90% Activity (Substantial decrease)

CONCLUSION:

The formulation and evaluation of an anthelmintic suspension using Bael leaf extract showed promising results, demonstrating significant potential for combating helminthic infections. The Bael leaf extract exhibited effective anthelmintic activity, with dose-dependent effects leading to the paralysis and expulsion of worms. This suspension was successfully formulated with desirable characteristics such as stability, appropriate viscosity, and ease of administration. The presence of bioactive compounds like coumarin, flavonoids, alkaloids, and tannins in the extract likely contributed to its therapeutic effects.

Extraction, FTIR studies show good compatibility with all the excipients. Formulation of F1 does not contain suspending agents; formulation F2, F3, F4 have suspending agents with concentrations (0.5, 1.0, 1.5, 2.0) respectively.

All the formulations were concluded by pH shows (1.9, 2.6, 3.7, 4.8) ranges. Viscosity (652.2,

667.9, 675.3, 692.9 mPa·sec), Particle size (4.25, 4, 3.3, 2.8), sedimentation rate (0.5, 0.8, 0.94, 1.87) and among which the F4 shows the better results. So, that F4 will consider has optimal formulation compared with the marketed formulation. It shows similar anthelmintic activity in which with marketed formulation based on this respectively. F4 found to be the best formulation.

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