Formulation, Development and Evaluation of a Polyherbal Tablet Containing *Moringa oleifera and Carica papaya* Leaf Extracts for the Management of Thrombocytopenia

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Abstract
A low platelet count, or thrombocytopenia, increases the risk of bleeding and delayed clotting. Because of their high concentration of flavonoids, alkaloids, and phenolic chemicals, herbal remedies—in particular, *Moringa oleifera* and *Carica papaya* leaves—have historically been shown to improve platelet synthesis. The purpose of this study were to create and assess a herbal pill that might be used to treat thrombocytopenia.
Fresh leaves were gathered, verified, cleaned, dried in the shade, and ground into a powder. The direct compression method were used to make tablets with conventional excipients after the powdered material were extracted using appropriate solvents. The physical characteristics of the prepared tablets, such as weight homogeneity, hardness, friability, disintegration time, and in vitro dissolution, were assessed, along with the phytochemical content.
The tablets met pharmacopeial criteria and preserved significant bioactive ingredients, according to the results, suggesting that they may be effective in promoting platelet synthesis.
This study shows that creating a standardized herbal pill from *Moringa oleifera* and *Carica papaya* leaves is feasible as a supplemental strategy for managing thrombocytopenia.

Keywords: *Moringa oleifera, Carica papaya*, Herbal tablet, Thrombocytopenia, Platelet Enhancement, tablet evaluation.

1. Introduction

A hematological disorder called thrombocytopenia is defined by a drop in the quantity of platelets in the blood. Thrombocytes, another name for platelets, are tiny cell fragments that are crucial to blood clotting and hemostasis [1]. They are created in the bone marrow from megakaryocytes, which are big progenitor cells. They typically stay in the bloodstream for seven to ten days [2]. Thrombocytopenia is the term for when a healthy person's platelet count is below this typical range. A decrease in the number of platelets in the blood is known as thrombocytopenia, a hematological condition [3]. Platelets, also known as thrombocytes, are microscopic cell fragments essential to hemostasis and blood coagulation [4]. They are produced in the bone marrow by large progenitor cells called megakaryocytes. Usually, they remain in the bloodstream for seven to 10 days. When a healthy individual's platelet count falls below this normal range, it is referred to as thrombocytopenia [5].
Carica papaya is a significant medicinal plant that is well known for its therapeutic and nutritional qualities [6]. Through gene expression activity, *papaya* leaf boosts platelet synthesis. Arachidonate 12-lipoxygenase (ALOX-12) and platelet activating factor receptor (PTAFR) are two genes whose activity is enhanced by *C. papaya* leaf extract. The bone marrow produces more megakaryocytes when certain genes are highly expressed [7, 8]. These megakaryocytes are the stem cells that produce platelets. As they mature, they split into tiny pieces known as platelets, which increases the production and aggregation of platelets in the blood [9, 10].
The therapeutic plant *Moringa oleifera* is high in antioxidants, vitamins, and minerals. *Moringa* may function as a supportive nutritional therapy to enhance platelet production and general blood health in thrombocytopenia, a disorder marked by a low platelet count [11,12,13,14].

2. Methodology

2.1 Procurement and Authentication of Plant materials:

The collection of *Moringa oleifera and Carica papaya* leaves done from the local area**.** The collected leaves were subjected to botanical authentication to confirm their identity. The authentication of the plant materials were carried out by Dr. Satish Kumar Sen, Botanist at V.Y..T.P.G. Autonomous College on 20/1.1/2025.

2.2 Method of extraction (Maceration):

Only mature, disease-free, and healthy leaves were chosen. They were then properly cleaned with clean water to get rid of dust and other contaminants, laid out on sanitized trays, and shade-dried for around ten days [15]. Collected plant materials subjected into a coarse powder using a mechanical grinder after they had completely dried and become brittle. For extraction, 50 g of dried powdered *Moringa oleifera* and *Carica papaya* leaves were divided into two separate batches [16]. To shield the extract from light, each batch was moved into a different amber-colored glass bottle. For the maceration procedure, 70% ethanol was used as a solvent at a 1:10 ratio (powder: solvent) [17].

The containers were firmly sealed to stop solvent evaporation and stored at room temperature for seven days during the extraction [18]. Throughout this period, the contents were occasionally shaken to enhance the extraction of phytoconstituents from the plant components [19]. Whatman filter paper No. 1 was used to filter the combination comprising the plant extract and solvent after three days of maceration. In order to carefully remove the solvent, the filtrates were subjected to solvent evaporation using a water bath. To keep the extract's heat-sensitive phytoconstituents from degrading, the temperature were kept at 40°C [20].

2.3 Phytochemical test of extracts

1. Dragendroff's Test: Clean test tubes were filled with two milliliters of each extract. After adding two to three drops of Dragendroff's reagent, the liquid were gently shaken.After letting the test tubes stand for one to two minutes, an orange-red precipitate started to form [20].

2. Test for flavonoids

Shinoda Test: Two ml of each extract were added to a test tube. A few drops of strong hydroalcoholic acid (HCl) were added after a tiny bit of magnesium ribbon. The presences of flavonoids were confirmed by gently shaking the mixture and looking for pink and orange colors [21].

3. Test for Tannins

Ferric Chloride Test: Two milliliters of each extract were put to a test tube along with two to three drops of a 5% ferric chloride ($FeCl_3$) solution. The presence of tannins were established by gently shaking the mixture and looking for a blue-black or greenish-black hue [22].

4. Phenolic compound test

2 ml of each extract were taken in a test tube and 2-3 drops of 5% ferric chloride ($FeCl_3$) solution were added. The mixtures were shaken gently and observe of blue, green coloration indicated the presence of phenolic compound [19].

5. Test for Glycoside

Keller - Killani test: 2 ml of extract were taken in a test tube treated with glacial acetic acid containing a trace amount of ferric chloride ($FeCl_3$) were added. Followed by careful addition of concentrated sulfuric acid along the side of the test tube. Formation of a brown ring at the interface indicated the presence of cardiac glycosides [18].

6. Terpenoids test

Salkowski Test: Two milliliters of each extract were put to a test tube along with two milliliters of chloroform. Next, a distinct layer were formed by carefully adding 1-2 cc of concentrated sulfuric acid down the test tube's side. The presence of terpenoids was indicated by the reddish brown color observed at the contact [23].

7. Saponin test: 2 milliliters of each extract are heated in a test tube and then vigorously shaken with 10 milliliters of distilled water for 30 seconds. noticed the development and persistence of foam on the surface [24].

2.4 FTIR (Fourier Transform Infrared Spectroscopic) Analysis

An analytical method for determining the functional groups and chemical makeup of herbal extract is Fourier Transformed Spectroscopy (FTIR) [25]. The combined extract of *Moringa oleifera* and *Carica papaya* leaves were subjected to FTIR analysis in this work. In order to validate the presence of the bioactive ingredient responsible for therapeutic efficacy, FTIR offers a chemical fingerprint of plant extract [26].

The basic idea behind FTIR is that certain frequencies of infrared radiation are absorbed by molecular bonds, resulting in vibrations like stretching, bending, or twisting. The device creates a spectrum that represents the functional groups in the combined sample by measuring the absorbance of infrared light over a range of wave numbers (4000-400 cm^{-1}) [27].

2.4 Preformulation studies

1. General appearance

The color texture, appearance, grittiness and odor of the formulated Tablet were examined visually by physical inspection [28].

2. Angle of repose determination :

The angle of repose were determined by the fixed funnel method. The powder blends were allowed to flow through a funnel fixed at a certain height onto a flat surface, forming a conical heap. The height (h) 3 cm and radius (r) 8.1 cm of the heap were measured and the angle of repose [29].

Formula: $\tan \theta = h/r$

Where,

θ = the angle of repose,

h = the pile's height,

r = the powder cone's average radius

3. Bulk density determination :

In order to determine the bulk density of each powder 10 g (M) of the sample were transferred into a 100 ml glass measuring cylinder, where the bulk volume (Vo) were noted. The following formulas were used to determine the bulk density [30].

Formula: Bulk density = weight of powder / Bulk Volume

Table 1: Ingredients of tablet formulation

Ingredients		Quantity (Mg / tablet)	
		F1 (mg)	**F2 (mg)**
Active Ingredients	*Moringa oleifera* leaves powder	67 mg	100 mg
	Carica oleifera leaves powder	67 mg	100 mg
Diluents	Lactose	27 mg	40 mg
Binder/ Disintegrate	Starch	21 mg	32 mg
Binder	PVP K-30	7 mg	10 mg
Glidant	Talc	5.5 mg	8 mg
Lubricant	Magnesium Stearate	5.5 mg	8 mg
Total		**200 mg**	**300mg**

4. Tapped Density:

The tapped density of accurately weight 10 g of powder were transferred into 100 ml graduated measuring cylinder and the initial volume were noted. The cylinder were then subjected to 50 taps until a final volume were recorded [31].

Formula: Tapped density = Weight of powder / Tapped Volume

5. Carr's Compressibility Index determination:

Carr's compressibility Index were determined to evaluate the flow properties of the powder blend. The bulk density and tapped density of the powder blend were measure using a measuring cylinder [32]. Carr's compressibility index were calculated using the formula:

Formula: Carr's Index (%) = Tapped density – Bulk density / Tapped × 100

6. Hauser's Ratio:

By dividing the tapped density by the bulk density, the Hauser ratio of the powder blend were determined. Better flow characteristics are indicated by a lower Hauser's ratio (< 1.25) than by a higher one (> 1.25) [33, 34]. Hauser's ratio can be calculated as follows:

Formula: Tapped density/ bulk density

2.5 Method of Tablet Formulations:

Wet granulation method

1. **Weighing of ingredients:** All ingredients (*Moringa oleifera*, *Carica papaya*, leaf powder, lactose, starch, PVP K-30, talc, magnesium stearate) were accurately weight using a digital weighing balance according to the formulation [35].
2. **Ingredient sieving:** To achieve consistent particle size, each ingredient—aside from talc and magnesium stearate—was run through sieve No. 60 independently [36].
3. **Dry mixing**: To create a homogenous powder blend, the weighed amounts of lactose, *Carica papaya* leaf powder, and *Moringa oleifera* were put into a mortar and thoroughly combined for ten to fifteen minutes [37].
4. **Binder solution preparation**: PVP K-30 and starch were utilized as binders. A tiny amount of cold, filtered water was mixed with starch to create a smooth slurry. After that, the slurry were added to boiling filtered water while being constantly stirred to create a sticky, translucent paste. To create a uniform binder solution, the PVP K-30 solution was progressively added to the starch paste and thoroughly mixed [38].
5. **Wet mass:** The powder blends were gradually mixed with the prepared binder solution. Wet granules of consistent size were produced by passing the wet mixture through filter No. 16 [39].
6. **Drying:** The granules were dried at 40–50°C in a hot air oven until their moisture content were decreased. To produce granules of consistent size, the dried granules were run through sieve No. 20 [39].

7. **Lubricant:** To enhance flow characteristics and avoid sticking during compression, talc and magnesium stearate were added to the dried granules and properly mixed [38].
8. **Compression**: A tablet compression machine equipped with appropriate punches was used to compress the lubricant granules into tablets [36,37].
9. **Storage:** After being visually examined, the prepared tablets were kept at room temperature in airtight glass containers for additional assessment research [40].

3.1 Evaluation of tablet formulation

1. General appearance:
During the evaluation process, the general appearance of the tablet were assessed including factor such as a color, shape, odor and texture [41].

2. Diameter and Thickness:
Ten tablets are chosen at random from each batch, and their thickness and diameter can be measured using Vernier calipers. The average value of these measurements is then calculated [42].

3. Weight Variation:
Twenty tablets have been chosen and weighed separately in order to calculate the weight fluctuation using an analytical weighing balance. After determining the average weight, the weight deviation were calculated by comparing each tablet's weight to the average [43].

4. Test for Hardness:
Each of the five pills were chosen at random. The force required to crush a tablet in a compression test. The Pfizer tester were used to measure the hardness of a tablet by crushing it between two jaws. The unit of hardness is kg/cm2 [43, 44].

5. Test of Friability:
The friability test were conducted using a tablet friability tester (Vengo). Ten tablets were chosen and cleaned. After weighing the tablets, the initial weight (W1) was noted, [45, 46].

6. Test of Friability:
The friability test were conducted using a tablet friability tester (Vengo). Ten tablets were chosen and cleaned. After weighing the tablets, the initial weight (W1) were noted. The pills were weighed and tested at a speed of 25 rpm for 4 minutes (100 revolutions). The final weights (W2) were determined by weighing the pills after the dust were removed. The percentages of friability were calculated [47].

$$\textbf{Friability}\ \% = W1 - W2 / W1 \times 100$$

7. Test for Disintegration:
A disintegration test is used to find out how long it takes a pill to disintegrate into smaller pieces under particular circumstances. The disintegration test apparatus's vessel tubes were filled with six separate tablets. The basket rack assemblies were submerged in distilled water that were kept at 37 ± 2°C. The device were used, and the amounts of time needed for each tablet to completely dissolve were noted [48,49].

3. Thrombocytopenia Studies in Animal Model:

IAEC Approval:
The Institutional Animal Ethics Committee (IAEC) of Rungta Institute of Pharmaceutical Sciences, Bhilai, Chhattisgarh, reviewed and approved the experimental protocol for assessing the thrombocytopenia activity of the prepared herbal tablet containing *Moringa oleifera* and *Carica papaya* leaves. Approval Reference No. RIPS/IAEC/2025-26/562

Table 2: In- Vivo Experimental Model of Thrombocytopenia

S. No	Groups	Rats	Age	Group Name	Weight	No of Animal
1	Groups I	Wistar rat	8 -10 weeks	Normal Control	150 – 200 g	5
2	Groups II	Wistar rat	8-10 weeks	Cyclophasphamide	150 -200 g	5
3	Groups III	Wistar rat	8 -10 weeks	Standard Drug	150 – 200 g	5
4	Groups IV	Wistar rat	8 -10 weeks	Test I (Low dose)	150 – 200 g	5
5	Groups V	Wistar rat	8 -10 weeks	Test II (High dose)	150 – 200 g	5
Total				**25**		

Induction of Thrombocytopenia:

Preparation of Cyclophasphamide solution:

The drug used to induce thrombocytopenia was Cyclophasphamide. For injection, 200 mg of cyclophosphamide were dissolved in 10 ml of sterile water to create a stock solution with a final concentration of 20 mg/ml [50]. dosage determined using the following

Formula: Body weight (kg) × standard dose (mg)

equals the dose. Volume (ml) = concentration (mg/ml) / necessary dose (mg)

- **Experimental Procedure:**

Before the tests began, healthy wistar rats weighing between 125 and 200 g were acclimated to a normal laboratory. The animals are divided into five groups, each consisting of five individuals. Before inducing day 0, blood samples were drawn from each animal, and baseline hematological parameters such as platelet count, RBS count, WBC count, and hemoglobin level were recorded. To induce thrombocytopenia, Group I were administered 10 ml/kg of normal saline for 14 days. On days 1, 2, and 3, cyclophosphamide were administered intraperitoneally to groups II, III, and IV at a dose of 50 mg/kg body weight [51].

On day seven, blood samples were drawn again to confirm the induction of thrombocytopenia by measuring the platelet count. After verification, Group III and Group IV were given the herbal tablet formulation at body weight doses of 200 mg/kg for the low dose and 300 mg/kg for the high dose, while Group II were given the standard drug (Caripill Tablet). The duration of the treatment were 14 days [52].

Blood samples were obtained from the animals at the end of the treatment period and tested for platelet count, red blood cell count, white blood cell count, hemoglobin level, bleeding time, and clotting time in order to evaluate the formulation's anti-thrombocytopenic effect [51,52].

- **Treatment Protocol:**

The herbal tablets were taken orally at a dose of 200 mg/kg body weight for 14 consecutive days. After the tablets were ground into a fine powder, 37 mg of the powder were distributed in 1 mL of distilled water using a vortex mixer. The suspension were administered orally using a 16–18 G gavage needle attached to a syringe. The animals were gently confined while the dose were administered gradually to guarantee proper administration. To prevent spillage, food were provided to the rats after 10 minutes of monitoring [52,53].

Determination of platelet count:

Blood samples were taken on the first, seventh, and fourteenth days of treatment in order to calculate the platelet count. Animals' tail veins were used to extract blood. The platelet count is measured prior to therapy, following the induction of thrombocytopenia, and on the seventh and fourteenth days following the administration of test formulations. An automated blood cell counter was used to determine the platelet count [53].

Determination of bleeding time:

The bleeding time were measured using this method. The animal's tail were revealed and it was put in a restrainer. Warm water and rectified alcohol were used to clean the tail with cotton. A sterile, clean lancet were used to find and puncture the tail vein. Every ten seconds, the blood stain were blotted off using Whatman filter paper until the bleeding stopped and the stain vanished. The bleeding period were then measured and documented in seconds [54].

Determination of clotting time:

The clotting time were determined using the capillary tube method. The animal's Tail vein area were used to draw blood into a capillary tube. The capillary tube broke every 30 seconds until a fibrin thread emerged. The clotting time were measured in seconds [55].

Determination of RBC count, WBC count and Haemoglobin content

Using a K3 EDTA tube, the animals' tail veins were used to draw blood. Automated blood tests were used to determine the RBC, WBC, and hemoglobin concentration [56].

4. Result:

1. Phytochemical test:

Table 3: Phytochemical test of *Moringa Oleifera* leaves extract

S. No	Active compound	Phytochemical Class	Test name	Observation	Result
1	Moringine	Alkaloids	Dragendroff's Test	Orange / red	Present of alkaloids
2	Quercetin	Flavonoids	Shinoda test	Pink / reddish brown	Present of flavonoids

3	Catechin	Tannins	Ferric Chloride test	Blue/black	Present of tannins
4	Niaziminin	Glycosides	Killer-killiani test	Brown ring at junction	Present of Glycosides

Table 4 : phytochemical test of *Carica papaya leaves*

S. No	Active compound	Phytochemical class	Test name	Observation	Result
1	Carpaine	Alkaloids	Wagner's test	Reddish brown	Present of alkaloids
2	Kaempferol	Flavonoids	Alkalines reagent test	Pale Yellow color	Present of flavonoids
4	β-- Sitosterol	Steroids	Liebermann-Burchard test	Bluish green color	Present of steroids

2. FTIR

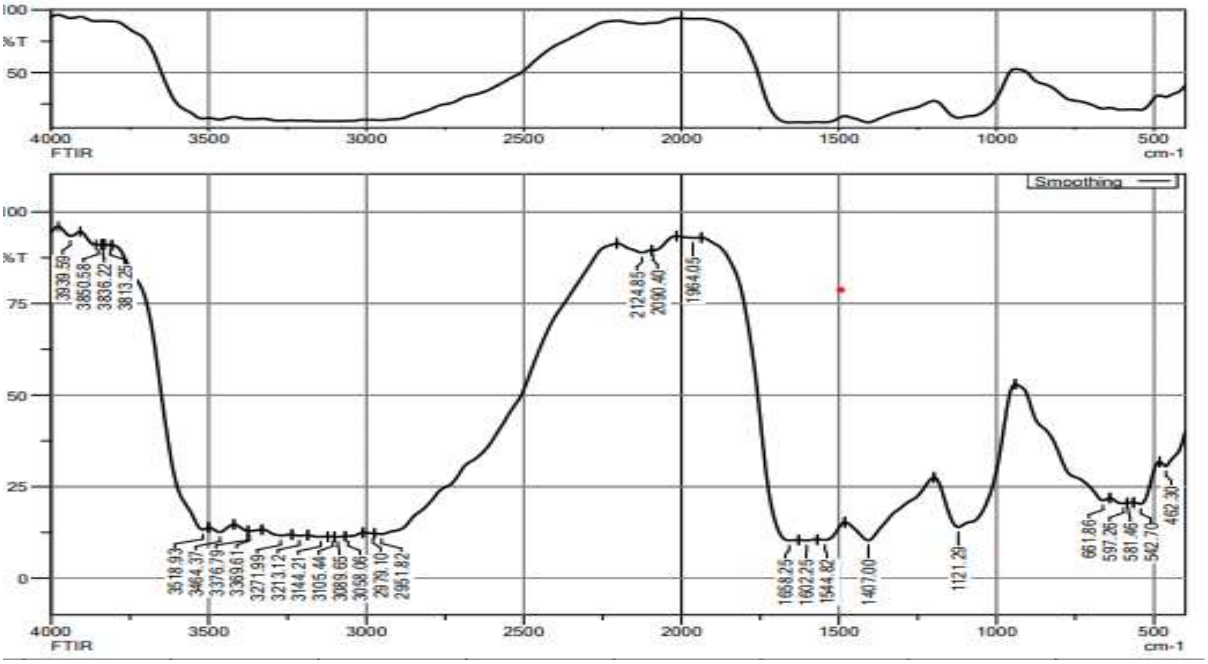

Figure 1: FTIR Analysis Combined of *Moringa oleifera* and *Carica papaya* Extract

Table 5: FTIR analysis of Combined extract of *Moringa oleifera* and *Carica papaya*

Peak (cm -1)	Functional Group	Interpretation
3939.59 – 3813.25	O – H Stretching	Free hydroxyl groups (Alcohol/Phenols)
3518.93 – 3058.06	O – H Stretching	Phenolics, Flavonoids, Alcohols
2979.10 – 2951.82	C – H Stretching	Aliphatic Compound (alkenes)
1658.25	C = O Stretching (Amide)	Proteins , Carbonyl compound
1602.25 – 1544.82	N – H Bending	Amides / Aromatics/Proteins
1407.00	C-H Bendings	Aliphatic compound
1121.29	C – O Stretching	Alcohols, ethers, Carbohydrates
661.86 – 462.30	C –X Stretching Fingerprint region	Presence of complex phytochemical constituent

Organoleptic properties:

Carica papaya **leaves powder**

Moringa oleifera **leaves powder**

Figure 2: Organoleptic properties of plant materials

Table 6: Organoleptic properties of herbs

S. No	Plant name	Color	Taste	Texture
1	*Moringa oleifera*	Greenish brown	Bitter	Fine powder
2	*Carica papaya*	Dark green	Bitter	Fine powder

Angle of repose:

Carica papaya leaves powder

Moringa oleifera leaves powder

Figure 3: Angle of repose of plant materials

Table 7: Angle of repose

S. no	Herbal powder	Height (h) (cm)	Radius (r) (cm)	$\theta = \tan^{-1}$	Observed Angle (°)	Standard range (°)	Flow Property
1	*Carica papaya*	3.1	8.1	$\tan^{-1}$ (3/8.1)	20. 9°	25 - 30°	Excellent
2	*Moringa oleifera*	4.1	7.5	$\tan^{-1}$ (4/7.5)	28. 7°	30 - 35°	Good

Bulk density:

Carica papaya leaves powder

Moringa oleifera leaves powder

Figure 4: Bulk density of plant materials

Table 8: Bulk density result

S no.	Herbal name	Weight taken (gm)	Bulk Volume	Observed bulk density (g/ml)	Standard range (g/ml)

1	*Carica papaya*	10gm	29 ml	0.345	0.30 - 0.50
2	*Moringa oleifera*	10gm	30 ml	0.333	0.30 0.50

Tapped density:

Carica papaya leaves powder *Moringa oleifera* leaves powder

Figure 5: Tapped density of plant materials

Carr's compressibility Index: Formula:

Table 9: Tapped density

S. no	Herbal powder	Carr's Index (%)	Flow property	Standard Carr's index (%)
1	*Carica papaya*	31 %	Poor	< 15% Excellent)
2	*Moringa Oleifera*	35.9 %	Very poor	<15% (Excellent)

Hauser's Ratio:

Table: 10 Carr' s index

S. no.	Herbal powder	Hauser's ratio	Flow property	Standard Hausner's ratio
1	*Carica papaya*	1.45	Poor	1.12 -1.18 (Good)
2	*Moringa oleifera*	1.56	Very poor	1.12 – 1.18 (Good)

Evaluation of Tablet Formulations

Table: 11 Hauser's ratio

S. No.	Parameter	Observed value(F1) mg	Standard value mg
1	Color appearance	Green	-
2	Thickness	2.5 mm	5 mm
3	Weight variation	3.8 %	5% (tablet >250mg
4	Hardness	4.48 kg/cm²	4 - 8 Kg/cm2
5	Friability	0.46%	0.5 – 1.0%
6	Disintegration time	13 minutes	15 minute

In vivo evaluation:

Table 12: Evaluation Parameter formulation 1:

S. no.	Parameter	Observed value (F2) mg	Standard value mg
1	Color appearance	Green	-
2	Thickness	3.5 mm	5 mm
3	Weight variation	4.5%	5%
4	Hardness	5.45 kg/cm²	4 – 8 Kg/cm2
5	Friability	0.75%	0.5 – 1.0%
6	Disintegration time	14 minutes	15 minute

Table 13: Evaluation Parameter formulation 2

Treatment Group	Day 1 (×10/mm³)	Day 7 (×10/mm³)	Day 14 (×10/mm³)
Normal Control	9.80 ± 0.15	9.76 ± 0.18	9.85 ± 0.12
Cyclophosphamide Induced	4.95 ± 0.12	4.32 ± 0.14	3.98 ± 0.11
Standard Drug (Caripill)	5.02 ± 0.16	7.85 ± 0.21	9.12 ± 0.19
Low Dose Herbal Tablet	6.10 ± 0.13	7.25 ± 0.17	8.60 ± 0.15
High Dose Herbal Tablet	6.15 ± 0.14	8.10 ± 0.19	9.30 ± 0.17

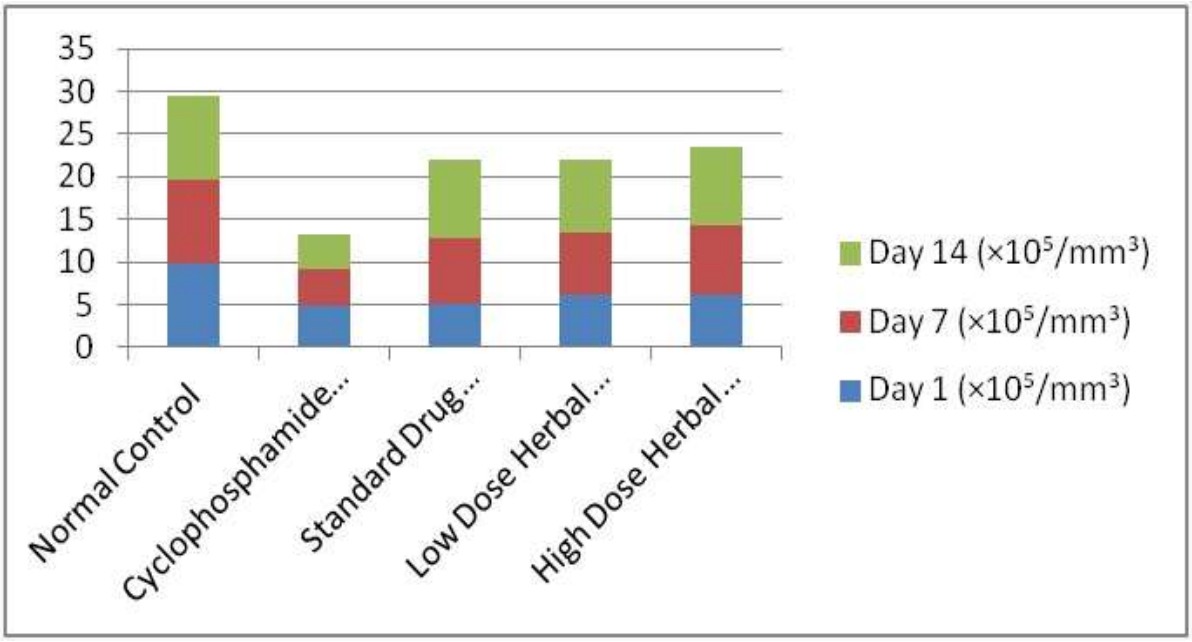

Figure 6 : Graph of effect of platelet count

Bleeding time:

Table 14: Effect of herbal tablet formulation on platelet count:

Treatment	Mean bleeding time in Seconds		
	Day 1	Day 7	Day 14
Normal Control	76.66 ± 2.30	82.5 ±1.83	81.5±3.22

Cyclophosphamide Induced	60.00 ± 4.47	126.66±20	131.66±6.009
Standard Drug (Caripill)	69.5±2.92	132.5±6.80	75.5±3.81
Low Dose Herbal Tablet	75.33±2.71	119.16±6.11	70.83±3.27
High Dose Herbal Tablet	71.83±1.90	77.66±3.66	125±4.28

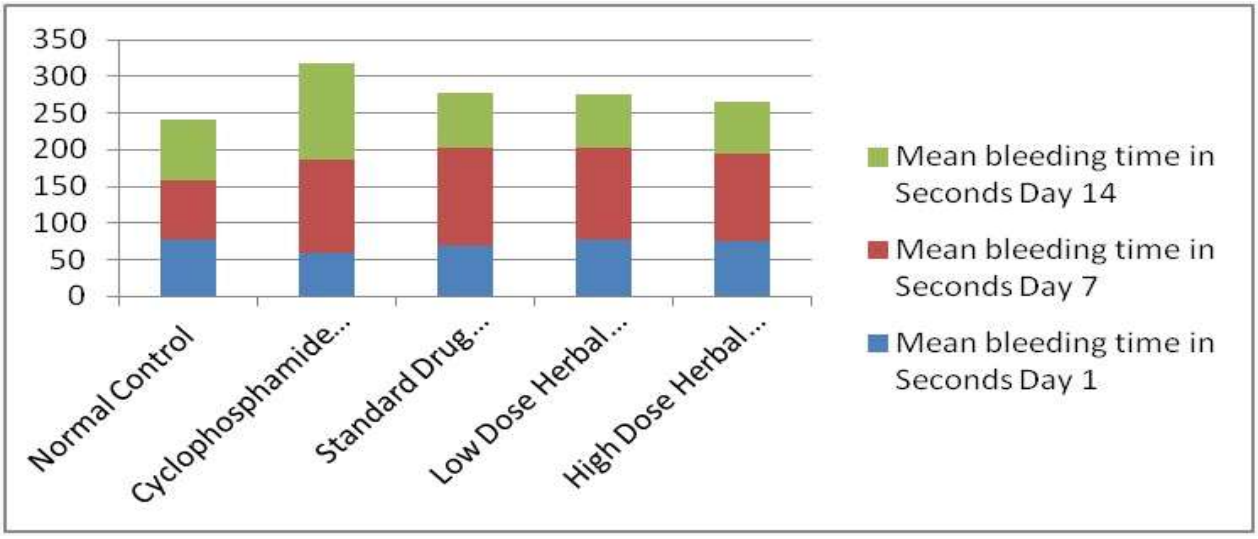

Figure 7: Graph of effect of tablet formulations on bleeding time

Clotting time

Table 15: Effect of herbal tablet formulation on bleeding

Treatment groups	**Mean Clotting time in Seconds**		
	Day 1	**Day 7**	**Day 14**
Normal Control	145±7.63	135±4.28	141.66±3.07
Cyclophosphamide Induced	255±24.18	168±6.7	115±10.24
Standard Drug (Caripill)	182±14.42	258.33±21.04	190±12.11
Low Dose Herbal Tablet	171.66±10.77	188±5.42b	295±21.09
High Dose Herbal Tablet	180±9.66	188.33±7.92	305±8.46

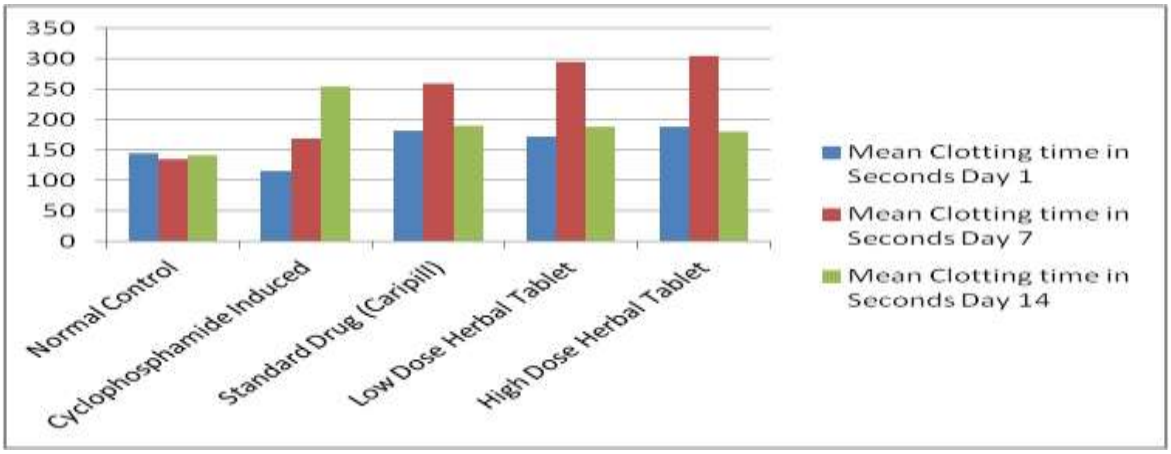

Figure 8: Graph of effect of tablet formulations on clotting time

RBC count

Table 16: Effect of Carica papaya formulations on Clotting time

Treatment Group	Day 1 (×10⁶/mm³)	Day 7 (×10⁶/mm³)	Day 14 (×10⁶/mm³)
Normal Control	7.40 ± 0.08	7.38 ± 0.07	7.42 ± 0.06
Cyclophosphamide Induced	7.10 ± 0.07	6.60 ± 0.06	6.20 ± 0.05
Standard Drug (Caripill)	7.15 ± 0.08	7.00 ± 0.07	7.35 ± 0.06
Low Dose Herbal Tablet	7.20 ± 0.07	6.90 ± 0.06	7.15 ± 0.05
High Dose Herbal Tablet	7.22 ± 0.06	7.05 ± 0.06	7.38 ± 0.05

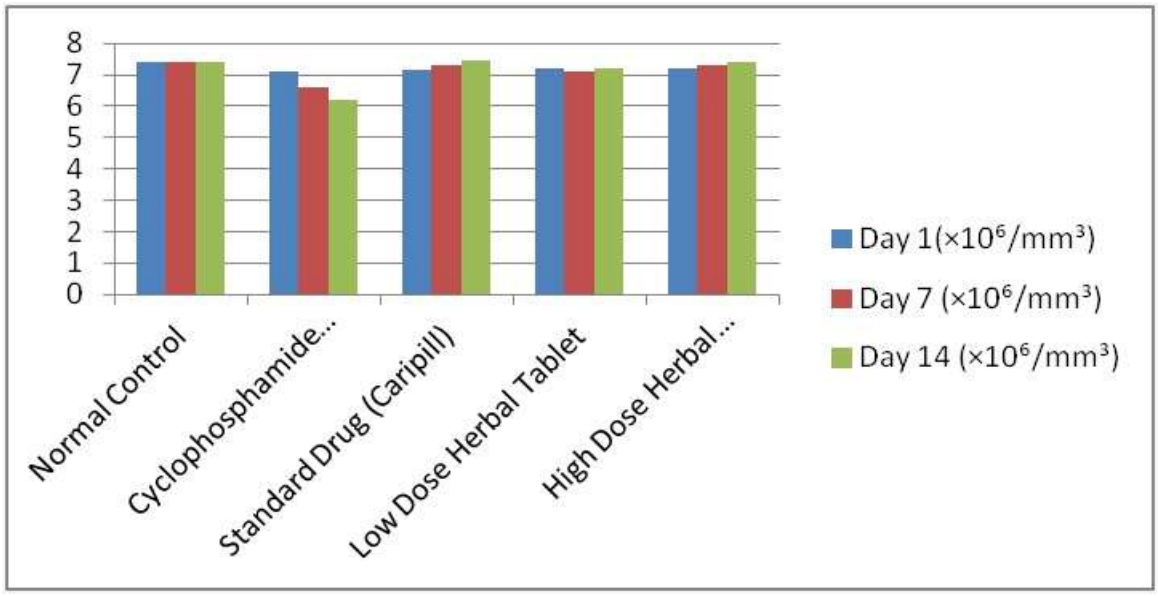

Figure 9: Graph of effect of tablet formulations on RBC count

WBC count

Table 17: Effect of Carica papaya formulations on RBC Count

Treatment Group	Day 1 (cells/mm³)	Day 7 (cells/mm³)	Day 14 (cells/mm³)
Normal Control	7800 ± 120	7700 ± 110	7850 ± 115
Cyclophosphamide Induced	7600 ± 105	5200 ± 95	4800 ± 90
Standard Drug (Caripill)	7500 ± 110	6500 ± 100	7400 ± 105
Low Dose Herbal Tablet	6400 ± 95	5900 ± 90	6900 ± 100
High Dose Herbal Tablet	6500 ± 100	6200 ± 95	7600 ± 110

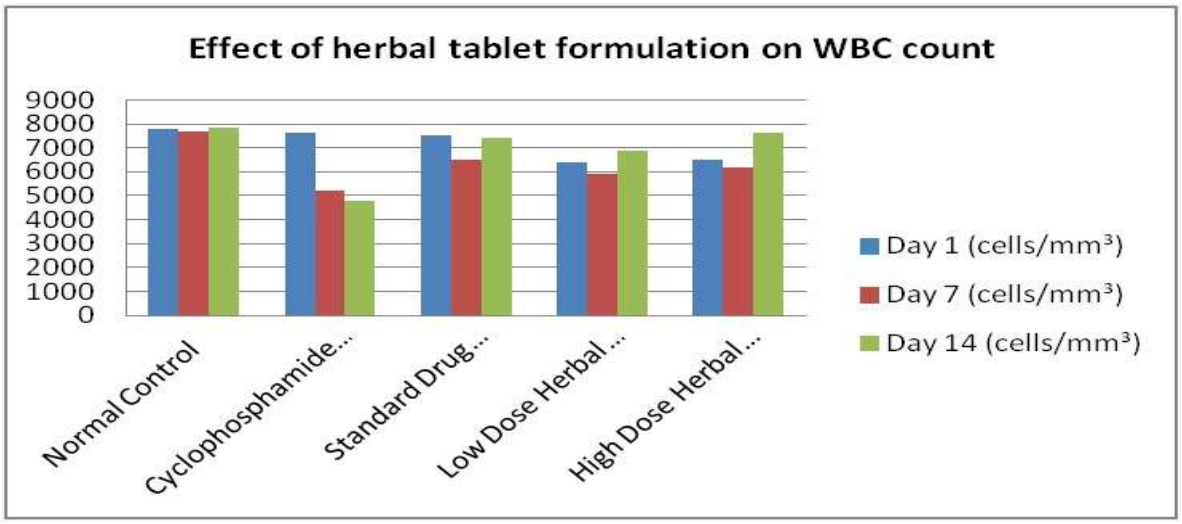

Figure 10: Graph of effect of tablet formulations on WBC count

Haemoglobin content

Tablet 18: Effect of herbal tablet formulations of on Total WBC count

Treatment Group	Day 1 (g/dL)	Day 7 (g/dL)	Day 14 (g/dL)
Normal Control	14.30 ± 0.20	14.25 ± 0.18	14.35 ± 0.16
Cyclophosphamide Induced	12.70 ± 0.15	10.85 ± 0.20	10.20 ± 0.18
Standard Drug (Caripill)	12.80 ± 0.17	12.95 ± 0.16	13.90 ± 0.15
Low Dose Herbal Tablet	13.10 ± 0.16	12.20 ± 0.18	13.20 ± 0.17
High Dose Herbal Tablet	13.15 ± 0.15	12.80 ± 0.17	14.00 ± 0.14

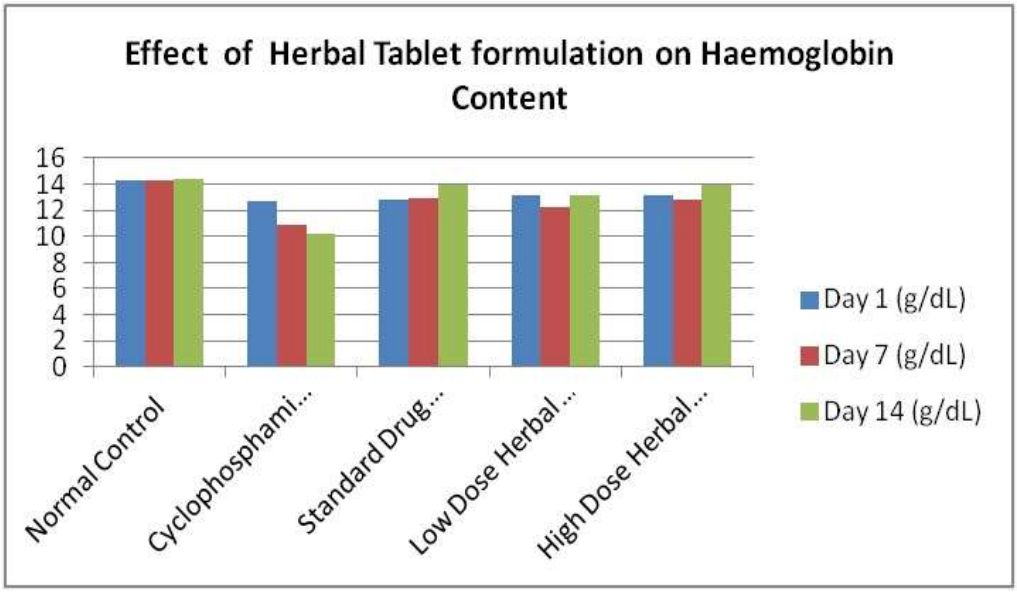

Figure 11: Graph of effect of tablet formulations on haemoglobin level

Discussion

Both *Moringa oleifera* and *Carica papaya* leaf extracts contained alkaloids, flavonoids, tannins, glycosides, and phenolic chemicals, according to the initial phytochemical screening. [10,12] published similar results, showing that

both plants included flavonoids, phenolics and alkaloids and attributing their hematopoietic and antioxidant properties to these components. The putative platelet-enhancing effect of the prepared herbal tablet is supported by the presence of these phytochemicals in the current investigation.

The prepared tablet demonstrated good mechanical strength and pharmaceutical quality, as evidenced by its satisfactory hardness (5.45 kg/cm²), friability (0.75%), and disintegration time (min). [9,13], who created a herbal formulation with *Carica papaya* leaf extract and found friability below 1% with acceptable disintegration behavior, reported similar tablet properties. Additionally, the current formulation met pharmacopoeial constraints, indicating acceptable tablet integrity and patient acceptance.

The dissolution investigation revealed 70 % drug release in 80% min, which was similar to the results of [7,14], who found that herbal formulations containing extracts of *Carica papaya* and *Moringa oleifera* released phytoconstituents quickly. Better bioavailability of the active phytoconstituents responsible for platelet augmentation may be facilitated by the effective dissolving profile found in this investigation.

Following therapy, the treatment group's platelet count dramatically increased from 75.33 to 78.83 cells/µL. These results are in line with those of [51,52], who found that rats with hydroxyurea-induced thrombocytopenia treated with *Carica papaya* leaf extract had significantly higher platelet counts. Similarly, after administering papaya leaf extract, [51] found that the platelet count increased from roughly 30,650 to over 120,000 cells/µL. The current study's improvement may be explained by increased thrombopoiesis and megakaryocyte activity stimulation.

Additionally, *Moringa oleifera's* immunomodulatory and antioxidant qualities have been shown to enhance hematological parameters. Platelet count, hemoglobin, and red blood cell counts significantly improved after using *Moringa* supplements, according to [12,14]. These observations are corroborated by the current findings, which further imply that the combination formulation may have synergistic effects on hematological recovery and platelet formation. The mixed herbal pill has favorable pharmacological qualities and may have platelet-enhancing effect, according to the overall findings. The results support the use of *Moringa oleifera* and *Carica papaya* as a promising natural treatment strategy for thrombocytopenia..

Conclusion

For the treatment of thrombocytopenia, the current study effectively developed and assessed a herbal tablet including hydroalcoholic extracts of *Moringa oleifera* and *Carica papaya* leaves. Important bioactive components like alkaloids, flavonoids, tannins, glycosides, phenolic compounds, and saponins which are recognized for their antioxidant, immunomodulatory, hematopoietic, and platelet-enhancing qualities were found, according to preliminary phytochemical screening.

The presence of distinctive functional groups connected to these phytoconstituents was further verified by the FTIR analysis. Good tablet quality and stability were indicated by the formed tablets' suitable physicochemical properties, which included acceptable hardness, friability, thickness, weight variation, disintegration time, and dissolving profile. Because *Moringa oleifera* and *Carica papaya* have been shown to promote hematopoiesis, increase platelet synthesis, and shield blood cells from oxidative stress, this combination was chosen. Both plants include bioactive chemicals that work in concert to boost platelet recovery and hematological health in general.

All things considered, the results point to the herbal tablet as a promising, secure, and economical natural formulation for the supportive treatment of thrombocytopenia. To determine its therapeutic efficacy, safety profile, and mode of action in the treatment of thrombocytopenia, more preclinical and clinical research is necessary.

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