



**PREPARATION AND EVALUATION OF POLYHERBAL FORMULATION  
FOR ANTIDIABETIC ACTIVITY AGAINST STREPTOZOTOCIN  
INDUCED DIABETES MELLITUS**

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**ARTICLE INFO**

**ABSTRACT**

**Key words:**

Cascabelathevetia,  
Hibiscus rosa-sinensis,  
Ocimumtenuiflorum,  
Luffaaegyptiaca, and  
Cinnamomumtamala, P  
olyherbal Formulation,  
antidiabetic

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The present study is to develop the polyherbal formulation of some herbal plants viz: *Cascabelathevetia*, *Hibiscus rosa-sinensis*, *Ocimum tenuiflorum*, *Luffaaegyptiaca*, and *Cinnamomumtamala* for Anti diabetic activity. The plant materials were dried in the shade, generally crushed and separated by the following technique with ethanol. After the extraction was completed, the extracted powder was discarded and also the ethanol extract for further process. After the extraction was completed, the extracted powder was discarded and also the ethanol extract for further process. Evaluation of the organoleptic characters for the polyherbal formulation refers to its color, odour, taste, texture, etc. Standard screening test of the polyherbal formulation was carried out. Diabetes was induced in overnight fasted Wistar rats (200-250 g) by Orally feeding of streptozocin in saline at a dose of 120 mg/kg body weight. The glucometer was used to choose of blood glucose levels. Reliably blood was drawn from tail of mindful rodents and glucose was evaluated by glucometer. Blood samples were collected from rats and serum was separated by centrifuge. The animals were observed for 24 hours for any sign and symptoms of intoxication, behavioural changes, effect on body weight and mortality. No symptoms of toxicity, nor mortality was observed. The formulations were found to be effective in managing the biochemical parameters against diabetic activity.

**INTRODUCTION**

In numerous provincial African and Asian societies today, Herbal medicine is as yet a huge piece of the fundamental medical services framework. Moreover, it is a basic part of the way of life of numerous global networks. Various plants and home grown cures have a long history of people applications and medical advantage claims. As per logical examinations, Herbal medicine contain multifaceted substance parts that are accountable for the pharmacological activities, which relate to the wellbeing benefits and additionally poisonousness they cause. As well as being used as extremist

Medicines for an assortment of moderate to serious problems, Herbal medicine have likewise been utilized as prophylaxes for the uninvolved safeguarding of wellbeing. [Tilburt, 2008]

Today, Herbal medicine are made and used in different ways, which likewise impacts the consequences of their activity. The portion type of home grown drugs fluctuates incredibly founded on various factors, including the sickness being dealt with, the organization course, the patient, culture, and, surprisingly, philosophical viewpoints. Herbal medicines are often made from new or dried spices in homes and conventional medication centers. These spices are

habitually transformed into implantations, decoctions, poultices, powders to pour on painful injuries, or added to territorial beverages, puddings, and different food sources. Usually available types of customary business Herbal medicine items incorporate pills, containers, tablets, powders/granules, creams, treatments, from there, the sky is the limit. The utilization of Herbal medicine into restorative measurements structures is expected to further develop consistence by means of engaging use, exact dosing, and style. [Li, 2009]

#### **Poly herbal**

As opposed to drug prescriptions, which are habitually comprised of only one synthetic element (unadulterated synthetics), HMs are commonly made out of various mixtures, here and there in their crude, unpurified structure. People recipes that oftentimes incorporate numerous natural materials as the dynamic fixing are utilized to make many finished home grown items. Large numbers of The polynomial person of most HMs might be an advantage. [Jayakumar, 2010]

On the off chance that ideal outcomes are to be accomplished, the constituent polynomial components of numerous HMs, as recorded in numerous conventional recipes, are habitually essential for the completeness of the item. By simultaneously helping critical pharmacological cycles such bioactive part assimilation, appropriation, digestion, and disposal, multicomponent mixtures might increment impacts. Moreover, certain components might affect numerous physiological frameworks or receptors, which is conceivably why numerous HMs display a range of restorative benefits. [Parasuraman, 2010]

**Diabetes Mellitism** Diabetes mellitus is gotten from the Latin expression mellitus, and that implies sweet, and the Greek word diabetes, and that means to siphon or move through. As per a verifiable investigation, Apollonius of Memphis begat the name "diabetes" somewhere close to 250 and 300 BC. The sweet person of the pee in this sickness was found by the old Greek, Indian, and Egyptian developments, prompting the spread of the term diabetes mellitus. To address this growing issue, extraordinary

exertion has been finished consistently, prompting a few disclosures and the improvement of the board methods. Diabetes is deplorably still quite possibly of the most far and wide persistent disease in the country and this present reality. It keeps on being the seventh most normal reason for death in the US. [Kumar, 2021]

Diabetes mellitus, in some cases alluded to as basically diabetes, is an assortment of metabolic sicknesses described by tenaciously raised glucose levels. Continuous pee, expanded thirst, and expanded hunger are normal side effects. Diabetes can prompt an extensive variety of medical problems whenever ignored. Hyperosmolar hyperglycemia, diabetic ketoacidosis, and even mortality are instances of intense intricacies. Coronary illness, stroke, persistent renal infection, foot ulcers, nerve harm, eye harm, and mental debilitation are instances of serious long haul outcomes. [Salleh, 2021]

Diabetes has a confounded physiology and treatment plan that require a few medicines for powerful infectious prevention. The administration of diabetes relies upon patient association and diabetic training. Patients who have some control over their eating routine (starch and absolute calorie limitation), practice frequently (more noteworthy than 150 minutes of the week), and autonomously check their glucose have improved results. It is habitually expected to get long lasting consideration to stay away from accidental issues. Preferably, HbA1c ought to be under 7% and glucose levels ought to be kept somewhere in the range of 90 and 130 mg/dL. In spite of the fact that keeping up with glucose control is significant, too forceful treatment might bring about hypoglycemia, which can have hurtful or lethal results. [Umpierre D, 2011]

#### **MATERIAL & METHOD**

##### **Collection and Authentication of Crude Drugs**

*Cascabelathevetia*, *Hibiscus rosa-sinensis*, *Ocimum tenuiflorum*, *Luffaa egyptiaca*, *Cinnamomum Tamala* were undeniably accumulated from adjoining neighborhood markets as the unrefined substances for the production of the veterinary polyherbal detailing. From Gayatri Homeopathic Drug

store, streptozotocin was recovered. The instruments were aligned as per standard working technique, and every one of the reagents utilized in the ongoing review were of scientific grade.

#### **Preparation of Plant extracts from all five plants**

The around 50 gm powdered example was then positioned in the Soxhlet Apparatus and removed for 40 cycles.

The plant material was regularly squashed, dried in the shade, and isolated involving ethanol simultaneously.[Gegenheimer P, 1990][Abubakar, 2020]

#### **Evaluation of Organoleptic evaluation**

Assessment of the polyherbal plant's organoleptic qualities incorporates surveying its tone, smell, taste, surface, and so on. A little piece of the example was set in a receptacle that was the right size to test the fragrance of an immaterial substance by leisurely and more than once breathing in air over the substance. Assuming that there was no recognizable smell, the example was tenderly squashed. In the event that the substance was known to be perilous, one more elective strategy was utilized, for as adding a little measure of bubbling water to the squashed example in a container. In the wake of deciding the smell's force (none, frail, unmistakable, solid), specialists investigated its attributes (fragrant, fruity, stale smelling, rotten, spoiled, and so on.). A taste may be fragrant, hot, sweet, sharp, astringent, adhesive, or harsh, to give some examples.[Kumar, 2012]

#### **Physicochemical parameters**

The accompanying physicochemical properties were tried on air-dried powdered plant parts.

#### **Moisture content/Loss on drying:**

10g of unequivocally weighed powdered medicine were placed in a plate that would vanish the tar. Subsequent to placing the medicine into the tarred dissipating dish and gauging it, it was dried at 105°C for 5 hours. Up to a predictable weight, the drying and weighing processes were rehashed consistently. In view of the example that was gotten, the rate dampness content was registered.[Islam, 2019]

#### **Determination of ash**

**Total ash:** A formerly lit and tarred pot was loaded up with definitively weighed 2g air dried powdered material. The substance was equally circulated, and it was lit by logically raising the intensity to 500-600°C (480°C), until it became white, connoting an absence of carbon. It was weighed subsequent to cooling in the desiccators. If this technique is fruitless in creating sans carbon debris, the pot was cooled; the buildup was dampened with 2ml of water, dried on a water shower, and lighted to consistent weight. The buildup was promptly weighed in the wake of cooling in desiccators for 30 minutes. Regarding air-dried plant material, the level of complete not entirely set in stone. [Rao,2009]

$$\text{Total ash value} = (z-x/y) \times 100$$

Where,

X = weight of the silica crucible

Y = weight of the drug powder (g)

Z = weight of the silica crucible with powder ash

#### **Acid insoluble ash:**

The known measure of debris was put in the cauldron with 25ml of HCl, covered with a watch glass, and gradually stewed for 5 minutes. 5ml of boiling water were utilized to flush the watch glass, and this fluid was then put to the cauldron. The debris free channel paper was utilized to catch the insoluble material, and heated water was utilized to wash it away until the filtrate was nonpartisan. The underlying cauldron got the channel paper with the insoluble material on it. On a hot plate, it was dried and consumed to a consistent weight. The buildup was quickly weighed subsequent to cooling in the desiccator for 30 minutes. Accordingly, the extent of debris that is insoluble in corrosive was assessed utilizing air-dried plant material.[Kim, 2013]

$$\text{Acid insoluble ash value \%} = (a/y) \times 100$$

where,

A = weight of the remaining residue

Y = weight of crude powder taken (g)

#### **Water soluble ash:**

A known measure of debris was set in a pot with 25ml of water and warmed for 5 minutes. On a debris free channel paper, the insoluble material was gathered and afterward heated water was utilized to wash it away. The insoluble material-containing channel paper was added to the first cauldron and consumed there for 15 minutes at a temperature no higher than 45°C. The build-up was quickly weighed subsequent to cooling in the desiccator for 30 minutes. This build-up's weight was deducted from the general debris' weight. While computing the extent of water solvent debris, air-dried plant material was utilized as a kind of perspective. [Kadam, 2013]

#### **Extractive Value**

Strategy In a shut carafe, 5 gm of coarsely powdered, air-dried medicine was macerated for 24 hours with 100 ml of dissolvable (ethanol), which was shaken routinely for the initial six hours prior to representing the most recent eighteen hours. From that point onward, forestalling liquor loss was immediately separated. A 25 ml test of the filtrate was dried to dryness in a shallow dish with a level base, dried at 105°C, and gauged. The extent of extractive that is solvent in liquor was assessed involving the air-dried drug as a base. How much dissolvable substances required for extraction in that specific dissolvable is alluded to as the extractive worth. [Pawar, 2015] Extractive value was determined using the formula

$$\text{Extractive value(\%)} = \frac{\text{weight of residue}}{\text{weight of dry powder}} \times 100$$

#### **Evaluation of polyherbal suspension [Ghelani, 2014]**

##### **Viscosity**

At room temperature, the example's consistency was evaluated utilizing a Brookfield viscometer at 50 cycles each moment with spindle number 3.

**pH:** Utilizing a pH meter, the pH of the still up in the air.

**Flow rate:** Utilizing the condition, the clear consistency of a suspension test going through a pipette was determined.

Flow rate = Volume of pipette (ml)/Flow time

#### **Evaluation of Anti-Hyperglycemic Activity [Goel, 2004]**

Streptozotocin-actuated hyperglycemia was utilized to survey the antihyperglycemic properties of polyherbal details in Wister rodents. Rodents were parted into five gatherings of six for this undertaking. Creatures with diabetes were treated to test the polyherbal details F-1 and F-2 for blood glucose levels. To kill all non-extractable material, including cell parts and different constitutions that are not dissolvable in the extraction solvents, all concentrates were gone through Whatmann channel paper No. 42 (125mm). Utilizing a revolving evaporator and brought down pressure, the entire concentrate was dense to dryness, and the dried examples were then positioned in marked sterile vials. At the point when more examples were required, same activities were rehashed. 24 creatures in totally were haphazardly isolated into 4 gatherings, including control and trial creatures. Utilizing the Sprague method, the deadly measurement of both the plant separate and not entirely settled. During the trial time frame, the investigation was performed at the 0th, second, fourth, eighth, eighteenth, and 24th hours.

The animals were isolated into gatherings, each with six animals.

Group I - (Normal saline) + Streptozotocin - 250 mg/ kg for 30 days.

Group II - (Normal saline) + Standard Drug (Glibenclamide)

Group III - (Normal saline) + Formulation-1

Group IV - (Normal saline) + Formulation-2

The blood glucose levels were chosen utilizing a glucometer. Blood was precisely taken from the tails of cognizant rodents, and a Glucometer was utilized to quantify glucose. In every get-together, glucose levels were correspondingly evaluated consistently until kicking the bucket and archived not many weeks a while later.

#### **Induction of experimental diabetes in rats:**

Streptozotocin was given orally to expedite abstained Wistar rodents (weighing 200-250 g) at measurements of 250 mg/kg body weight in saline to prompt diabetes. Following three days of taking care of, the diabetes condition

was approved by testing fasting blood glucose with a one-contact Accu-chek sensor glucometer in their tail vein. Rodents were utilized in this study that had hyperglycemia, which is a condition that clinically mirrors diabetes and has a fasting blood glucose level of under 250 mg/dl.

**Glycemic Studies (Blood Glucose)**

Utilizing an end point test and an enzymatic unit, blood still up in the air (Peak

Biosystems, India). glucose was changed into gluconic corrosive and hydrogen peroxide by the protein glucose oxidase. Within the sight of peroxidase, hydroxybenzoate and 4-aminophenazone joined to create a vivid complex with peroxide. One ml of the functioning reagent was added to a test tube with 10 l of blood serum, and everything was entirely blended. It was then brooded for 10 minutes at 37°C and estimated at 505 nm.

**Formulation of Polyherbal Suspension**

**Table 1: Formulation Table**

S.No	Material	Formulation-1 (F-1)	Formulation-2 (F-2)
1.	<i>Cascabelathevetia extract</i>	15%	20 %
2.	<i>Hibiscus rosa-sinensis extract</i>	25%	20%
3.	<i>Ocimum tenuiflorum extract</i>	20%	25%
4.	<i>Luffaa egyptiaca extract</i>	25%	20%
5.	<i>Cinnamomum Tamala extract</i>	15%	10%
6.	Sodium carboxymethyl cellulose (suspending agent)	2.5%	2.5 %
7.	Purified water q. s.	2.5%	2.5 %

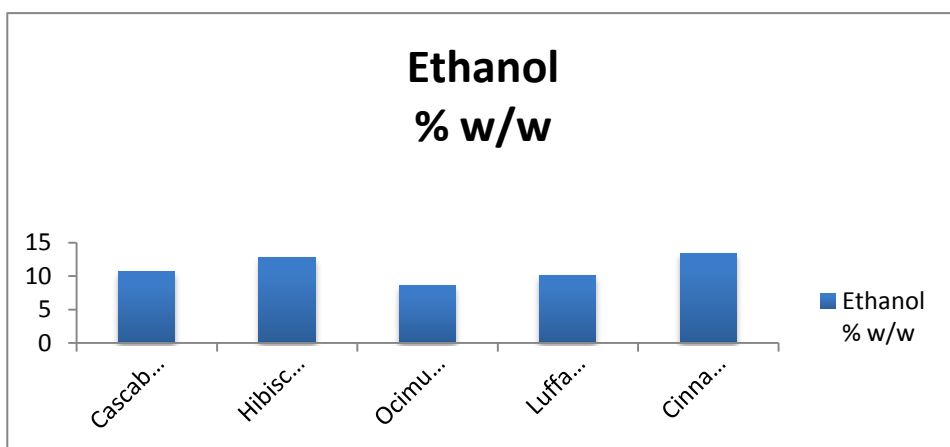
**RESULT & DISCUSSION**

**Extractive Values**

For alcoholic and aqueous solutions, the extractive values of the plant were assessed.

**Table 2 Extractive Values of the plant extract**

S.NO	Name of The Plant	Drug taken in gram	Yield %w/w
1.	<i>Cascabelathevetia</i>	50	10.62
2.	<i>Hibiscus rosa-sinensis</i>	50	12.75
3.	<i>Ocimum tenuiflorum</i>	50	8.52
4.	<i>Luffaa egyptiaca</i>	50	10.15
5.	<i>Cinnamomum Tamala</i>	50	13.44



**Figure 1 Graph of Extractive Values of the plant extract**

**Table 3 The Organoleptic properties of the plant extract were evaluated for appearance, colour and taste.**

Crude drugs	Physical Test			
	Nature	Colour	Odour	Taste
<i>Cascabelathevetia</i>	Coarse powder	Yellowish brown	without any specific odor	without any specific taste.
<i>Hibiscus rosa-sinensis</i>	Powder	Pale Red	Pleasant	Sour taste
<i>Ocimum tenuiflorum</i>	Coarse powder	Greenish	An astringent	Bitter
<i>Luffaa egyptiaca</i>	Coarse powder	Creamish grey	Appetizing	without any specific taste
<i>Cinnamomum Tamala</i>	Coarse powder	Brownish	Pungent	bitter taste

**Table 4 Loss on Drying And Foreign Organic Matter**

Crude drugs	Loss on drying (% w/w)*	Foreign matter (% w/w)*
<i>Cascabelathevetia</i>	6.35	0.58
<i>Hibiscus rosa-sinensis</i>	6.54	1.34
<i>Ocimum tenuiflorum</i>	5.32	1.45
<i>Luffaa egyptiaca</i>	7.15	2.52
<i>Cinnamomum Tamala</i>	6.45	1.75

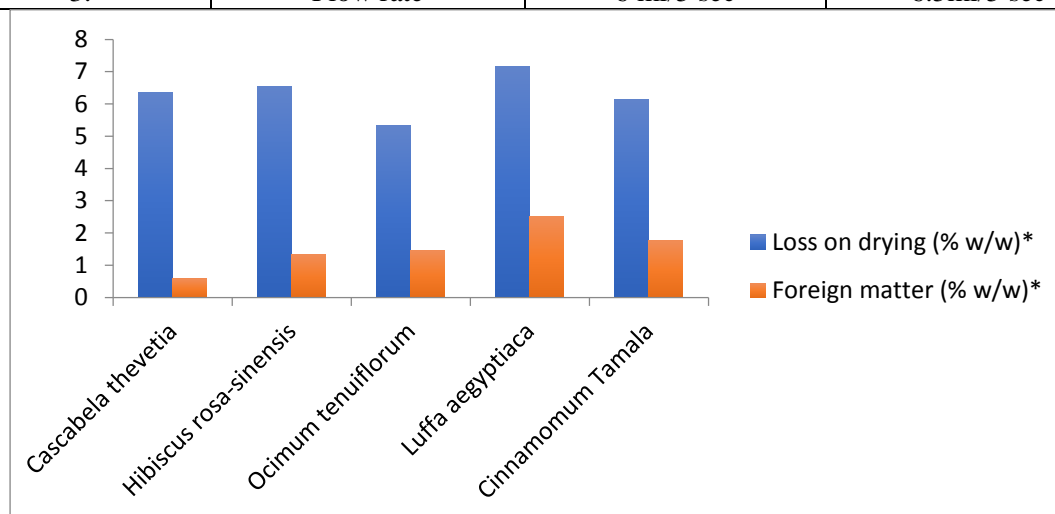
**Table 5 Total Ash, Acid Insoluble Ash And Water Soluble Ash Values**

Crude drugs	Total ash value* % w/w	Water soluble ash* % w/w	Acid insoluble ash value*% w/w
<i>Cascabelathevetia</i>	12.15	12.34	4.15
<i>Hibiscus rosa-sinensis</i>	10.65	8.45	1.11
<i>Ocimum tenuiflorum</i>	8.46	8.64	1.8
<i>Luffaa egyptiaca</i>	6.75	4.52	1.24
<i>Cinnamomum Tamala</i>	7.46	5.12	2.01

**Evaluation of suspension**

**Table 6 Evaluation of suspension**

S.no	Property	F1	F2
1.	pH	5.8	5.7
2.	Viscosity	70 cP	85 Cp
3.	Flow rate	6 ml/5 sec	6.5ml/5 sec



**Figure 2 Graph of Loss on Drying And Foreign Organic Matter**

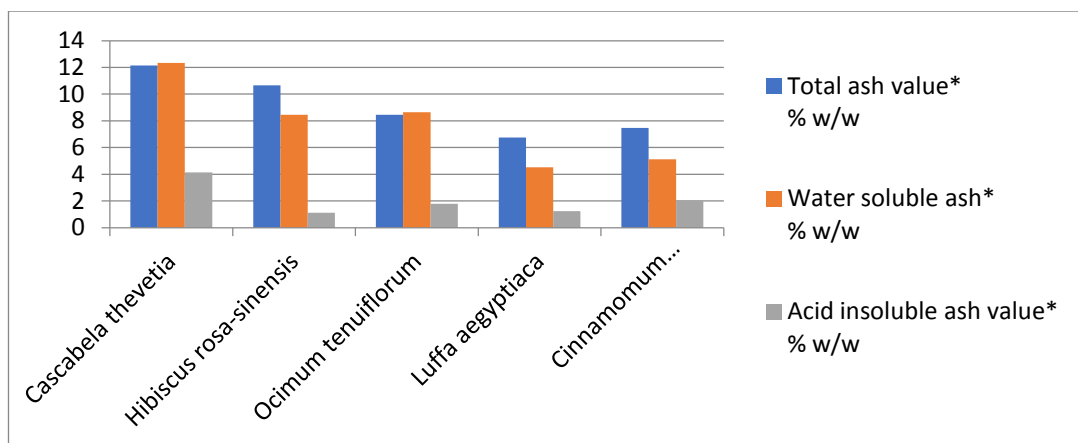


Figure 3 Graphs of Total Ash, Acid Insoluble Ash and Water Soluble Ash Values

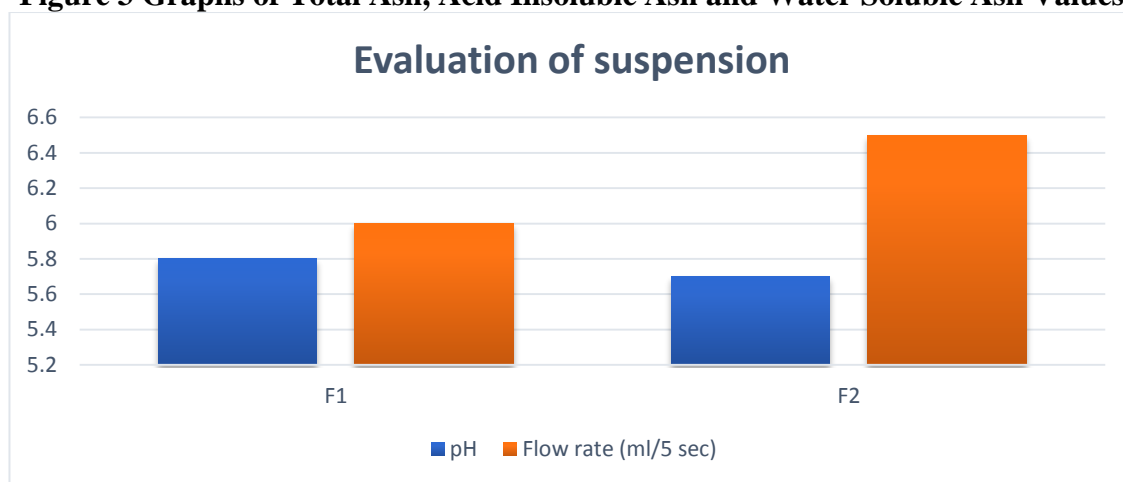


Figure 4 Graph of Evaluation of suspension

Table 7 Effect of herbal formulation on the blood glucose levels in STZ Induce Diabetic Rats

Treatment Groups	Time In Hours				
	Blood Glucose (mg/dl) after (0) Hours	Blood Glucose (mg/dl) after (2) Hours	Blood Glucose (mg/dl) after (8) Hours	Blood Glucose (mg/dl) after (18) Hours	Blood Glucose (mg/dl) after (24) Hours
<b>Group 1</b> (Normal saline) + (Streptozotocin 250 mg/ kg)	346.12	316.75	328.51	345.62	343.25
<b>Group 2</b> (Normal saline) + Standard Drug (Glibenclamide)	353.29	261.20	201.93	214.68	267.52
<b>Group 3</b> (Normal saline) + Polyherbal Formulation 150 mg/ kg)	347.38	286.17	264.16	257.46	256.84
<b>Group 4</b> (Normal saline) + Polyherbal Formulation 300 mg/ kg)	353.19	275.63	257.18	248.37	247.93

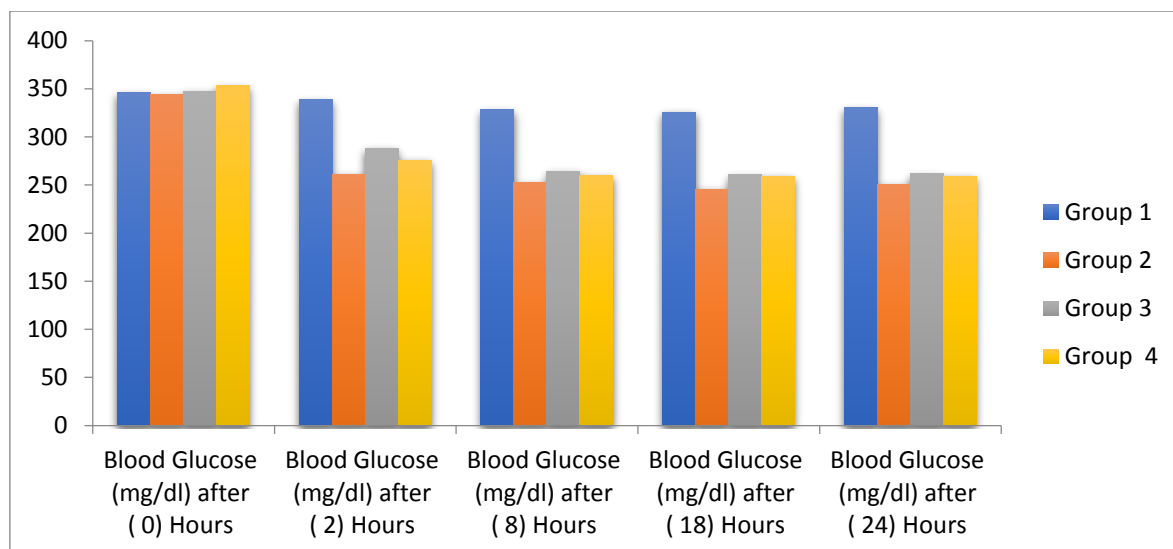


Figure 5 Graph of Blood Glucose level

The polyherbal plan's phytochemical concentrate on uncovered the presence of various phytochemical fixings that compare to its customary case of remedial viability.

Insightful methods were utilized to expose a polyherbal piece to a few evaluation rules.

The polyherbal plan has various mixtures, including flavonoids, alkaloids, glycosides, phenols, steroids, and tannins, as per phytochemical investigation. The organic activities, for example, antihyperglycemic, antidiabetic, cancer prevention agent, antibacterial, mitigating, anticarcinogenic, antimalarial, anticholinergic, antileprosy, and so on are significantly affected by the presence of various phytoconstituents and auxiliary metabolites in plants. Great rigid qualities are tracked down in tannins. They diminish any aroused mucous layer and accelerate the recuperating of wounds. It has been proposed that flavonoids offer possible antioxidation and free extremist searching skills. Furthermore, it supports decreasing oxidative pressure welcomed on by diabetes. Terpenoids have additionally been found to be useful in the therapy and counteraction of different ailments, including malignant growth. Terpenoids likewise have calming, hostile to hyperglycemic, antiviral, antibacterial, antifungal, antiparasitic, antiallergenic, antispasmodic, and immunomodulatory impacts. Terpenoids can be utilized as defensive materials for saving farming items since they have likewise been

accounted for to have insecticidal properties. Studies have shown that steroids are answerable for the cholesterol-bringing down activities, though saponins help in the precipitation and coagulation of red platelets. Moreover, steroids help in controlling the immunological reaction. It's fascinating to take note of that the polyherbal detailing contains the two saponins and steroids. Essentially all plants contain glycosides, which are remembered to make a huge therapeutic difference. Moreover, alkaloids are a group of mixtures that influence the focal sensory system, stifle hunger, and have diuretic properties. The polyherbal definition shows the presence of alkaloids, demonstrating that the detailing might have diuretic properties. Accordingly, the helpful characteristics of the polyherbal plan not entirely set in stone from the ongoing request in view of the phytoconstituents remembered for them. It is common knowledge that plant extracts frequently contain mixtures of many bioactive substances or phytochemicals with various polarities. The process of identification and characterisation continues to face a significant barrier in the separation of these elements.

**Physico-Chemical Evaluation of Crude Drugs:** All of the unprocessed medications underwent physical and chemical analysis for various characteristics. The first stage used in the identification and standardisation of crude pharmaceuticals is physical examination. It



supports the authenticity of crude drugs and aids in the detection of adulterants. It serves as the first stage in identifying chemical components and standardising crude drugs.

**Physical Test of Crude Drugs:** The physio-chemical characteristics of the plant's powder were assessed, and the results were compared to published literature. The outcomes calculated using the ayurvedic pharmacopoeia of India's declared limitation.

**Phytochemical Screening:** Plant material concentrates have shown that saponins, tannins, glycosides, and sugars are available. The concentrates not entirely set in stone to be absent any and all proteins. As indicated by this examination, the methanolic separate has more parts. The table beneath records each concentrate's starter phytochemical screening test results. The early phytochemical screening tests distinguished flavonoids, tannins, starches, saponins, tannins, triterpenoids, and proteins in the concentrate, recommending that they might be powerful in the disclosure of bioactive standards. Moreover, the restorative activities of the two unmistakable concentrates might be because of the presence of a few phytoconstituents. The fact that alkaloids have antibacterial impacts makes it routinely found. Plant phenolics are a critical class of substances that capability as the body's primary cell reinforcements, alongside flavonoids and tannins. As per reports, tannins block the development of a few molds, yeasts, microscopic organisms, and infections. The cell reinforcement properties of plant material concentrate might be because of the presence of these synthetic substances, which were found in the concentrates. The plant material concentrate incorporated the optional metabolites and other synthetic parts. Since removes from whole plants incorporate various parts as well as a few bioactive substances. Finding compound parts in plant material that could bring about their quantitative estimation is made simpler with the guide of the fundamental phytochemical tests. Before a concentrate high in regular cell reinforcements may be additionally examined for future application in wellbeing advancing enhancements for the food business, a

reasonable extraction strategy should be contrived and upgraded to recuperate however many cancer prevention agents as plausible.

#### **Collection of Blood**

The Retro-Orbital plexus technique were used to obtain blood samples in capillary tubes, which were then centrifuged at 3000 rpm for 20 min.

#### **Glycemic Studies**

By assessing the supplements, metabolites, and catalysts, one might decide the physiological movement of the typical homeostasis. Useful movement might shift or be modified in the event that a destructive substance is consumed over a drawn out time span, and this ought to be clear in the blood's piece. After these meds were directed for 28 days of treatment, definite biochemical appraisals were made in light of these speculations. Glycemic upsides of the test plans are inspected. After a specific time frame, oral organization of a polyherbal plan at 150 mg/kg and 300 mg/kg showed no physiologically huge changes in the blood glucose level boundaries.

#### **CONCLUSION**

An significant human health issue, diabetes is reported to affect every fifth Indian, making it one of the most resistant diseases in the world. The physio-chemical characteristics of the plant's powder were assessed, and the results were compared to published literature. the outcomes calculated using the ayurvedic pharmacopoeia of India's published limitations. Table 1.1 lists the organoleptic characteristics of the plant extract that were assessed for appearance, colour, and flavour. Table 1.2 lists the extractive values of the plant extract tested in ethanol and aqueous solutions. Table 1.3 lists the values of the plant extract are loss on drying and foreign organic matter. Table 1.5 lists the plant extract's total ash, acid insoluble ash, and water soluble ash values. Based on these presumptions, extensive glycemic tests for the 30 day therapy of these designed medications were carried out. The table above contains chapters that examine the blood glucose readings for the test formulations, treatment groups, and control groups. After 24 hours of oral treatment of

several polyherbal material extracts at 150 mg/kg and 300 mg/kg, no physiologically significant variations in blood glucose measurements were found. The levels of blood glucose were shown to be significantly reduced by the extracts.

#### Acknowledgement

All of the aforementioned authors considerably contributed to the idea generation and drafting of this research article.

#### Conflict of Interest

The Authors declare no conflict of interest

#### REFERENCES

1. Tilburt J. C, Kaptchuk T. J. J. Herbal medicine research and global health: An ethical analysis. *Bull World Health Organ.* 2008;86(8):594–9.
2. Li J. W. H, Vederas J. C. Drug discovery and natural products: End of an era or an endless frontier? *Science.* 2009;325:161–5.
3. Jayakumar RV. Herbal medicine for type-2 diabetes. *Int J Diabetes Dev Ctries.* 2010;30:111–2
4. Parasuraman S, Kumar EP, Kumar A, Emerson SF. Anti-hyperlipidemic effect of triglize, a polyherbal formulation. *Int J PharmPharm Sci.* 2010;2:118–22
5. Kumar, S., Mittal, A., Babu, D., & Mittal, A. (2021). Herbal Medicines for Diabetes Management and its Secondary Complications. *Current diabetes reviews, 17*(4), 437–456.
6. Salleh, N. H., Zulkipli, I. N., MohdYasin, H., Ja'afar, F., Ahmad, N., Wan Ahmad, W., & Ahmad, S. R. (2021). Systematic Review of Medicinal Plants Used for Treatment of Diabetes in Human Clinical Trials: An ASEAN Perspective. *Evidence-based complementary and alternative medicine :eCAM, 2021*, 5570939.
7. Umpierre D, Ribeiro PA, Kramer CK, Leitão CB, Zucatti AT, Azevedo MJ, Gross JL, Ribeiro JP, Schaan BD. Physical activity advice only or structured exercise training and association with HbA1c levels in type 2 diabetes: a systematic review and meta-analysis. *JAMA.* 2011 May 04;305(17):1790-9
8. Gegenheimer P. (1990). Preparation of extracts from plants. *Methods in enzymology, 182*, 174–193.
9. Abubakar, A. R., & Haque, M. (2020). Preparation of Medicinal Plants: Basic Extraction and Fractionation Procedures for Experimental Purposes. *Journal of pharmacy & bioallied sciences, 12*(1), 1–10.
10. Kumar, D., Kumar, K., Kumar, S., Kumar, T., Kumar, A., & Prakash, O. (2012). Pharmacognostic evaluation of leaf and root bark. *Roxb. Asian Pacific journal of tropical biomedicine, 2*(3), 169–175.
11. Islam, M., Wahid, K. A., Dinh, A. V., & Bhowmik, P. (2019). Model of dehydration and assessment of moisture content. *Journal of food science and technology, 56*(6), 2814–2824.
12. Rao, Y., & Xiang, B. (2009). Determination of total ash and acid-insoluble ash of Chinese herbal medicine. *Yakugakuzasshi: Journal of the Pharmaceutical Society of Japan, 129*(7), 881–886.
13. Kim, D., Kim, B., Yun, E., Kim, J., Chae, Y., & Park, S. (2013). Statistical quality control of total ash, acid-insoluble ash, loss on drying, and hazardous heavy metals contained in the component medicinal herbs of "Ssanghwatang", a widely used oriental formula in Korea. *Journal of natural medicines, 67*(1), 27–35.
14. Kadam, Vasantrao. (2013). Determination of water soluble Ash values of some Medicinal Plants of Genus Sesbania. *Journal*

- of Pharmaceutical and Biological Research. 1. 1-4.
15. Pawar, Sushama & M.G., Jadhav. (2015). Determination of Extractive value and Phytochemical analysis of Bacopamonnieri (L)., Sushama & M.G., Jadhav. (2015). Determination of Extractive value and Phytochemical analysis of Bacopamonnieri (L).
  16. Ghelani, H. S., Patel, B. M., Gokani, R. H., & Rachchh, M. A. (2014). Evaluation of polyherbal formulation (SJT-HT-03) for antihypertensive activity in albino rats. *Ayu*, 35(4), 452–457.
  17. Goel, R. K., Mahajan, M. P., & Kulkarni, S. K. (2004). Evaluation of anti-hyperglycemic activity. *Journal of pharmacy & pharmaceutical sciences: a publication of the Canadian Society for Pharmaceutical Sciences, Societecanadienne des sciences pharmaceutiques*, 7(1), 80–83.