

# Formulation of Poly Herbal Capsule from Ethanolic Extract of *Withania coagulans*, *Picrorhiza kurroa*, and *Gymnema sylvestre*

Deepak Prajapati <sup>1\*</sup>, Dr. Gaurav Goyanar <sup>2</sup>

<sup>1</sup>Research Scholar, Department of Pharmacy, SAGE University, Indore, Madhya Pradesh, India.

Email: dsp7229@gmail.com

<sup>2</sup>Associate Professor, Department of Pharmacy, SAGE University, Indore, Madhya Pradesh, India.

\*Corresponding Author: Deepak Prajapati, Research Scholar, Department of Pharmacy, SAGE University, Indore, Madhya Pradesh, India. Email: dsp7229@gmail.com

## Abstract:

The current study intended to develop capsule formulations using isolated substances from *Withania coagulans*, *Picrorhiza kurroa*, and *Gymnema sylvestre*. To achieve anti-diabetic formulations with enhanced oral hypoglycemic efficacy, reduced adverse effects, and improved patient adherence, therefore offering comprehensive advantages. Isolated fractions of selected plants were combined in a 1:1:1 ratio inside hard gelatin capsules. The preformulation of capsules was assessed by the angle of repose and bulk density. Completed capsule formulations were assessed for weight variation, pH, moisture content, disintegration time, in vitro drug release percentage, and in vivo antidiabetic investigations. Our analysis revealed that the pH of the empty capsule shell was 3.62, and the moisture level of the capsule was less than 5% w/w, indicating a reduced likelihood of microbial development and preventing the capsule from becoming soft. The filled capsule met the criteria for weight consistency, and all capsules dissolved within seven minutes. The in-vitro dissolving investigation of the capsule yielded a result of 91.17%.

**Keywords:** Polyphenolic compounds, herbal formulations.

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**INTRODUCTION** Medicinal plants are well recognized for their medicinal efficacy and lack of adverse effects. In light of this, the creation of antidiabetic medications from natural plants has been a focal point for researchers in natural product research, since synthetic pharmaceuticals may have undesirable side effects. The systematic development of innovative pharmaceuticals from conventional medicine presents new opportunities in contemporary healthcare [1-3]. Nonetheless, empirical evidence supporting the anti-diabetic efficacy of medicinal plants and phytopharmaceuticals with reduced adverse effects remains absent. *Dregea volubilis* and *Leptadenia reticulata* belong to the *Asclepiadaceae* family, which is extensively used in Indian traditional medicine. In herbal medicine, plant-based compositions are used to mitigate ailments. However, the primary issues encountered by these formulations stem from their insufficient examination. Evaluation is essential to guarantee the quality and purity of the

herbal product. Establishing an assessment strategy for any plant medication available in the market is crucial due to the significant variability across various batches. Nutrition is the supply of essential elements, in the form of food, to cells and organisms to sustain life. An inadequate diet may adversely affect health, leading to deficiency illnesses. Herbal nutritional supplements provide vital elements that are either absent or insufficiently present in the diet [4-6]. Therefore, we develop isolated compounds from *Withania coagulans*, *Picrorhiza kurroa*, and *Gymnema sylvestre* in polyherbal capsules to increase efficacy.

## Materials And Methods

**Development and Assessment of Capsules:** The description and dimensions of the capsules are consolidated in Table 1, detailing the capsule size acquired from the supplier.

Preformulation experiments were conducted to examine the physicochemical properties of a medicinal ingredient both alone and in conjunction

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with excipients. The primary aim of preformulation testing was to provide information beneficial for the development of a stable dosage form.

**The angle of repose:** The angle of repose was measured using a funnel positioned vertically in a stand at a predetermined height above a sheet of paper on a level surface. The funnel's base is sealed, and 10 grams of sample powder (a 1:1 mixture of DV and LR separated fractions) is placed in the funnel. The funnel was opened to dispense the powder onto the paper, creating a smooth conical mound, which was measured from several directions. The height of the heap was assessed using a scale. The angle of repose values are determined using the below formula:

$\tan \theta = h/r$  Where h represents the height of the heap and r denotes the radius of the heap.

**Bulk Density:** A certain amount of powder was meticulously introduced into the measurement cylinder. The powder was leveled (the DV and LR isolated fractions were combined in a 1:1 ratio) without compaction, if required, and the unsettled apparent volume,  $V_o$ , was recorded to the closest graded unit. Bulk density was computed in grams per milliliter using the following formula.

Bulk density is calculated as Bulk Mass divided by Bulk Volume.

### Manual Capsule Filling by Operated Hard Gelatin Capsule Filling Machine:

The vacant capsules are positioned in the loading tray situated above the bed. Upon opening the handle, the capsule bodies are secured, and the caps are detached inside the loading tray, which is then removed by engaging the lever. The measured quantity of the medicine was combined with an adequate number of excipients for capsule filling and positioned in a powder tray previously set on the bed. The powders are disseminated using a powder spreader to evenly fill the bodies of 200 capsules. The surplus powder is gathered on the surface of the powder tray. Depressed the pin plate and adjusted it lower to compact the powder inside the bodies. The powder tray is removed, and the caps are positioned on the holding tray. The caps are secured using a plate with a rubber top, and a lever is manipulated to detach the cap from the capsule body. The loading tray is detached, and the filled capsules are gathered in a tray.

### Quality Assurance Specifications for Capsule:

Capsule Formulation: Each formed capsule comprises the equivalent of 50 mg of extract and 30 mg of

excipients, which were previously ground, as stated in Table 1.

**Assessment of Moisture Content:** The test was conducted with the Karl Fischer equipment from Electro Lab. The sample was created by amalgamating the contents of four capsules. For low water concentrations ( $< 0.1\%$ ), it is advisable to use a titrant with a concentration factor of less than 5 mg/mL. An alternative to direct volumetric titration includes both external extraction and the KF oven technique: in external extraction, the sample is dissolved, while in the KF oven technique, water is liberated by heating the sample to a suitable temperature and subsequently transferred into a volumetric cell [7].

**pH:** The pH of a solution was measured potentiometrically using a glass electrode, a reference electrode, and a digital pH meter. The pH meter was used in accordance with the manufacturer's guidelines. The equipment was first calibrated using buffers with pH values of 4, 9, and 7. One empty pill was extracted and dissolved in 100 ml of demineralized water. The electrodes were submerged in the fluid, and the pH was assessed [8].

**Weight Uniformity:** Twenty full capsules were randomly picked and weighed to ascertain the average weight, which was then compared to the weight of individual capsules. The % weight variation was computed [9].

**Disintegration test:** The disintegration test for the capsule was conducted using a digital microprocessor-based disintegration test instrument manufactured by Electro Lab. A capsule was put into each tube, and a disk was placed to each tube. The assembly was immersed in a 1000 ml beaker filled with water. The water volume ensured that the wire mesh's highest point is at least 25 mm under the water's surface, while its lowest position is at least 25 mm above the beaker's bottom. The equipment was controlled to maintain a temperature of  $37.50 \pm 0.5^\circ\text{C}$ . The duration necessary for the complete disintegration of all capsules and their passage through wire mesh [10].

**in-vitro dissolution test:** The in-vitro dissolving test for the capsule was conducted using USP dissolution device 2 from Electro Lab. Nine hundred milliliters of the pH 7.2 phosphate buffer was injected into the vessel of the device as the dissolving media. A basket-type disintegration equipment was used for the capsules. The temperature was maintained at  $37.5^\circ\text{C} \pm$

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0.5°C. Ten milliliters of the sample were extracted at 30, 45, and 60-minute intervals and substituted with an equivalent volume of new buffer solution. The absorbance of the samples was measured at 263 nm. The proportion of medication release was determined using the following formula [11].

**Results and discussion:** The assessment of the pharmaceutical quality of herbal products, regardless of their medicinal content and therapeutic efficacy, is crucial; hence, this research focuses on the preformulation and formulation analyses of the developed capsules. The absorption of a medicine into the bloodstream is regulated by its release from solid dosage forms into gastrointestinal fluid. Therefore, enhancing the disintegration and dissolving rates of the medicine may enhance its absorption and bioavailability. The capsule has been successfully formulated. The developed dosage forms satisfied the pharmacopeial standards for quality assessment and may serve as appropriate alternatives in the management and treatment of hyperlipidemia.

**Preformulation investigations:** Recent advancements in formulation science and technology provide novel potential for encapsulating liquid and semi-solid compositions inside hard gelatin capsules. Consequently, we developed the polyherbal capsules, and the investigation was conducted to assess their effects. In our analysis, the angle of repose of the sample powder was determined to be  $30.88^\circ \pm 0.28$  (n=3), and the bulk density of the powder sample was measured at  $0.6675 \pm 0.005$  (n=3). The pH of the empty capsule shell was determined to be 3.62, and the moisture content of the capsule was measured to be less than 5% w/w. The filled capsule met the criteria for weight homogeneity, and the disintegration time of the polyherbal capsules was determined to be 7 minutes. The percentage release of the capsule is shown in Table 3 and Figure 1. The dissolving percentage of the capsule was determined to be 94.17%. In recent years, there has been a significant surge in interest about the use of hard gelatin capsules in the development and production of pharmaceuticals. This is likely attributable to rapid advancements in dose formulations for hard gelatin capsules. Simultaneously, the structural underpinning of a new technology has been established and materialized via efficient process equipment. The design of a rapid-release hard gelatin capsule may be mostly inferred from the physicochemical

characteristics of the active pharmaceutical ingredient. The active substance is often combined with excipients and immediately encapsulated. As it is also very important to estimate the pharmaceutical quality of the herbal products irrespective of their medicinal content and therapeutic states; so in the present study, the pre-formulation and formulation studies of the formulated capsules. Absorption of drug in the blood is controlled by the availability of drug from solid dosage into the GI fluid. Hence the rate of absorption and availability may be improved by improving the disintegration and the rate of dissolution of drug. Capsule has been successfully formulated.

### Conclusion

The use of Ayurvedic Poly herbal formulation has stood the test of time. Using the Ayurvedic concept of Panchamahabhutas and Tridoshas. Poly herbal formulation provides treatment of diseases in a holistic approach. The scientific advancement carries with it the improvement in Ayurvedic formulation of PHFs, through the study of various phytoconstituents and discovery of useful herbs combinations which work synergistically to produce desirable effect. Today, the “renaissance” of Ayurvedic PHFs has occurred the world over, owing to its comparable efficacy, fewer side effects and better acceptability than allopathic drugs. Most of the time, they produce satisfactory effect and safety, making them one of the highly selected drugs of choice. Nonetheless, public's inadequate knowledge and misconception on the safety of PHFs may result in the opposite effect such as toxicity and undesired interaction. Poor regulatory control and manufacturers' irresponsibility has also affected the quality of the PHFs manufactured, which can be dangerous to the consumers' health. For this, preventive and corrective steps are crucial to reduce the hazardous risks, including the practice of strict regulatory control and public education on the correct use of PHFs. Only with correct and rational use, Ayurvedic PHFs can exert the best effect in human health. The current study develop capsule formulations using isolated substances from *Withania coagulans*, *Picrorhiza kurroa*, and *Gymnema sylvestre*. To achieve anti-diabetic formulations with enhanced oral hypoglycemic efficacy, reduced adverse effects, and improved patient adherence, therefore offering comprehensive advantages. Isolated fractions of selected plants were combined in a 1:1:1 ratio inside hard gelatin capsules. The preformulation

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of capsules was assessed by the angle of repose and bulk density. The filled capsule met the criteria for weight consistency, and all capsules dissolved within seven minutes. The in-vitro dissolving investigation of the capsule yielded a result of 91.17%.

### References

- Venkatesan. N, Anton Smith. A, Effect of active fraction isolated from the leaf extract of *Dregea volubilis* [Linn.] on plasma glucose concentration and lipid profile in streptozotocin-induced diabetic rats, Springer Plus 2 (2013) 394,
- Venkatesan. N, Anton Smith. A, Effect of active fraction isolated from the leaf extract of *Leptadenia reticulata* on plasma glucose concentration and lipid profile in streptozotocin-induced diabetic rats, Chinese journal of natural medicines, 12 (5) (2014) 463 – 468.
- Tamizhmani. T, Ponnusankar. S, Nancy. J, Toxicity of using herbs, The indian pharmacist, 14 (2) (2003) 13.
- Mohapatra. P, Shirwaikara. A, Aswatharam. H, Standardization of a polyherbal formulation, Pharmacognosy magazine, 4 (13) (2008) 65-69.
- Indian Pharmacopoeia. Vol. II, Government of India, Ministry of Health and Family Welfare, New Delhi, (2006) A-81-83.
- Pandey. S, Devmurari. V, Goyani M, Formulation and evaluation of *cedrus deodara* Loud extract, Int J Chem Tech Res, 1(4) (2009) 1145 – 1152.
- Devi. R, Sharma. D.K, Hypolipidemic effect of different extracts of *clerodendron colebrookinum* walp in normal and high fat diet fed rats. Journal of ethnopharmacology, 90 (1) (2004) 63-68, DOI: 10.1016/j.jep.2003.09.022
- Lax. E.R, A Simple Method for Administration of Drugs in Solid Form to Fully Conscious Rats. Laboratory Animals, 17 (1983) 50-54.
- Millard. P.R, Essential Histopathology, Black well scientific publications, London, 1990, pp. 1 – 337.
- Srinivasan. K, Ramarao. P, Animal models in type II diabetes research: An overview. Indian journal of medical research, 125 (2007) 451-472.

**Table 1: Description with size of capsules**

Description	Size of capsule
Capsule Body Capacity	100 mg
Fill Weight (materials with density 1g/ml)	80 mg
External Diameter Maximum	2.65 mm
Length When Locked Maximum	23.2 mm

**Table 2: Quantity of ingredients in polyherbal capsules**

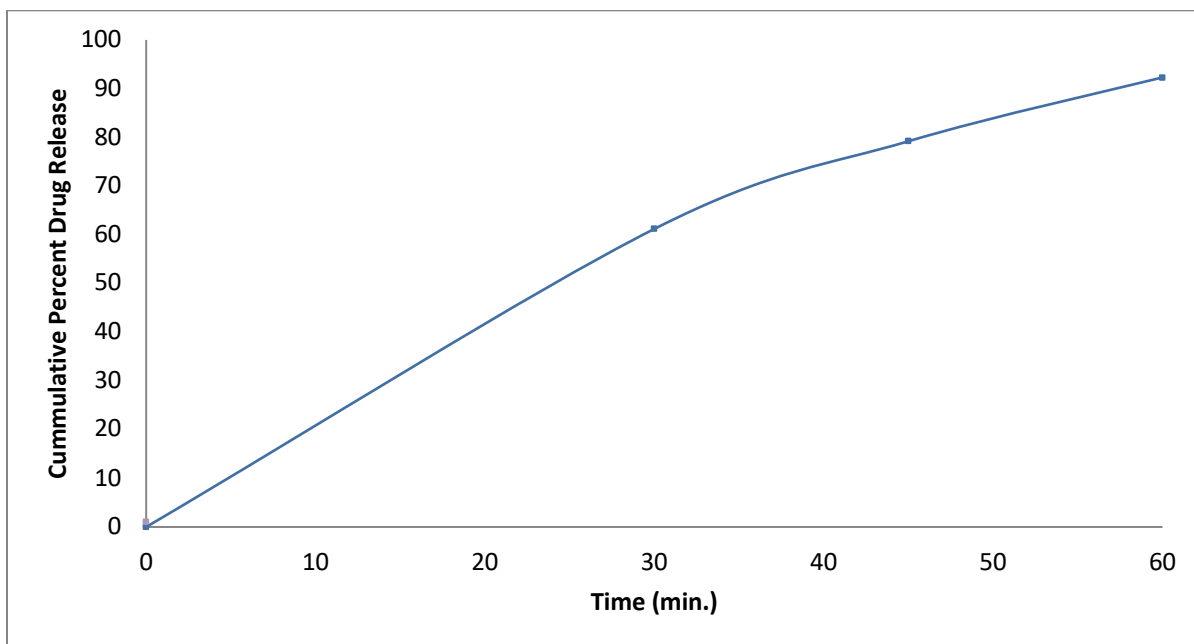
Ingredients	Strength (mg)
<i>Withania coagulans</i>	25
<i>Picrorhiza kurroa</i>	25
<i>Gymnema sylvestre</i>	25
Carboxy methyl cellulose (CMC) Q. S.	80

**Table 3: in-vitro dissolution study of polyherbal capsule (n=6)**

S. No.	Cumulative percent drug release (%)		
	30 min	45 min	60 min
1	65.72	80.17	93.75

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2	66.12	82.27	94.17
3	65.11	81.5	92.97
4	64.98	80.97	94.07
5	65.27	82.15	93.1



**Figure 1: *in-vitro* dissolution study of polyherbal capsule (n=6)**