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RESEARCH ARTICLE

Medicinal Importance, Physicochemical Evaluation and Formulation Development of Polyherbal Anti-diabetic Tablet

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Abstract
Herbal drugs have enormous therapeutic potential which can be explored through various beneficial drug delivery systems. In recent times the less use of herbal formulations due to lack of their standardization. These formulations reported to have various advantages over the solubility and reduced toxicity on the basis of physicochemical evaluation. The main objective of this present study was design, development and physicochemical evaluation of anti-diabetic polyherbal formulation. The overall objective of this work is to provide a complete knowledge and understanding of characteristics of a drug molecule before development of polyherbal tablets.
Potentially active anti-diabetic herbs were used for developing tablets, these study should focus on physiochemical properties of new compound that affect drug performance and development of efficacious doses formulations or tablets. Phytochemical parameters for standardization of plants were according to standard methods and hydroalcoholic extract of *Alstonia scholaris, Pterocarpus marsupium* and *Embelia ribes* were used in the formulations.
Keywords: Polyherbal formulations, Preformulation studies, Physicochemical evaluation.

1 | INTRODUCTION

Herbs generally defined as the leafy green or flowering parts of a plant which have fragrance and either it may be fresh or dried, while spices are usually dried and produced from other parts of the plant, including seeds, bark, roots and fruits which have medicinal value and are used as medicine in traditional medicinal system in China, India and Egypt in ancient time. herbs are a widely distributed and widespread group of plants with savory or aromatic properties that are used for flavor-

ing and garnishing food, for medicinal purposes, or for fragrances; excluding vegetables and other plants consumed for macronutrients. Culinary use typically distinguishes herbs from spices.

Herbaceous plants are vascular plants that have no persistent woody stems above ground, including many imperishable and nearly all annuals and biennials.The traditional system of medicine in India such as Ayurveda, Unani, Sidha and other alternatives system of medicine based on herbal product and herbal drug which have significant properties for medicinal purpose.

It is also known as Herbalism or Phytomedicine. It is the study of the use of medicinal plants. It includes modern standards of testing of herbs and medicines derived from natural sources, few high quality clinical-trials and standards of purity.

Herbal medicinal products, these are defined as any medicinal product, exclusively one or more active ingredients of herbal origin.

Herbal drug prepared from various herbal materials with different pharmaceutical process which is extraction with various solvents that may be polar or non-polar fractionation critical flute purification, concentration and other processes.

Plants are very useful to mankind. Many of them are used exclusively for medicinal purposes. According to the World Health Organization (WHO), "a medicinal plant is a plant which, in one or more of its organs, contains substances that can be used for therapeutic purposes, or which are precursors for chemo-pharmaceutical semi-synthesis." Such plants are in great demand by pharmaceutical companies for their active ingredients.

Plants have played a major role as the basic source in several key industries, thus being responsible for stabilising and enhancing the economy of developing countries like India. Many valuable compounds like morphine, quinine, reserpine, vincristine, vinblastine etc. have been obtained from plant source. Plants provide us with nearly 30% of the medicines and drugs that we use, so much so, that many pharmaceutical companies have collecting centers specifically set up in many forests of the third world and developing countries for collecting plants used as drugs.

In view of the significance of plants, it is worthwhile to document this knowledge, as it will greatly help in the advancement of scientific work on plants.

Supplementary information The online version of this article (https://doi.org/10.15520/mcrr.v4i07.174) contains supplementary material, which is available to authorized users.

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2 | MATERIALS AND METHODS:

Alstonia scholaris (Leaves and Material), *Pterocarpus marsupium* (Bark) and *Embelia ribes* (Seeds) were collected from authorized local herbal supplier from Ujjain (M.P.).

1. Development of polyherbal formulation:

Powder of leaves and material of *Alstonia scholaris,* Heartwood of *Pterocarpus marsupium,* Seeds of *Embelia ribes* were coarsely powdered passed through 20# sieve. Now this powder extracted and prepared separately about 200 gms with hydroalcoholic mixture of 70% ethanol and 30% water in a soxhlet apparatus for 12-24 hours respectively. The solvent was removed under reduced pressure, with respect to dried plant material. The powdered plant material first extracted with petroleum ether to remove fatty materials and than extracted from ethanol solvent.

The dried extract was stored in desiccator till further use.

The hydroalcoholic extract of *Alstonia scholaris* (Leaves and Material), *Pterocarpus marsupium* (Bark) and *Embelia ribes* (Seeds) by the compression method for the treatment of diabetes. The dried powder extract and other ingredients were mixed uniformly and then mixture was blended and granulated. The granules were then compressed into tablets.

2. Physicochemical evaluation:

A method of investigating physiochemical systems that makes possible a determination of the nature of the interactions between the components of a system

through a study of the relations between the system's physical properties and compositions.

1.) Color: 5 ml extract was taken into watch classes and placed against white background in white tube light. It is observed for its color by naked eyes.

2.) Odour: Approx 2 ml of extract was smelled individually, the time interval among two smelling was kept 2 minutes to nullify the effect of previous smelling.

3.) Taste: A pinch of final syrup was taken and examined for its taste on taste buds of the tongue.

4.) Melting Point: Melting point was determined by capillary method. The poly herbal extract was finely powdered and charged in thin glass capillary tube, one end of which was sealed. Sufficient amount of drug was filled in the glass capillary, to form a column at the bottom of the tube (2.5-3.5 mm height), when packed down closely as possible by moderate tapping on solid surface. The capillary tube was placed in a melting point apparatus and the range of temperature when the drug just starts melting and till it completely melted was noted.

5.) pH: 2 gm of the powder material was shaken with 100 ml of distilled water for 5 minutes and the pH of the supernatant liquid was determined using a pH meter.

6.) Loss on drying: A watch glass is weighed accurately and then 1 gm of sample is taken in weighed watch glass and dried in an electric hot air oven at 1100°C for 6 hours. After that it is cooled and again weighed. The difference in the two weights gives the loss on drying of the sample in percentage.

7.) Bulk density and tapped density: 10 gm of powder sample was placed into a clean dry measuring cylinder and the volume (V0) occupied by the sample without tapping was determined. The cylinder was then dropped onto a hard wooden surface from a height of one inch at 2 seconds intervals until the powder occupied a constant volume (Vt). The bulk and tapped densities were determined from these values:

Density = Weight of powder(w)/Volume of powder

Bulk density = Weight of powder(w)/Bulk volume of powder(V0)

Tapped density = Weight of powder(w)/Tapped volume of powder(Vt)

8.) Carr's index: Carr's index or the compressibility index of the Plant(Seed) powder was calculated using the equation:

Carr's Index = [(Tapped density-Bulk density)/Tapped density]*100

TABLE 1: The acceptance criteria for Carr's Index

Compressibility Index	Flow Property
<10	Excellent
11-15	Good
16-20	Fair- aid not needed
21-25	Passable
26-31	Poor
32-37	Very poor
>38	Very very poor

9.) Hausner's ratio: Hausner Ratio was calculated using the formula:

Hausner's Ratio = Tapped density/Bulk density

TABLE 2: The acceptance criteria for Hausner's ratio

Hausner's ratio	Flow Property
<1.25	Good flow
>1.5	Poor flow
1.25-1.5	Glidant addition required
>1.5	Glidant doesn't improve flow

10.) Angle of repose: An angle of repose was determined by using the funnel method. The powder was poured through a funnel that can be raised vertically until a maximum cone height(h) was obtained. The inverse tangent of this ratio is the angle of repose.

The radius of the heap(r) was measured and the angle of repose(θ) was calculated using the formula:

θ = tan-1(h/r)

3 | RESULTS:

Physiochemical parameters such as bulk density, tap density, Carr's index, Hausner's ratio, and angle of repose were obtained for the laboratory granules. The

TABLE 3: The acceptance criteria for Angle of repose

Angle of Repose(degrees)	Flow
<25	Excellent
25-30	Good
30-40	Passable
>40	Very poor

granules showed excellent flow property. The results are presented in Table No. 4:

TABLE 4: Physicochemical evaluation of polyherbal formulation

Parameters	Observation
Colour	Light brown
Odour	Odourless
Taste	Bitter
pH	7.9
Bulk density	0.81 gm/ml
Tapped density	0.721 gm/ml
Angle of repose	19.06°
Carr's index	4.01%
Hausner's ratio	1.19±0.09
Melting point	~173°C
Loss on drying	2.10%

4 | SUMMARY AND CONCLUSION:

In the developing countries increasing cost of medicine as well as their side effects has become great task when the public health is concerned. The scientific advancement carries with if the improvement in polyherbal formulations through the study of various physiochemical parameters.

The therapeutic efficacies of herbals or herbal formulations are mostly based on the synergistic property of each active constituent. This formulation was prepared by hydroalcoholic extracts of *Alstonia scholaris, Pterocarpus marsupium* and *Embelia ribes.* These results suggest the absence of any chemical interaction between the drug and the excipients used in this formulations. The standardization which provides a specific and rapid tool for setting the quality, identity and purity in polyherbal anti-diabetic formulations.

Hence, the polyherbal extracts pass all the parameters and according to data we say that they are more effective in the formulation development of polyherbal anti-diabetic tablet. It is futuristic approach in the anti-diabetic arena. This polyherbal extract of three plants can be recommended for formulation development of polyherbal anti-diabetic tablet.

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