

Research Article

Formulation and Characterization of Herbal Antidiabetic Suspension

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ABSTRACT

The present study was focused mainly on the preparation of herbal antidiabetic suspension. Bael leaves *Aegle marmelos* belonging to family Rutaceae, is commonly known as (BAEL). The plant used traditionally as Antibacterial Activity, Anti-diabetic Activity, Analgesic and Antiinflammatory activity as well as Bay leaf (*Laurus nobilis*) used traditionally as Antioxidant and it also having Anti-diabetes activity. Herbal medicine is the oldest form of healthcare known to humanity. Herbs had been used by all culture all over history. It was a vital part of the development of modern civilization. Herbal medicinal products are defined as any medicinal products, entirely containing one or more active substances. The WHO report 80% of the world population relies on the drug from natural origin. We make herbal antidiabetic suspension by using bay and bael leaves. The in vitro studies for the formulation can be Physical test of herbal suspension, Accelerated stability studies, Redispersibility, Viscosity, pH and crystal growth. Among three formulation F 2 formulation was found to be stable.

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INTRODUCTION

Herbal drugs play an important role in the development of influential therapeutic agents. Furthermore, it has proven their potential for the obstacle of several ailments. Earlier human beings started their studies on diseases and its treatments, but there was no evidence found that people have prehistoric use of artificial means synthetic medicines for their sickness. Plant medicines are readily used in combination rather than in a single form to acquire maximum benefit from their combined potential to reduce side effects of one another. Keeping the above information in view, an indigenous polyherbal preparation was developed. DM develops due to obesity which is also an rising problem worldwide, induces atherosclerosis and other metabolic syndromes like heart diseases, stroke and other health related problems. According to the provisions of insulin DM was classified into two main categories; insulin

dependent diabetes mellitus (Type 1), and non-insulin dependent diabetes mellitus (Type 2). Research desires in the field of herbal medicines are huge; the identification of active compounds from the plants source is still remaining a challenge. So, there should be research-based authentication on either whole herbs or on extracted compounds are found to be superior. The issue of herb-herb and herb-drug interactions is also an important, which requires increased awareness and study, as in polypharmacy and polyherbacy. The new technologies, such as nanotechnology and novel emulsification methods are used in the formulation of herbal products, which mainly affect bioavailability as well as efficacy of herbal components and this also needs to study. This can lead to reinvestigation of some agents that failed in earlier trials and can be restudied and redesigned using new technologies to finish whether they can be customized for better efficacy and fewer

side effects. Today, there is a vital need to develop safer drugs for the treatment of various disorders. As a result, there is an emergent interest in the pharmacological evaluation of various plants used in traditional systems of medicine (Sahu et al 2018)

Diabetes mellitus

According to International Diabetes Federation's (IDF) estimates, 80% of the world diabetic population will be from low- to middle-income countries in 2030. As per IDF 2011 report, China, India, and the United States of America have a diabetic population of 90.0, 61.3, and 23.7 million, which may be increased up to 129.7, 101.2, and 29.3 million, respectively, in 2030. Diabetes Mellitus (DM) is a metabolic disorder associated by impairment in the metabolism of carbohydrate, fat and proteins which was recognized by insufficient insulin secretion or rising resistance to its action. DM develops due to obesity which is also an increasing problem worldwide, Induces atherosclerosis and other metabolic syndromes (Eckel et al 2005)

According to the requirements of insulin DM was classified into two main categories; which was earlier classification of Diabetes.

- Insulin dependent diabetes mellitus (Type 1), and
- Non-insulin dependent diabetes mellitus (Type 2).

The new classification proposed by WHO in 1980 and 1985 were identified four types of diabetes mellitus, Type 1 insulin dependent diabetes mellitus, Type 2 non-insulin dependent diabetes mellitus and Type 3 is Maturity Onset Diabetes of the Young (MODY) as well as Gestational Diabetes Mellitus (GDM) was classified as Type 4 (Care D 2000)

Effective treatment of DM is considered to be an important task for the medical community because most of the currently available drugs have various adverse effects (Chaudhury et al 2017). Various studies have analyzed the alternatives for the treatment of DM that have similar therapeutic efficacy to that of conventional therapeutic agents but without causing significant adverse effects (Montales et al 2017) (Salehi et al 2019). However, no another treatment options have been recommended to date for treating DM. Ethno-botanical knowledge includes ~1200 species of medicinal plants that have the potential to treat DM and its complications. Several plant extract-based medicines have been experienced for the management of different diseases in Asian countries as well as in different regions of the world. However, the exact mechanisms of action of these extracts are not well studied. Currently, scientists are evaluating the use of different herbal extracts for treating various diseases including DM (Sharma et al 2020).

Bael leaves *Aegle marmelos* belonging to family Rutaceae, is commonly known as (Bael). The plant used traditionally as Antibacterial Activity, Anti-

diabetic Activity, Analgesic and Antiinflammatory activity and further studied reveal the presence of various Phytochemical screening showed that its leaves contained essential oils, tannins, flavonoids, terpenoids, and fatty acids. Bay leaf (*Laurus nobilis*) is an evergreen perennial shrub that belongs to family (*Lauraceae*). The plant used traditionally as Antioxidant and it also having Anti-diabetes activity. The leaves contained flavonoids, tannins, eugenol, citric acid, carbohydrate, steroids, alkaloids, triterpenoids, and essential oils. Traditional medicines from readily available medicinal plants have great potential for the discovery of new antidiabetic drugs. These natural products have either insulinomimetic or secretagogues properties. Plants with hypoglycemic and antioxidant properties are useful as antidiabetic agent. Polyherbal formulations have been prepared and found to have antidiabetic activity. A combination of two or more plants gives better therapeutic effect as compared to a single plant. Studies showed that the glycemic level was restored to normal. Hence antidiabetic plants were used to prepare a polyherbal formulation as suspension which is easy, rapid and economical to be formulated. The herbs used in suspension were leaves of *Aegle marmelos* (bael) and *Laurus nobilis* (bay).

MATERIALS AND METHODS

Bay leaves and Bael leaves were obtained from local market and Nashik region. All chemical used were of analytical grade. The leaves are then shade dried then makes fine powder and use for preparation of suspension.

Preparation of herbal suspension

The composition of formulation for preparing 100 ml of suspension of powder BAEL leaves *Aegle marmelos* and Bay leaf (*Laurus nobilis*) was passed through 100 mesh size sieve to get fine particles of the drugs that are properly mixed by trituration. After that the drug mix in water and the different additive such as Tween-80, sodium carboxymethyl cellulose (CMC), sweetening agent, flavoring agent, and sodium benzoate used for its better stability during shelf life of formulation.

Stability parameters for suspension

Physical test of herbal suspension

The physical test of herbal suspension was carried out at room temperature ($\pm 25^{\circ}\text{C}$) and 45°C .

Accelerated stability studies

The accelerated stability studies were carried out for herbal suspension. The different parameters such as sedimentation volume, redispersibility, flow rate, viscosity, pH, and crystal growth were studied for the formulation and results for particular test can be noted.

Sedimentation volume:

The sedimentation volume is the ratio of the ultimate height (Hu) of the sediment to the initial height (Ho) of

the total suspension as the suspension settles in a cylinder under standard condition.

Redispersibility

The suspension was allowed to settle in a measuring cylinder. The mouth of the cylinder was closed and was interred through 1800 and the number of inversion necessary to restore a homogeneous suspension was determined

Rheology

The time required for suspension sample to flow through a pipette was determined the apparent viscosity of suspension and can be calculated using the following equation

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

Viscosity

The viscosity of the sample was determined at room temperature using OSWALD's viscometer.

pH

The pH of suspension was determined using pH meter and noted.

Crystal growth

Stability of suspension will also reduce because of crystal growth, which usually occurs from temperature variation during storage and form broad particle size distribution. Crystal formulation was determined at 4°C, Room temperature (RT) and 47°C. (Srivastava, *et al* 2017)



Fig.1: Bay leaves



Fig.2: Bael leaves

Table 1: Composition of Herbal Suspension

Name of Ingredients	Quantity		
	F ₁	F ₂	F ₃
Bay leaves powder	1 g	1 g	1 g
Bael leaves powder	0.5 g	0.5 g	0.5 g
Tween 80	0.1 w/v	0.1 w/v	0.1 w/v
Sodium CMC	1%	1.5%	2.0%
Sodium benzoate	1 g	1 g	1 g
Sugar™ Free gold	0.1 g	0.1 g	0.1 g
Lemon oil	1 ml	1 ml	1 ml
Purified water q.s	100 ml	100 ml	100 ml



Fig. 2: Herbal Suspension

Table 2: Physical Test for Herbal Suspension

Parameter	F ₁	F ₂	F ₃
Nature	Liquid	Liquid	Liquid
Color	green	green	green
Odor	Pleasant	Pleasant	Pleasant
Texture	Suspension	Suspension	Suspension

RESULT AND DISCUSSION

Herbal suspension was prepared, and stability parameters were evaluated (Table 2).

The World health organization guidelines and parameters are now very essential for developing herbal products for various diseases. Moreover, pharmaceutical formulation in the form of suspensions many require preservatives, coloring, flavouring agents and other similar additives. Therefore, the necessity of adding a preservative at the desired level as well as its physical and chemical compatibility with other constituents of the medicinal product must be demonstrated. Sugar free gold (zydus wellness) was chosen as a sweetening agent

and Tween 80 is polysorbate used as surfactant and also used to increase bioavailability in oral suspension because of its non-ionic nature, it does not change pH of the suspension. CMC improves viscosity and stability of

suspension. Lemon oil was selected as a flavoring agent in suspension. Sodium benzoate is used as a preservative. Its relatively non-toxic and least harmful preservative.

Table 3: Accelerated Stability Studies

Parameter	F ₁	F ₂	F ₃
pH	7±0.57	7±0.57	7±0.57
Viscosity (cps)	58.6 cP	61.4 cP	69.5 cP
Sedimentation rate	2.26	1.21	0.94
Crystal growth	No	No	No
Flow rate	5ml/4.33sec	5ml/24.65sec	5ml/2min.

The prepared suspension formulation was found to have redispersibility property with sedimentation studies showed that the sedimentation volume of formulation F₂, which indicates that the formulation was optimum and acceptable (Table 2). All stability parameter is best, stable and suitable at variable temperature. There was no significant change observed in physicochemical and organoleptic behavior of the suspension.

FUTURE GOAL

Presently we worked on in vitro study but in future we planned for In vivo study for this herbal suspension.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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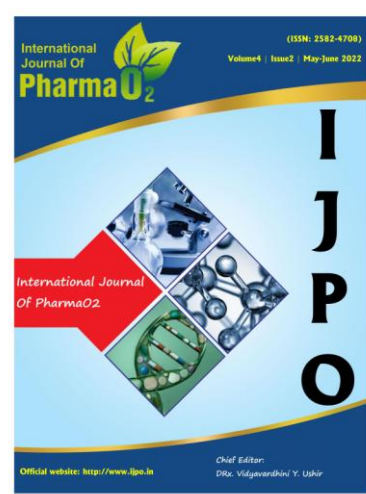
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