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Research Article

FORMULATION AND STABILITY STUDIES OF HERBAL SUSPENSION OF *AGARICS BISPORUS* POWDER

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ABSTRACT

The present study was focused on the stability study of herbal suspension of *Agaricus bisporus* powder. The suspension is useful in diabetes mellitus. Herbal medicine is the oldest form of healthcare known to humankind. Herbs had been used by all culture throughout history. It was an integral part of the development of modern civilization. Herbal medicinal products are defined as any medicinal products, exclusively containing one or more active substances. The WHO report 80% of the world population relies on the drug from natural origin.

Keywords: Herbal suspension, *Agaricus bisporus,* Stability study.

INTRODUCTION

Agaricus bisporus is an edible basidiomycete mushroom native to grasslands in Europe and North America. It has two color states while immature white and brown both of which have various names. *A. bisporus* is belonging to family Agaricaceae. A number of traditional herbal medical practices have been adopted for the diagnosis, prevention, and treatment of various diseases. The objective of development of herbal formulation is to provide the synergistic, potentiated, agonistic/antagonistic pharmacological agents within them self and work together in a dynamic way to produce maximum therapeutic efficacy with minimum side effects [1]. Therefore, treating diabetes mellitus with Ayurvedic medicines which are accessible and do not require laborious pharmaceutical synthesis seems highly attractive. Although oral hypoglycemic agents and insulin are the main stay of treatment of diabetes and are effective in controlling hyperglycemia [2]. Mushrooms have been reported to have hypoglycemic effects and antihyperglycemic effects. Mushrooms are known to contain compounds which help in proper functioning to the liver, pancrease, and other endocrinal gland there by promoting formation of insulin and related hormones which ensure healthy metabolic functioning. Polysaccharides, such as β-glucanscantained in mushrooms have the ability to restore the function of pancreatic tissues by causing increased insulin output by beta-cells which leads to lowering of blood glucose levels [3]. The oral rout of drug administration is the most important method of administrating drugs for systemic effects. Ayurvedic herbal formulations were also administered preferentially by oral route. Designing of oral herbal formulations is till date a challenge in modern pharmaceutics [4]. Suspension is coarse dispersion of finely divided solid particles of a drug dispersed in a liquid medium, in which the drug is not readily soluble. An aqueous suspension is a useful formulation system for administering an insoluble or poorly soluble drug [1] (Fig. 1).

MATERIALS AND METHODS

Materials

A. bisporus obtained from herbal garden of Kailash Institute of Pharmacy and Management, Gorakhpur Industrial Development Authority, Gorakhpur, Uttar Pradesh. All chemicals used were of analytical grade.

Preparation of herbal suspension dosage form

The composition of formulation for preparing 100 ml of suspension of *A. bisporus'* powder was as shown in Table 1. The 100 mesh size fine particles of the drugs are properly mixed by triturating [5]. 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 [6].

STABILITY PARAMETERS FOR SUSPENSION

Physical test of herbal suspension

The physical test of polyherbal formulation was carried out at room temperature (±25℃) and 45℃. The results were shown in Table 2.

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 observation.

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. It was

Table 1: Composition of herbal suspension

S.No.	Name of ingredients	Quantity taken		
		F_1	F_2	F_3
1.	*Agaricus bisporus* powder	1 g	1 g	1 g
2.	Tween 80	0.1 w/v	0.1 w/v	0.1 w/v
3.	Sodium CMC	0.5%	0.7%	1.0%
4.	Sodium benzoate	1 g	1 g	1 g
5.	Sugar™ Free gold	0.1 g	0.1 g	0.1 g
6.	Lemon oil	1 ml	1 ml	1 ml
7.	Purified water q.s	100 ml	100 ml	100 ml

CMC: Carboxymethyl cellulose

Table 2: Physical test for herbal suspension

S.No.	Parameter	F_1	F_2	F_3
1.	Nature	Liquid	Liquid	Liquid
2.	Color	Brown	Brown	Brown
3.	Odor	Pleasant	Pleasant	Pleasant
4.	Texture	Suspension	Suspension	Suspension

Table 3: Accelerated stability studies

S.No.	Parameter	F_1	F_2	F_3
1.	Redispersibility	1 inversion	1 inversion	1 inversion
2.	pH	6.66±0.57	6.66±0.57	6.66±0.57
3.	Flow rate	5 ml/4.33 seconds	5 ml/21.66 seconds	5 ml/1 min 16 seconds
4.	Viscosity	65 cP	110 cP	275 cP
5.	Sedimentation	2.26	1.21	0.94

Table 4: Crystal formation of formulation

S.No.	Sample no.	Time duration (hrs)	Temperature (°C)	Crystal formulation
1.	F_1	24	4°C	No
2.	F_2	24	RT	No
3.	F_3	24	47°C	No
4.	F_1	48	4°C	No
5.	F_2	48	RT	No
6.	F_3	48	47°C	No
7.	F_1	72	4°C	No
8.	F_2	72	RT	No
9.	F_3	72	47°C	No

Fig. 1: ***Agaricus bisporus***

determined by keeping a measured volume of suspension in a graduated cylinder in an undisturbed state for a certain period of time and note that the volume of the sediment which is expressed as ultimate height.

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 was using the equation.

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

Viscosity

The viscosity of the sample was determined at room temperature using Brookfield viscometer at 50 rpm by using spindle no. 3.

pH

The pH of suspension was determined using pH meter.

Crystal growth

Stability of suspension will also decrease because of crystal growth, which usually occurs from temperature fluctuation during storage and form broad particle size distribution. Crystal formulation was determined at 4°C, Room temperature (RT) and 47°C. The resulting parameters of suspension for all formulation are shown in Tables 3 and 4.

RESULT AND DISCUSSION

Herbal suspension was prepared, and stability parameters were evaluated. 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 selected as a sweetening agent and Tween 80 is polysorbate used as surfactant and also used to increase bioavailability in oral suspension and due to non-ionic nature, it does not change pH of the suspension. CMC improves viscosity and stability of suspension. Lemon oil was used as a flavoring agent in suspension. Sodium benzoate is used as a preservative. Its relatively non-toxic and least harmful preservative. The prepared suspension formulation was found to have redispersibility property with sedimentation studies showed that the sedimentation volume of formulation F_3, which indicates that the formulation was optimum and acceptable. All stability parameter is optimum stable and acceptable at variable temperature. There was no significant change observed in physicochemical and organoleptic behavior.

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