RESEARCH PAPER

Formulation Development and Evaluation of Herbal Cream of Salvia verbenaca for Candidiasis

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ABSTRACT

Hypertension is a widespread chronic disorder that requires effective and patient-friendly therapeutic strategies to ensure Candidiasis is a common opportunistic fungal infection primarily caused by Candida species, affecting mucosal and cutaneous tissues, with increasing prevalence due to immunosuppression, antibiotic misuse, and hormonal imbalance. Conventional antifungal therapies, though effective, are often associated with adverse effects, recurrence, and emerging drug resistance, necessitating the exploration of safer and effective alternative therapies. Herbal formulations derived from medicinal plants offer a promising approach owing to their bioactive phytoconstituents and minimal side effects. Salvia verbenaca (family: Lamiaceae), traditionally used for its antimicrobial, anti-inflammatory, and wound-healing properties, has gained attention as a potential antifungal agent.

The present study focuses on the formulation development and evaluation of a herbal cream incorporating an extract of Salvia verbenaca for the management of candidiasis. The plant material was subjected to extraction using suitable solvents, followed by preliminary phytochemical screening to identify active constituents such as flavonoids, phenolics, terpenoids, and essential oils known for antifungal activity. A topical herbal cream was formulated using appropriate excipients and optimized for consistency, stability, and patient acceptability.

The formulated cream was evaluated for physicochemical parameters including appearance, pH, viscosity, spreadability, homogeneity, and stability under different storage conditions. In-vitro antifungal activity against Candida albicans was assessed using standard microbiological methods, and the results were compared with a marketed antifungal preparation. The herbal cream exhibited satisfactory physicochemical characteristics, good stability, and significant antifungal activity, indicating its therapeutic potential.

The findings of this study suggest that Salvia verbenaca-based herbal cream may serve as a safe, effective, and economical alternative for the treatment of candidiasis. Further in-vivo studies and clinical investigations are recommended to validate its efficacy and safety for clinical application.

Keywords: Candida albicans, Salvia verbenaca, Herbal Cream, Candidiasis, Antifungal

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INTRODUCTION

Candidiasis is a widespread opportunistic fungal infection caused predominantly by *Candida* species, especially *Candida albicans*. These organisms are normal commensals of human mucosal surfaces; however, under favorable conditions such as immunosuppression, hormonal imbalance, prolonged antibiotic therapy, poor hygiene, and metabolic disorders, they can proliferate excessively and cause infection. Candidiasis commonly affects the skin, oral cavity, gastrointestinal tract, and genital mucosa, posing significant discomfort and recurrent health issues, particularly among women. The increasing incidence of candidiasis and the emergence of antifungal resistance have become major concerns in clinical practice [1,2].

Currently available antifungal agents, including azoles and polyenes, are effective but are often associated with limitations such as adverse drug reactions, high recurrence rates, prolonged treatment duration, and the development of resistant fungal strains. Additionally, synthetic antifungal formulations may cause local irritation, hypersensitivity reactions, and disruption of normal microbial flora upon prolonged use. These challenges emphasize the need for alternative therapeutic approaches that are safe, effective, economical, and suitable for long-term use [3,4]. Herbal medicines have been used since ancient times in traditional systems of medicine for

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the treatment of infectious diseases. Medicinal plants are rich sources of bioactive phytoconstituents such as flavonoids, phenolic compounds, terpenoids, alkaloids, and essential oils, many of which possess potent antifungal and anti-inflammatory properties. Herbal formulations are generally well tolerated and exhibit fewer side effects, making them attractive candidates for topical antifungal therapy [5-7].

Salvia verbenaca L., commonly known as wild sage and belonging to the family Lamiaceae, is an aromatic medicinal plant traditionally used for the treatment of skin infections, wounds, inflammation, and microbial disorders. Phytochemical studies of *Salvia verbenaca* have reported the presence of essential oils, flavonoids, phenolic acids, diterpenes, and triterpenoids, which contribute to its antimicrobial and antifungal activities. Several species of the genus *Salvia* are
well documented for their effectiveness against fungal pathogens, including *Candida* species, supporting the therapeutic potential of *Salvia verbenaca* [8].

Topical drug delivery systems such as creams are preferred for the treatment of cutaneous and mucocutaneous candidiasis due to their ease of application, localized action, enhanced patient compliance, and reduced systemic side effects. Herbal creams provide an effective means of delivering plant-derived antifungal agents directly to the site of infection while maintaining formulation stability and patient acceptability [9].

In this context, the present study aims to formulate, develop, and evaluate a herbal cream containing *Salvia verbenaca* extract for the treatment of candidiasis. The study focuses on optimizing the formulation, assessing physicochemical and stability parameters, and evaluating in-vitro antifungal activity. This research seeks to establish a scientifically validated herbal topical formulation that may serve as a safe and effective alternative to conventional antifungal therapies [8].

Material and Method Selection of plant material

Salvia verbenaca leaves have a long history of use in traditional and folk medicine, especially in Mediterranean, Middle Eastern, and South Asian systems. Their therapeutic value is mainly attributed to rich phenolic compounds, flavonoids, terpenoids, and essential oils. The leaves of ***Salvia verbenaca*** used as Antimicrobial activity, Anti-inflammatory effects, Antioxidant property, Wound healing and skin disorders, Antifungal and gynecological use, Analgesic and antipyretic activity, Digestive aid (Infusions of the leaves are used to treat indigestion, stomach cramps, and diarrhea, improving gastrointestinal function.) Respiratory disorders. The *Salvia verbenaca* id widely used in traditional medicine as antifungal, anti-inflammatory, antimicrobial, and wound-healing activities but till date no any systematic investigation has been carried out to study the toxicity profile of these medicinal plants, therefore an attempt was made to study the acute toxicity profile [10].

Collection and authentication of plant/plant material

The plant material selected for the present investigation *Salvia verbenaca* (leaves) was collected in the months of June-July from various sites of Malwa region of Madhya Pradesh and identified
& authenticated by Dr. Saba Naaz. Professor and Head, Department of Botany, Safia College of
Science, Bhopal (M.P.) and was deposited in our Laboratory, Voucher specimen No. Safia/159/Bot.

Extraction of Plant material

250 gm of the air dried coarsely powdered leaves of *Salvia verbenaca* was placed in soxhlet apparatus and was extracted with ethanol:water (90:10) until the extraction was completed. After extraction, the filtrate was evaporated to get the extract. [11]

Plant extracts

The hydro-alcoholic extracts of dried plant material of *Salvia verbenaca* Linn. were taken for formulation of herbal cream [12].

Formulation of herbal cream

The various steps involved in formulation of herbal cream were mentioned as described below: [13]

Preparation of oil phase

Stearic acid, cetyl alcohol, almond oil in desired quantity were taken in porclean dish and was melted at 70^0C.

Preparation of aqueous phase

Hydro-alcoholic extracts (HAEGA) of dried plant material of *Salvia verbenaca* (leaves) glycerol, methyl paraben, triethanolamine and water were taken in another porclean dish and were heated at 70^0C.

Addition of aqueous phase to oil phase

The aqueous phase was added to the oil phase with continuous stirring at room temperature. Perfume was added at last and the formulation was transferred in a suitable container.

Evaluation parameters of herbal cream

The prepared formulations were evaluated for the following parameters: [14]

. Physical evaluation

The physical evaluation of the herbal cream was done by evaluating clarity and transparency which was determined visually. The samples were observed in light at white background [15].

Determination of pH

The pH meter was calibrated first and zero reading was recorded. The samples were taken in the beaker and the readings were taken from calibrated electrode. The

procedure was repeated and three average reading was recorded [16].

Determination of Viscosity

The viscosity of the herbal cream was determined by Brookfield viscometer using spindle no 01 at 20 rpm at temperature 4 ^{o}C and 37^{o}C. About 15ml of the was taken in beaker and spindle was immersed in the formulation. The reading was recorded at initial and after rotation at different temperature. The reading was recorded thrice [17].

Determination of Homogeneity

All the prepared herbal cream was tested for homogeneity by visual inspection and was evaluated for presence of any aggregates present in the formulation [18].

Determination of Spreadability

The Spreadability was determined for all the prepared herbal cream. The formulations were placed on the glass slide and the empty glass slide was place on the top of gel containing slide. The formulation was placed in such as way that it was placed between two slides. The occupied distance of the slides was observed to be of 7.5 cm. The herbal cream was placed between slide and pressed form thin uniform layer. The weight kept on the herbal cream was removed. The excess herbal cream observed in the slides was removed. The two slides were fixed and on the upper glass slide the 20 ±0.5 g of the weight was tied [19]. Due to weight the both the slides were separated which was recorded as time to complete the separation distance of 7.5 cm. The three readings were recorded and mean time was taken. The Spreadability was calculated as

S= m X l/t

l is the length of slide (7.5 cm), m is the weight which is tied to slides and t is the time taken in second.

Determination of Wetness

The prepared herbal cream was determined for wetness by applying on skin surface [20].

Determination of type of smear

The prepared herbal cream was applied on the skin surface and after the application the type of film or smear formed on the skin was recorded [21].

Determination of Emolliency

The prepared herbal cream was checked for emolliency, slipperiness and amount of residue left after the application of cream [22].

Determination of type of Emulsion Dilution test

The prepared herbal cream was diluted with oil or water depending upon the type of emulsion whether o/w or w/o the results obtained were noted down [23].

Dye solubility test

The prepared herbal cream was mixed with a water soluble dye i.e., amaranth and was observed under the microscope. The results obtained were interpreted [24].

Determination of Drug content

The content of the herbal cream was estimated using UV-Visible spectrophotometer. Near about 1g of the formulation was taken in 50 ml of volumetric flask. The solution was make up to mark with methanol. The solution was shaked and filtered though whatman filter paper. The 0.1ml of the filterate was further diluted to 10ml with solvent and estimated at suitable wavelength.

***In vitro* drug release**

The semi permeable dialysis membrane bag (7cm long) was prepared and the herbal cream was placed in the membrane. The dialysis bag was ten suspended in 50ml of ethanol: water (1:1) at

temperature 37°C ± 0.5 °C in water bath. About 1ml of sample was withdrawn from the membrane at predetermine interval and the fresh equal volume was replaced simultaneously. The samples were withdraw till one week and were diluted and analyzed by UV Visible spectrophotometer at suitable λmax. The experiment was repeated trice and the cumulative amount of drug release was calculated from the reading.

Anti-candidal Activity

The anti-candidal activity was determined as per method described by Shriwas et al., [12]

Table 1: Composition of herbal cream of *Salvia verbenaca* extract for Candidiasis.

Ingredients	Formulation Code							
	HCS 1	HCS 2	HCS 3	HCS 4	HCS 5	HCS 6	HCS 7	HCS 8
HAESV	0.5	0.75	1.0	1.5	0.5	0.75	1.0	1.5
Stearic acid	5	5	5	5	10	10	10	10
Cetyl alcohol	10	10	10	10	5	5	5	5
Almond oil	5	5	5	5	5	5	5	5
Glycerol	3	3	3	3	3	3	3	3
Methyl paraben	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Triethanolamine	qs	qs	qs	qs	qs	qs	qs	qs
Water (100 ml)	qs	qs	qs	qs	qs	qs	qs	qs
Total weight	100	100	100	100	100	100	100	100

RESULT AND DISCUSSION

Note: All values are taken in gm

Several researchers have evaluated the effects of plant extracts and their formulations in systemic infections for the treatment of fungal infection including vaginal candidiasis. It was also revealed that presently there are some herbal formulations available in the market used for the vaginal infection and they having very promising as having less or no adverse/side effects. The present work was undertaken to formulate and evaluate herbal cream containing hydro-alcoholic extract of *Salvia verbenaca* (leaves). The formulated herbal cream was evaluated as per standard protocols. The results are mentioned in table 2. The drug content was found maximum in HCS7 i.e., 97.25 (Table 3). The results of drug release profile indicates that the formulation HCS7 has % release (Table 4)

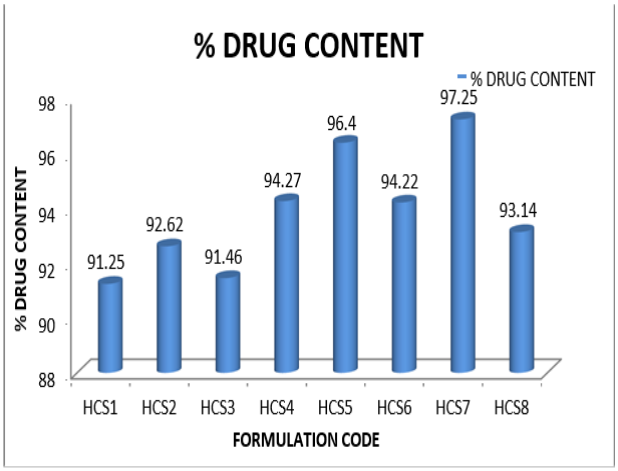
Table 2: Evaluation parameters of herbal cream

FC	Parameters								
	Appearance	**pH**	**Viscosity**	**Homogeneity**	**Spreadability**	**Wetness**	**Type**	**Emolliency**	**Type of**
HC	Pale white	6.	2726	Homog	64.25	+++	No n	No resid	o/w
HC	Pale white	7.	2769	Homog	65.38	+	No n	No resid	o/w
HC	Pale white	6.	2746	Homog	67.56	++	No n	No resid	o/w
HC	Pale white	6.	2712	Homog	61.36	++	No n	No resid	o/w
HC	Pale white	6.	2758	Homog	62.85	++	No n	No resid	o/w
HC	Pale white	6.	2768	Homog	61.74	++	No n	No resid	o/w
HC	Pale white	7.	2775	Homog	68.68	+++	No n	No resid	o/w
HC	Pale white	7.	2781	Homog	61.27	+	No n	No resid	o/w

(Note: +=Good, ++=Better, +++=Best)

Table 3: Drug content of herbal cream

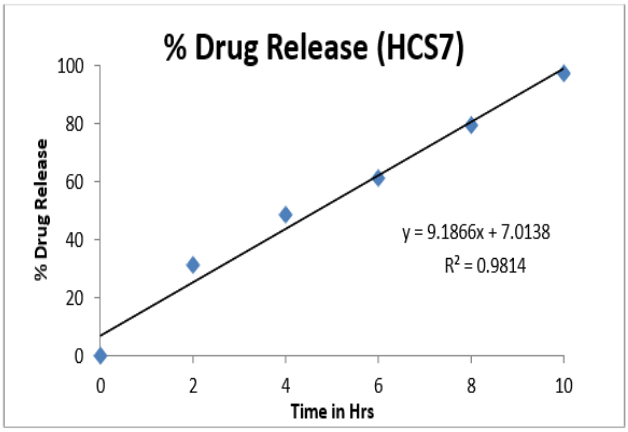
Formulation Code	% Drug Content
HCS1	91.25
HCS2	92.62
HCS3	91.46
HCS4	94.27
HCS5	96.40
HCS6	94.22
HCS7	97.25
HCS8	93.14



Graph 1: Drug content of herbal cream in percent

Table 4: % Drug release of herbal cream

Time (Hrs)	% Drug Release (HCR5)
0	00.00
2	29.33
4	47.38
6	59.14
8	83.47
10	95.24



Graph 1: % Drug release of optimized herbal cream

The optimized herbal cream HCS7 was tested against fungal strain to proof the efficacy of herbal formulation. The results obtained were compared with standard marketed preparation and it was found that HCS7 have significant value. (Table 5).

Table 5: Anti-*Candidal* Activity of herbal cream

S/No.	Test	Zone of Inhibition (mm)
1.	Negative Control	4.78±0.02
2.	Marketed Cream	22.15±0.004**
3.	HCS7	19.24±0.012*

Note: All values are expressed as Mean (X) ±SEM, (n=3). One way ANOVA followed by

student test, values are statistically significance *P<0.01, **P<0.001 when compared with control and standard.

Conclusion

From the results obtained it was concluded that the herbal cream containing hydro-alcoholic extract of leaves of *Salvia verbenaca* have optimum anti-*candida activity* and may be used for the treatment of gynecological disorders. Moreover detailed pharmacological screening and clinical approaches need to establish for the formulation of safe and effective drugs. The formulation code HCS7 has promising and effective drug content and release. Hence, it was concluded from the present investigation that the selected herbal formulation i.e., herbal cream (HCS7) have a prominent effect in the treatment of vaginal candidiasis, though the detailed clinical approaches need to establish for the formulated cream in order to establish its of safety and effectiveness

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