

FORMULATION AND EVALUATION OF WHEATGRASS TOPICAL GEL

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ABSTRACT

Topical preparation are meant to use externally for protection and treatment purposes. There are so many types of formulations available like creams, ointment, gels and pastes etc., Gels are transparent or translucent preparations containing gelling agent that merges or entangles to form a three-dimensional colloidal network structure In present work wheat grass gel is prepared to treat skin disorders like eczema, psoriasis and as natural energizer. The wheatgrass gel was formulated using carbopol 940, carbopol 974, xanthan gum and guar gum. The gel was evaluated for various physicochemical parameters like physical appearance, pH, homogeneity and spreadability.

KEYWORDS: Topical preparations, Wheat grass, Gels and Gelling agents.

INTRODUCTION

Topical drug administration

Topical drug administration is a localized drug delivery system anywhere in the body through ophthalmic rectal, vaginal and skin as topical routes. Skin is the most readily accessible organs on human body for topical administration and is main route of topical drug delivery system. Preparations are applied to the skin for surface, local or systematic effects. In Topical some cases the base may be used alone for its therapeutic properties, such as emollient, soothing or protective action.

Here Wheat grass gel preparation for topical use to treat skin disorders like eczema, psoriasis and as natural energizer.^[4]

Advantages of topical drug delivery system

Avoidance of first pass metabolism.

Skin irritation on contact dermatitis.

Possibility of allergic reactions.

Disadvantages of topical drug delivery system

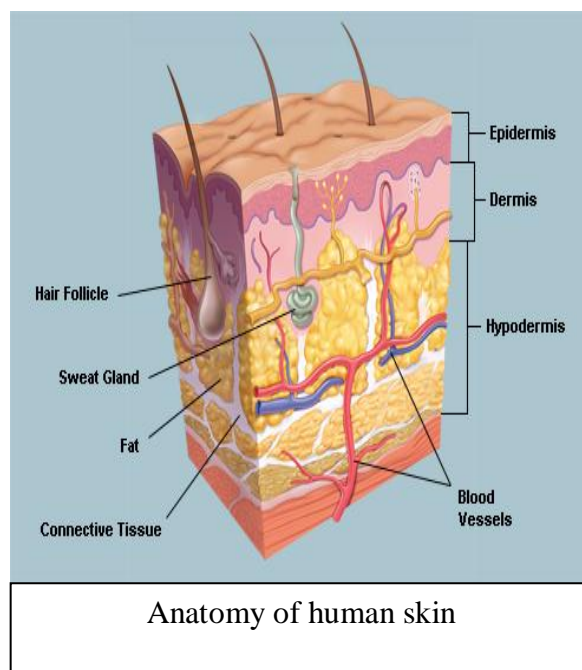
Skin irritation on contact dermatitis.

Possibility of allergic reactions.

Poor permeability of some drug through skin.^[5]

ANATOMY AND PHYSIOLOGY OF SKIN

The skin is the body's largest organ. It creates a barrier between the external environment and the internal organs. The skin has several important functions vital to human life. Its thickness varies depending on where it is located on the body.



Structure of Skin

The *epidermis* and *dermis* are the 2 main layers of the skin. They lie on top of a third layer called the sub cutis.

Epidermis

The epidermis is the thin outer layer of the skin. The epidermis also includes 2 other types of specialized cells: Langerhans cells (involved in immune response) and Merkel cells (believed to play a role in making the skin sensitive to touch).

Dermis

The dermis is the second layer of the skin, beneath the epidermis. The dermis is the thickest of all 3 layers. It is made up of a papillary layer and a reticular layer. Collagen and elastin are produced by fibroblasts in the dermis to provide structure to the skin.

Sub cutis

Beneath the dermis lies a fat layer known as the sub cutis or hypodermis. This layer is made up mainly of fat, or adipose tissue.

Function**The skin has many functions, which includes**

Protecting the body from heat, sunlight, injury and infection helping to regulate body temperature

Blood flow to the skin's surface allows the heat to escape to the air and helps to maintain a constant body temperature.

Nerve receptors in the skin monitor the environment by sensing cold, heat, pain and pressure.

Storing water, fat and Vitamin D.^[26]

GELS

Gels are transparent or translucent to opaque semisolids, containing gelling agent that merges or entangles to form a three-dimensional colloidal network structure. It is responsible for gel resistance to deformation and its visco-elastic properties.

Advantages

Gels are used to achieve optimal cutaneous and percutaneous drug delivery.

They can avoid gastrointestinal drug absorption difficulties caused by gastrointestinal pH.

Gels are having property to avoid enzymatic activity and drug interaction with food and drinks.

Gels have also been applied in pharmacy to some viscous suspension for oral use for example Aluminium hydroxide gel.

They have localized effect with minimum side effects.

Disadvantages

Gels have possibility of allergenic reactions.

Enzyme in epidermis may denature the drugs of gels.

Drugs of larger particle size do not absorb through the skin.

Ingredients used in preparation of gels

Antimicrobial preservatives Ex: Propyl paraben, Methyl paraben etc.

Antioxidants Ex: Ascorbic acid, Beta carotene, Vitamin A etc.

Humectants Ex: Glycerine, propylene glycol etc.

Fragrances Ex: Peppermint oil, Eucalyptus oil etc.

Gelling agents Ex: Sodium alginate, Xanthan gum, Guar gum etc.

Permeation enhancers Ex: DMSO, ethanol etc.

Co solvents Ex: Isopropyl alcohol, propylene glycol etc.

1.3.2. Gelling agents

These are the agents used to increase the consistency of any dosage form. It can also used as thickening agent.^[11]

Table no.1: Gelling agents.

Gelling agent	Concentration range
Carbopol-974	1%
Carbopol-940	1%
Sodium alginate	1%
Guar gum	1%
Xanthan gum	1%
HPMC-2910	2.5%
HPMC	3.5%
Sodium CMC	1%

WHEATGRASS

Wheat, (*Triticum species*) a cereal grass of the *Gramineae* (*Poaceae*) family, is the world's largest edible grain cereal-grass crop. It is commonly 60-150 cm. in height, may be as short as 30 cm. These reports and the chemical analyses undertaken reveal that wheatgrass is rich in chlorophyll, minerals like magnesium, selenium, zinc, chromium, antioxidants like beta-carotene (pro-vitamin A), vitamin E, vitamin C, antiemetic factors like vitamin B12, iron,

folic acid, pyridoxine and many other minerals, amino acids and enzymes, which have significant nutritious and medicinal value.



Wheatgrass

Benefits of wheatgrass

To treat skin disorders such as eczema and psoriasis.

Non-allergic.

Natural energizer.

Anti-cancer specifically blood cancer.

Treats paralysis.

Anti-diabetic.

Anti-inflammatory.

Slows down aging process.

Turns gray hair to natural color.^[12]

Nutritional values of wheat grass

Vitamin & minerals	Amount (mg 100ml)
Ascorbic acid	25.2
Dehydroascorbic acid	7.6
Vitamin E	8.5
Carotene	2.43
Potassium	57
Phosphorus	8.2
Calcium	2.4
Sulfur	2.37
Magnesium	1.7
Sodium	1.42
Aluminium	0.31
Zinc	0.02
Copper	0.007

Aminoacid	Amount($\mu\text{g/ml}$)
Aspartic acid	510.3
Threonine	105.8
Serine	201.8
Asparagine	3039.6
Glutamine	200.6
Proline	33.6
Glycine	20.6
Alanin	166.4
Valine	272.2
Methionine	14.0
Isoleucine	145.1
Leucine	101.0
Tyrosine	121.8
Phenylalanine	200.9
Lysine	174.5
Histidine	232.2
Tryptophan	160.1
Arginine	252.9

EXPERIMENTAL METHODOLOGY

List of equipments

List of equipments used in preparation of gels

S. No	Equipment name	Manufacturer
1	Digital weighing balance	Contech instruments ltd.,
2	Magnetic stirrer	Remi equipments pvt. ltd., Mumbai, India
3	Glass wares	Borosilicate
4	pH meter	Analog digital meter

List of materials

List of materials used in preparation of gels

S. No	Material name	Manufacturer
1	Carbopol-940	Yarrow chem. Products
2	Carbopol-974	Yarrow chem. Products
3	Guar gum	Yarrow chem. Products
4	Xanthan gum	Yarrow chem. Products
5	Methyl paraben	S.D fine chemicals ltd
6	Isopropyl alcohol	S.D fine chemicals ltd
7	Propylene glycol	S.D fine chemicals ltd
8	Glycerine	S.D fine chemicals ltd
9	Eucalyptus oil	S.D fine chemicals ltd
10	Sodium hydroxide	S.D fine chemicals ltd
11	Distilled water	Lab grade
12	Wheat grass powder	In house/ SVM Wheat Grass

Formulation of wheatgrass gel**Preparation of wheat grass**

Adequate quantities of unpolished wheat grain were soaked overnight in water in a container.

On the next day, the soaked wheat-grain were spread on the surface of the soil filled in plastic trays. Care was taken so that the grains did not touch one another.

A thin layer of soil was sprinkled on the wheat grains and then tray was covered with a newspaper to provide darkness, which helps sprouting.

The tray was kept in a covered balcony. Next day, the tray was uncovered to spray on some water and was covered again with the newspaper.

Previous step was repeated every day until sprouting took place, after which the tray was left uncovered and watered everyday for 8 days.

On 9th day the wheatgrass was harvested by cutting it with a clean pair of scissors about 1/2" above the surface of the soil.



Revious slide and provided with a hook.

A weight of 100 gm was placed on the top of the two slides for 1 min. to provide a uniform film of the gel between the slides.

After 1 min. the distance of spreaded gel was noted.

Spreadability (S) was calculated by $S = M.L/t$, Where M is the weight (g) tied to the upper glass slide, L is the length (cm) moved on the glass slide and t is time (sec).

Determinations were made in triplicate and average values are calculated.

Preparation of wheatgrass powder

The grass was harvested after 8 days from sprouting and shade-dried in well-ventilated dark rooms for 4 days.

Dried wheatgrass was powdered in a mill.

The crushed wheatgrass was completely exhausted by adding small quantities of methanol and filtering off every time in a successive manner.

This extract was evaporated to dryness at 35 °C to remove methanol.

Similarly successive extraction was also done.

In successive extraction, crushed wheatgrass was exhausted by adding small quantities of petroleum ether few times and filtering off every time in a successive manner.^[5]

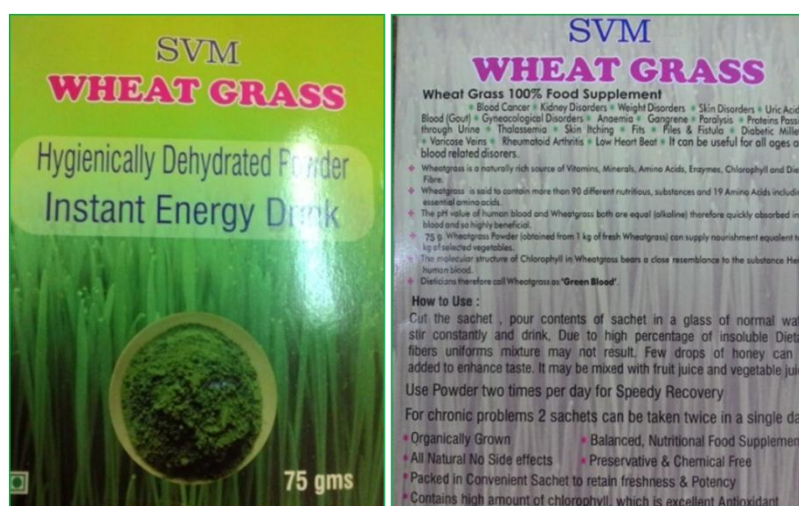
Filtrate was evaporated to remove petroleum ether and residues were again exhausted by adding acetone few times.

Here also filtrate was evaporated and residues were exhausted with methanol and then after with water and each time filtrate was evaporated.

Here powder obtained in successive extraction from petroleum ether, acetone, methanol and water were combined and used for preparation of gel.

(OR)

Commercially available wheatgrass powder can also be used for the preparation of gels.



Commercial wheatgrass powder

Formula for Wheat grass gel preparation (10 gms)

Formula for preparation of wheatgrass gel

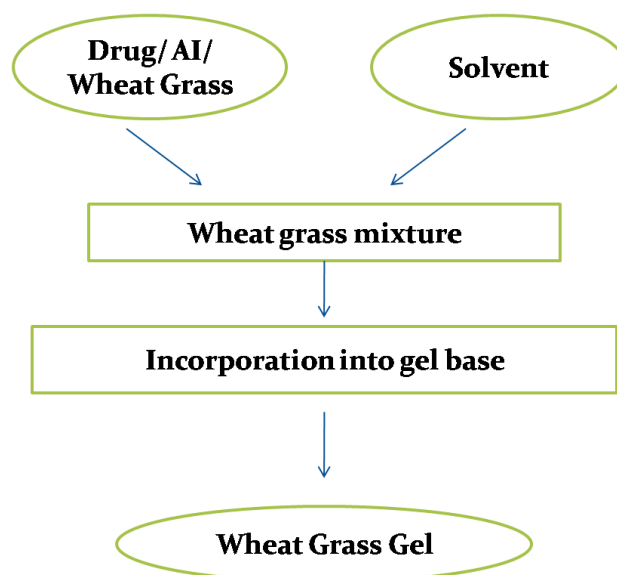
Ingredients	Formula 1	Formula 2	Formula 3	Formula 4
Wheatgrass extract Powder	0.48 gm	0.48 gm	0.48 gm	0.48 gm
Co-solvent mixture (IPA : PG) (1:1)	2 ml	2 ml	2 ml	2 ml
Carbopol 940	0.1gm	---	---	---
Carbopol 974	---	0.1gm	---	---
Xanthan gum	---	---	0.1gm	---
Guar gum	---	---	---	0.1gm
Glycerine	1.5 ml	1.5 ml	1.5 ml	1.5 ml
Triethanolamine	0.1 ml	0.1 ml	---	---
Methyl paraben	0.05 gm	0.05 gm	0.05 gm	0.05 gm
Eucalyptus oil	Q.S	Q.S	Q.S	Q.S
Distilled water	10 ml	10 ml	10 ml	10 ml

Preparation of gels**Method for preparation of Gels**

Step1: Preparation of Wheat grass powder co-solvent mixture.

Step2: Preparation of gel base using various gelling agents.

Step3: Incorporation of wheat grass powder mixture into gel base.

**General method for preparation of Gels**

The gels were prepared with varying amount of the Carbopol 940 polymer on trial and error bases. The required amount of Carbopol 940 was added in to distilled water with vigorous stirring and left for overnight for proper dissolving of the polymer.

The required amount of wheatgrass extract obtained after successive extraction was dissolved in the co-solvent mixture of alcohol and propylene glycol (1:1). Required quantity of methyl paraben as a preservative was also added into this mixture. This mixture was slowly dispersed in the Carbopol 940 dispersion with vigorous mixing at 300 rpm.

The beaker was covered with aluminum foil and left mixing for approximately 15 minutes.

The mixture was also homogenized with a homogenizer for 5 minutes at low speed.

After complete addition of the polymer and proper mixing, the pH was adjusted to 7 with the addition of 1 % sodium hydroxide solution and gels were spontaneously formed.

To this gel required amount of glycerine and perfume (Eucalyptus oil) and colorants were added.

The gel was left at room temperature to set and to allow the air bubbles produced by the mixing to escape from the gel by putting on ultrasonicator for 15 min.

The same procedure applied to gels containing carbopol 974, xanthan gum and guar gum as gelling agents.



Preparation of wheatgrass gel with various gelling agents

3.5. Evaluation of formulated gels

The prepared wheatgrass gels were evaluated for appearance, pH, homogeneity and spreadability. The gel was visually inspected for clarity, colour, presence of particles and fibers.

APPEARANCE

The wheatgrass gel was greenish transparent in colour.

Measurement of pH

The pH of Wheat grass gel was determined by using digital pH meter. One gram of gel was dissolved in 100 ml distilled water and stored for two hours. The measurement of pH was done in triplicate and average values are calculated.^[5]



Measurement of pH for gel

Homogeneity

It is evaluated by visual observation for uniformity of contents.

Spreadability

Spreadability was measured on the basis of “slip” and “drag” characteristics of the gels. gm of gel under study was placed on the slide.

The gel was then sandwiched between this slide and another glass slide having the dimension of previous slide and provided with a hook.

A weight of 100 gm was placed on the top of the two slides for 1 min. to provide a uniform film of the gel between the slides.

After 1 min. the distance of spreaded gel was noted.

Spreadability (S) was calculated by $S = M.L/t$, Where M is the weight (g) tied to the upper glass slide, L is the length (cm) moved on the glass slide and t is time (sec).

Determinations were made in triplicate and average values are calculated.^{[5],[11]}



Spreadability test

RESULTS AND DISCUSSION

Results for the evaluation of prepared wheatgrass gels

Formulation	Appearance	pH	Homogeneity	Spreadability (gm.cm/min)
Formula 1 (Carbopol 940)	Greenish transparent	7	+++	0.15
Formula 2 (Carbopol 974)	Greenish transparent	6.8	+++	0.22
Formula 3 (Xanthan gum)	Greenish transparent	6.8	+++	0.25
Formula 4 (Guar Gum)	Greenish transparent	6.9	++	0.20

+++ Excellent, ++ Clear, + Turbid

Wheat grass gel prepared by using carbopol 940, carbopol 974, xanthan gum and guar gum were evaluated for appearance, pH, homogeneity and spreadability. All the formulations are greenish transparent in appearance, pH was found to be 6.8 to 7, excellent homogeneity, spreadability found to be 0.15 to 0.25 gm.cm/min. and all formulations are physically stable. The gels showed good Physico-chemical properties.

CONCLUSION

Wheatgrass has been traditionally used, since ancient times, to treat various diseases and disorders. So, in the present study we formulated a gel formulation of wheatgrass for treatment of skin diseases using carbopol 940, carbopol 974, xanthan gum and guar gum. The wheatgrass gel has been recommended for treatment of skin diseases for topical use.

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