



**INTERNATIONAL JOURNAL OF
PHARMACEUTICAL SCIENCES**
[ISSN: 0975-4725; CODEN(USA): IJPS00]
Journal Homepage: <https://www.ijpsjournal.com>



Research Article

Formulation And Evaluation of Deodorant Gel Using Herbal Extracts

Dr. Rahul Kasliwal, Prajakta Milmile*, Soumya Pandey, Shrihali Hedau

Priyadarshini J. L. College of Pharmacy, Hingna Road, Nagpur, India 440016

ARTICLE INFO

Published: 27 Jun. 2025

Keywords:

Aloe vera, green tea extract
and cucumber extract,
deodorant gel, formulation

DOI:

10.5281/zenodo.15755115

ABSTRACT

This study explores the formulation of a natural deodorant gel containing green tea extract, aloe vera, and cucumber extract due to their antioxidant, antibacterial, and soothing properties respectively. Three formulations using varying concentrations of Carbopol 940 (0.5%, 1.5%, and 2%) were prepared. The formulations were assessed for physical parameters including pH, viscosity, spread ability, irritation, antimicrobial activity, and compared with a marketed product. Among the formulations, F2 demonstrated the most effective results in terms of antimicrobial activity and physical stability, suggesting its suitability as a natural deodorant alternative.

INTRODUCTION

Deodorant is a type of cosmetic product designed to eliminate unpleasant body odor and reduce sweat production by blocking underarm pores. The active ingredient in antiperspirants is usually Aluminium Chlorohydrate. This compound works by closing sweat gland pores, reducing sweat production. However, Aluminum Chlorohydrate is a chemical substance that can damage DNA and is suspected to cause breast cancer and Alzheimer's disease if overused.[1] To avoid the negative effects of deodorants, plant-based antiperspirants can be used. These natural alternatives work by inhibiting bacterial growth and blocking underarm pores. Based on the above explanation, we have

formulated and evaluated deodorant gel containing Green tea extract, Aloe vera and cucumber extract.[1]

Deodorants:[2]

Deodorant is a substance applied to the body to prevent or mask body odor caused by bacterial breakdown of perspiration, for example in the armpits, groin, or feet. A subclass of deodorants, called antiperspirants, prevents sweating itself, typically by blocking sweat glands.

Ideal Properties of Deodorants.[2]

- It should not be irritant to the skin.

***Corresponding Author:** Prajakta Milmile

Address: Priyadarshini J. L. College of Pharmacy, Hingna Road, Nagpur, India 440016

Email ✉: prajaktamilmile18@gmail.com

Relevant conflicts of interest/financial disclosures: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.



- It should not deteriorate clothing.
- It should be safe and nontoxic.
- Easy to use and adhere well on skin.

Types of Deodorants:

A. Based on formulation approach:[3]

- Stick Deodorants
- Roll-On Deodorants
- Spray Deodorants
- Cream and Paste Deodorants Gel
- Crystal Deodorants:

B. By Function/Active Ingredient:[4]

- Antibacterial Deodorants
- Antiperspirants
- Natural Deodorants

Merits of natural deodorant gel:[5]

- Healthier for Skin: Natural deodorants avoid aluminum, parabens, and other chemicals, potentially reducing skin irritation and allergic reactions.
- Better for the environment
- Natural deodorants don't block pores
- Natural ingredients, suitable for sensitive skin.
- Use of natural scents and ingredients

Demerits of natural deodorant gel:[5]

- May not provide strong odor control
- Natural deodorant may require more frequent application
- Even natural ingredients can cause skin irritation or allergic reaction
- Not as effective for heavy perspiration.
- Less effective sweat control

Uses of Deodorant Gel.[5-7]

- Helps neutralize and prevent body odor by killing odor-causing bacteria.
- Provides a cooling effect and keeps underarms feeling fresh throughout the day.
- Long-lasting odor protection .
- Gel deodorants dry quickly and don't leave white residue on skin or clothes.
- Some deodorant gels contain skin-conditioning ingredients like Aloe vera to prevent irritation and provide soothing effect.
- Acts as a light personal fragrance, keeping the underarms smelling fresh.

Mechanism of Antiperspirant/Deodorants[8-9]

The active ingredient penetrates the sweat and apocrine glands, and an insoluble hydroxide gel is formed in the sweat pores and thus physically block the release of secretory product by constricting the opening of sweat gland duct. Bathing and washing will remove antiperspirant gel. Deodorants work by killing the bacteria on your skin, and they also work as an anti-perspirant by reducing the amount of sweat. The active ingredients react with the electrolytes in your sweat to create a thick gel that effectively blocks the top of your sweat glands and contracts your sweat pores.

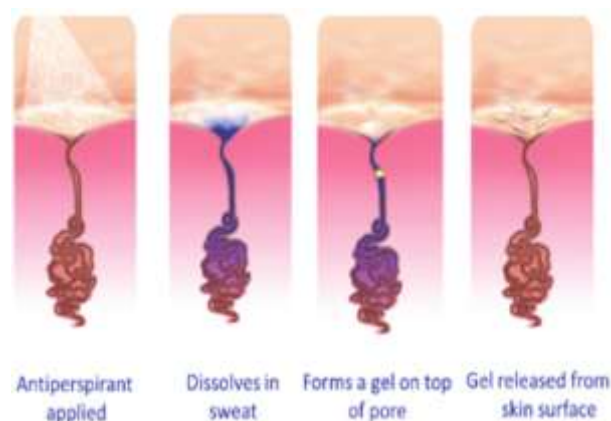


Figure No. 01: Mechanism of Antiperspirant

AIM AND OBJECTIVE

Aim: The aim of this research work is to formulate deodorant gel containing Green tea extract, Aloevera and cucumber extract and ensuring its safety, efficacy and compatibility with various skin types and comparing it with the marketed products.

Objective:

- The objective of the study is to obtain a natural deodorant gel which is physically stable and effective against body odor.
- To formulate and evaluate natural deodorant gel.
- To compare the formulated Deodorant gel with marketed product to ensure its safety efficacy and compatibility with normal skin conditions.

MATERIAL AND METHODS

NATURAL INGREDIENTS USED IN DEODORANT GEL

GREEN TEA[10-11]

Green tea, derived from the leaves of *Camellia sinensis* (family Theaceae), is also known as tea plant, tea shrub, tea tree, or *Camellia thea*. It is rich in chemical constituents such as polyphenols (30–40%)—especially catechins like epigallocatechin-3-gallate and the aflavins—along with caffeine (10–24%), tannins, amino acids like theanine, alkaloids, and various minerals. Green tea possesses several beneficial properties including antibacterial, antioxidant, and free radical scavenging effects. It helps neutralize body odor, prevent cancer, support cardiovascular health, and may aid in obesity prevention.

ALOEVERA[12-13]

Aloe vera, also known as Aloe, Musabbar, or Kumari, is obtained from the dried juice of various Aloe species like *Aloe barbadensis* and belongs to

the family Asphodelaceae. Its key constituents include aloin isomers, barbaloin, β -barboloin, isobarbaloin, resin, and aloe-emodin. Aloe vera has antioxidant, antibacterial, anti-inflammatory, and wound-healing properties. It is beneficial for skin burns, lightening scars, and has anti-hyperlipidemic activity.

CUCUMBER[14]

Cucumber, also known as Khira or Kakdi, comes from the fruits of *Cucumis sativus* of the Cucurbitaceae family. It contains flavonoids, tannins, alkaloids, triterpenes, vitamins, minerals, and polysaccharides. Cucumber has soothing, anti-inflammatory, anti-aging, cooling, antifungal, and anti-diabetic effects, and helps lighten pigmentation and protect the liver.

METHOD

Method used for extraction of Green Tea:[15]

Soxhlet extraction: 100 g of defatted green tea powder was subjected to Soxhlet extraction using 200 mL of ethanol in an Erlenmeyer flask as solvent. The extraction process was carried out at a temperature ranging from 60-70°C until the tea powder gets completely exhausted.

Method used to extract gel from Aloevera:[16]

The production process of aloe products involves crushing, grinding or pressing of the entire leaf of the Aloevera plant. Firstly wash the Aloevera leaves, then thorns are removed, slice the Aloevera leaf lengthwise from top to bottom. Use a spoon or a small knife to scoop out the translucent gel from the inside of the leaf After extracting the gel, place it into a blender or food processor. Blend the gel until it reaches a smooth, watery consistency. This will help break down the gel's natural pulp and ensure an even texture, making it easier to apply to your skin.



Method used for cucumber extraction.[17]

Cucumber extract was obtained by macerating the crushed fruit in hydro-alcoholic mixture, then filtering and concentrating it on rotary evaporator. Extract so obtained is rich in vitamins, especially vitamin C and A.

EXPERIMENTALWORK**Preparation of Deodorant gel:[1]**

Prepare the tools and weigh all the ingredients. First, prepare the gel base by dissolving Carbopol 940 in distilled water (aquadest) at 70°C in a beaker glass, gradually adding the distilled water while stirring until evenly mixed and forming a gel mass. Continue stirring for 20 minutes using a stirrer. Once the gel mass has formed, add methyl paraben and propyl paraben, then stir until homogeneous. Dissolve citric acid and trisodium citrate in distilled water, then add this solution to the gel mixture. Stir until homogeneous. Allow the mixture to cool. Once the gel mass has cooled, weigh green tea extract, Aloe vera gel and cucumber extract, and add them to the mixture. Stir until homogeneous mixture is obtained. Transfer the mixture into containers, and conduct an evaluation of the final formulation.

Formulation:**Table No. 01: Formulation Table for Deodorant Gel**

Sr. No.	Ingredients	Function	F1	F2	F3
1.	Green Tea extract	Anti-oxidant and Antiperspirant	5%	5%	5%
2.	Aloe vera	Anti-bacterial	2%	2%	2%
3.	Cucumber extract	Cooling and soothing Effect	1.5%	1.5%	1.5%
4.	Carbopol940	Gelling Agent	0.5%	1.5%	2%
5.	Methyl paraben	Preservative	0.18%	0.18%	0.18%
6.	Propyl paraben	Preservative	0.02%	0.02%	0.02%

7.	Citric acid	Buffer	0.1%	0.1%	0.1%
8.	Trisodium citrate	Buffer	4%	4%	4%
9.	Distilled water	Solvent	Q.s	Q.s	Q.s
10.	Perfume	For Fragrance	Q.s	Q.s	Q.s

Antimicrobial Studies by Cup Plate Method:**Preparation of Nutrient Agar Media:[18]****Table No. 02: List of ingredients**

Sr. No.	Ingredients	Quantity
1.	Beef Extract	0.06 g
2.	Peptone	0
3.	Sodium chloride	0.1g
4.	Agar	0.3g
5.	Distilled water	20ml

Antibacterial screening by cup plate method:[19]

Nutrient agar plates were prepared aseptically to get a thickness of 5-6 mm. The plate were allowed to solidify and inverted to prevent the condensate falling on the agar surface. The plates were dried at 37°C before inoculation A definite volume of the microbial suspension (inoculums) was poured into the sterilized nutrient agar media (cooled at 40°C) and mixed thoroughly. About 20 ml of this suspension was poured aseptically in the petri plates and kept till the solidification. The surface of agar plates was pierced using a sterile cork borer. The prepared wells were filled with equal volume of solution of Prepared Deodorant gel separately. After a period of pre-incubation diffusion, the plates were incubated face up for a definite time under specified conditions. The zones of inhibition were measured as a parameter of antimicrobial properties of prepared Deodorant gel.

Evaluation of Deodorant Gel

- a) **Color:** The color of prepared deodorant gel was assessed and observed visually.[20]
- b) **Odor:** Odor of prepared deodorant gel was assessed by spreading it on the palm and evaluating it's Odor.[20]
- c) **State:** State of prepared deodorant gel was observed visually.[20]
- d) **Texture:** The texture of prepared deodorant gel was assessed by rubbing it between the thumb and index finger.[21]
- e) **Homogeneity:** Every gel that had developed was checked for homogeneity after it had been put inside the container and visually inspected for appearance and the presence of aggregates.[21]
- f) **pH:** A digital pH meter was used to measure the pH of several gel formulations. Two hours were spent storing 2.5g of meticulously weighed gel that had been diluted in twenty-five ml of distilled water. The average values of the triplicate pH measurements are shown for each formulation.[22]
- g) **Viscosity:** Using a Brook field rotational viscometer with spindle number94, the viscosity of the Deodorant gel was measured at 2rpm. Following the sample's two-minute equilibrium, each reading was obtained.[23]
- h) **Irritation:** A small patch of skin is usually used to test a gel's irritation by applying it there and keeping an eye out for any negative side effects, like redness, itching, or inflammation.[24]
- i) **Spreadability:** The slip and drag characteristics of the gels were used in this method to calculate spreadability. On this ground slide, an excess of gel was being investigated. Subsequently, the gel was positioned between this glass slide and another with a hook that was the same size as a fixed ground slide. To create an even layer of gel between the slides and release any trapped air, a one kg weight was placed on top of each slide for five minutes. Removed the excess gel by scraping it off the edges. After that, a fifty-gram pull was applied to the top plate. Time how long (in seconds) it takes for the top slide to move 6.5 cm by using a piece of string that is fastened to the hook.[25] The following formula, spreadability was determined using below formula: $S = M \times L / T$,
Where, S= Spreadability
M=Pan weight (connected to the upper slide),
L = length that the glass slide moved
T=the amount of time required to fully separate each slide
- j) **Antimicrobial Studies:** Agar well diffusion method is widely used to evaluate the antimicrobial activity of plants or microbial extracts. The agar plate surface is inoculated by spreading a volume of the microbial inoculums over the entire agar surface. A hole with a diameter of 6 to 8 mm is punched aseptically with a sterile cork borer or a tip, and a volume for desired concentration is introduced into the well. Then, agar plates are incubated under suitable conditions depending upon the test microorganism. The antimicrobial agent diffuses in the agar medium and inhibits the growth of the microbial strain. [26-27]
- k) **Lasting Time :** Note down the time after applying the Deodorant gel on skin and observed for how much duration it show odor protection.[28]
- l) **Extrudability:** Extrudability refers to its ease of being expelled from a container (such as tube) under applied pressure. Fill the gel in collapsible tube; apply a uniform pressure at the crimped end of tube. Observe how easily the gel is extrude.[28]

RESULT AND DISCUSSION

Table No. 03: Result of Evaluation parameter

Sr. No.	Parameters	F1	F2	F3
1.	Color	Dark yellow	Pale yellow	Pale yellow
2.	Odor	Pleasant	Pleasant	Pleasant
3.	State	Semisolid	Semisolid	Semisolid
4.	Texture	Smooth	Smooth	Smooth
5.	Homogeneity	Homogeneous	Homogeneous	Homogeneous
6.	pH	5.75+0.17	4.60+0.01	4.68+0.01
7.	Viscosity(cP)	28880+7.07	59921+8.49	84565+7.01
8.	Irritation	No irritation	No irritation	No irritation
9.	Spread ability(g.cm/s)	14.03+0.31	12.36+0.4	11.4+0.2
10.	Zone of inhibition(cm)	1.3+0.01	1.50+0.02	1.4+0.01
11.	Lasting time(hrs)	2-4	2-4	4-6
12.	Extrudability	Good	Excellent	Good

COMPARATIVE STUDY:

After the evaluation of prepared deodorant gels. The deodorant gel having good results in term of organoleptic properties, pH, viscosity, spread ability and antimicrobial activity was compared

with marketed Natural Deodorant. The F2 formulation is good as compared to other two formulations and it is further compared with marketed product. The results are as follows in Table No. 04.

Table No. 04: Comparative Study with Marketed Product

Sr. No.	Evaluation Parameters	F2	Marketed Product
1.	Color	Pale Yellow	Creamish Yellow
2.	Odor	Pleasant	Citrusy Odor
3.	State	Semisolid	Slightly Liquidy
4.	Texture	Smooth	Smooth
5.	Homogeneity	Homogeneous	Homogeneous
6.	pH	4.60±0.01	5.15±0.02
7.	Viscosity	59921cP±8.49	22000cP±5.01
8.	Irritation Test	No Irritation	No Irritation
9.	Spread ability	12.36g.cm/s±0.4	16.02g.cm/s±0.3
10.	Zone of Inhibition	1.50cm±0.02	1.45cm±0.03
11.	Lasting Time	2-4 hours	4-6 hours
12.	Extrudability	Excellent	Excellent



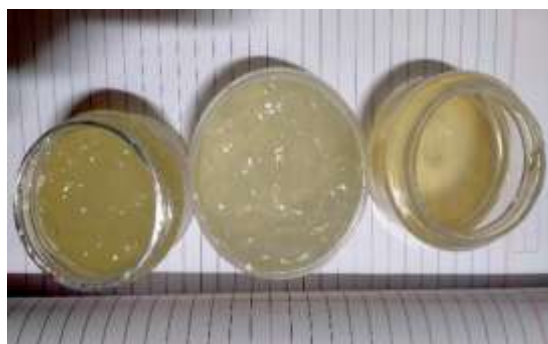


Figure No. 02: Prepared Deodorant Gel

CONCLUSION

The formulated Deodorant gel containing Green tea extract, Alovera and cucumber extract demonstrated promising result in terms of stability and compatibility with normal skin condition. Green tea extract contributed to its anti-oxidant and antibacterial properties, effectively reducing odor causing bacteria. Alovera proved its antibacterial and soothing effects, while cucumber extract added a refreshing and cooling sensation. The prepared deodorant gel was evaluated for physical parameters like color, odor, state, texture, homogeneity, spread ability, irritation, extrudability and antimicrobial studies were also performed. Among these 3 formulations, F2 Formulation demonstrated the most promising result in terms of spread ability, viscosity, pH and antimicrobial activity. Further evaluation of F1, F2 and F3 formulation against the marketed natural deodorant shows that prepared deodorant gel is equally good in comparison with marketed Natural deodorant. It has also shown significantly comparable antimicrobial effect. Among the three formulations F2 Formulation shown the greater antimicrobial activity, although further studies are required to scale up the preparations & evaluate accordingly.

ACKNOWLEDGEMENT

The authors are thankful to the principal Priyadarshini J. L. College of Pharmacy, Nagpur, Maharashtra, for providing facilities.

REFERENCES

1. Zen Achmad Redho Nugraha et al. The Journal of Pharmaceutical Care and Sciences: Formulation and Physical Evaluation of Deodorant Gel Preparation Combined with Orange Peel Extract. E-ISSN:2828-4828, Vol. 4, No. 1, Year 2023
2. Deodorants: <https://www.euromonitor.com/deodorants-in-india/report>
3. <https://www.thebusinessresearchcompany.com/report/deodorants-global-market> (Types of Deodorants) Access on dated: 12 March 2025
4. World Journal of Pharmaceutical Research: An Updated Review on Antiperspirants. E-ISSN: 2277-7105, Vol. 12, issue 9, 449-463.
5. <https://www.healthline.com/health/deodorant-vs-antiperspirant> (Difference between Deodorants and Antiperspirants) Access on dated: 12 March 2025
6. James G. Corrine J, Diana S, David Taylor, Ralph Calvert. 2013. Microbiological and biochemical origins of human axillary odor. FEMS Microbiology Ecology 83(3):527-540. Doi:10.1111/1574-6941.12054.
7. Bouslimani A, da Silva R, Kosciolk T, Janssen S, Callewaert C, Amir A, et al. The impact of skin care products on skin chemistry and microbiome dynamics. BMC Biol. 2019; 17(1):47.
8. Dr. Satya Prakash Singh, Textbook of cosmetic science, Thakur Publication Pvt. Ltd: First Edition 2021.
9. Mohammad AS, Mustafa G, Ali F, Niloufar S, Dariush S, Syed AF. Deodorant effects of a sage extract stick: Antibacterial activity and sensory evaluation of axillary deodorancy. J Res Med Sci. 2013; 18(10):833-9.



10. Preeti Arya, Abhishek Dabra, and Kumar Guarve: Review Article on Green tea: Chemical composition, biological effects and health benefits. *Asian Journal of Pharmacy and Pharmacology* 2019; 5(2):227-234
11. Himani Vishnoi, Ramesh B. Bodla and Ravi Kant."Green (Camellia sinensis) and its antioxidant property: A Review *IJPSR* (2019), vol.9,issue 5.
12. Ms. Varsha A Dighe, Astikta Ashok Bhondave, Aditi Rajendra Waghmare: ALOE VERA: It's pharmacognosy, phytoconstituents and pharmacological effects. *IJARIE- ISSN (O)-2395-4396, Vol-9 Issue-3 2023.*
13. Bhushan D Varpe, Anil S Mali, Amol Kulkarni - Aloe vera Compositions Used for Medicinal Applications: A Patent Review.
14. Teti Anggela Sari et al, *Int. Journal of Pharmaceutical Sciences and Medicine: Overview of Traditional Use, Phytochemical and Pharmacological Activities of Cucumber (Cucumis sativus L.) (IJPSM)*, Vol.6 Issue. 3, March- 2021, pg. 39-49 ISSN: 2519-9889.
15. Khomendra Sarwa, Mithun Rudrapal and Manabendra Debnath: Extraction of Green Tea: The use of Different Methods, their Optimization and Comparative Evaluation. *Biosciences Biotechnology Research Asia*, June 2013. Vol.10(1), 383-386*
16. Ramachandra C T and Srinivasa Rao P, 2008. Processing of Aloe Vera Leaf Gel. *American Journal of Agricultural and Biological Sciences* 3 (2):502-510.
17. Naveed Akhtar and Arshad Mehmood: Exploringcucumber extract for skin rejuvenation, *African Journal of Biotechnology* Vol. 10(7), pp. 1206-1216, 14 February, 2011
18. Subhashis Debnath, M. Niranjana Babu, G. Kusuma Formulation and Evaluation of Herbal Antimicrobial Deodorant Stick. *Res .J. Topical and Cosmetic Sci.*2 (1):Jan.–June 2011 page 21-24.
19. Bireesh K Sarkar, Ritesh Patel, Upendra Bhadoriya: Antimicrobial Activity of Some Novel Pyrazoline Derivatives, *Journal of Advanced Pharmacy Education & Research* (5) 243-250 (2011) ISSN 2249-3379. Antimicrobial Studies
20. Akshatha R S, Manasa C Reddy, Ranjitha Suresh and Thanushree H R : Formulation and evaluation of antibacterial herbal deodorant stick, *World Journal of Biology Pharmacy and Health Sciences*, 2023, 16(02), 029–034 .
21. Rajasekaran Aiyalu , Arulkumaran Govindarjan, Arivukkarasu Ramasamy: Formulation and evaluation of topical herbal gel for the treatment of arthritis in animal model, *Brazilian Journal of Pharmaceutical Sciences* vol. 52, n. 3, jul./sep., 2016
22. Singh MP, Nagori BP, Shaw NR. Formulation development and evaluation of topical gel formulations using different gelling agents and its comparison with marketed gel formulation. *Int J Pharm Erud*2 013;3:1-10
23. B Niyaz Basha, Kalyani P, Divakar G. Formulation and evaluation of gel containing fluconazole-antifungal. *Int J Drug Dev Res* 2011;3:109-12.
24. Doaa AH,Dalia AE, Sally AA, Mohamed AE. Formulation and evaluation of fluconazole topical gel. *Int J Pharm Pharm Sci* 2012;4:176-83.
25. Sudipta DA, Arnab SA, Ananya BO. Design, development and evaluation of fluconazole topical gel. *Asian J Pharm Clin Res* 2015;8:132-13.
26. Mayers D.L., Lerner S.A., Ouellette M. vol. 2. Springer Dordrecht Heidelberg; London: 2009. (Antimicrobial Drug Resistance C: Clinical and Epidemiological Aspects). pp. 681–1347. [Google Scholar]



27. Guschin A., Ryzhikh P., Rumyantseva T. Treatment efficacy, treatment failures and selection of macrolide resistance in patients with high load of *Mycoplasma genitalium* during treatment of male arthritis with Josamycin. BMC Infect. Dis. 2015;15:1–7. doi: 10.1186/s12879-015-0781-7.
28. Hardik B. Bhatt, Dr. Nikunj B Patel. Natural Deodorants: A way towards sustainable cosmetics-June2021, International Journal of Pharmaceutical Science and Health Care, Issue 11, Vol. 3(ISSN 2249 – 5738).

HOW TO CITE: Dr. Rahul Kasliwal, Prajakta Milmlile, Soumya Pandey, Shrihali Hedau, Formulation And Evaluation of Deodorant Gel Using Herbal Extracts, Int. J. of Pharm. Sci., 2025, Vol 3, Issue 6, 5285-5293. <https://doi.org/10.5281/zenodo.15755115>

