



Research Article

PREPARATION AND EVALUATION OF NUTRITIONAL AND ANALYTICAL PARAMETERS OF
MEDHYA COOKIES: AN AYURVEDIC NUTRACEUTICAL FORMULATION

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Article info

Article History:

Received: 03-04-2026

Accepted: 10-05-2026

Published: 07-06-2026

KEYWORDS:

Stress, *Medhya*
Cookies,
Standardization
parameters.

ABSTRACT

Ayurveda has many drugs which can act significantly in stressful conditions. *Medhya* Cookies contains the drugs which are most commonly used by physicians in conditions related to both mental and physical health. The drugs used namely *Brahmi*, *Shankhapushpi*, *Vacha*, *Jatamamsi*, *Yashtimadhu* are not very palatable in *Churna* (powder) form but their effect on mind and body is significantly helpful to manage conditions like stress, anxiety, sleeplessness etc. In the form of cookies, these drugs can be converted into a more palatable form and can be advised to be consumed on regular basis instead of junk foods etc. **Aims & Objectives:** To prepare a unit operative procedure for the preparation of *Medhya* cookies and to evaluate nutritional and analytical parameters of *Medhya* cookies. **Methodology:** The study was carried out in two different phases namely preparation of *Medhya* cookies and evaluation of nutritional and analytical parameters of *Medhya* cookies. The cookies were prepared as per the expert guidelines and the proportion of drugs used were finalized according to the dosage of individual drugs as per Ayurvedic Pharmacopoeia of India. The evaluation of analytical parameters based on confectionaries etc mentioned in Ayurveda as per the General Guidelines for Drug Development of Ayurvedic Formulations by CCRAS which includes parameters for nutritional evaluation like moisture content, ash content, fat content, protein content and carbohydrate content. **Results:** A unit operative procedure for the preparation of *Medhya* cookies was prepared based on seven trials. The nutritional and analytical parameters were evaluated and the results were observed within the permissible limits. **Conclusion:** It can be concluded that this formulation can be suggested as healthy alternative for junk food specifically for people who tend to binge-eat during stress.

INTRODUCTION

Stress has become a very common condition which most of us face on a regular basis in this fast-moving world of deadlines and high expectations. According to WHO, Stress is defined as a state of worry or mental tension caused by a difficult situation [2]. Stress can be correlated to conditions associated with *Chinta* (anxiety), *Shoka* (grief) and *Bhaya* (fear) which can lead to the manifestation of various physical and psychological illnesses.

Stress has now become an inexorable part of life and a major category of people develop eating disorders such as stress eating, binge-eating etc which is one of the reasons for today's global obesity epidemic. In such cases, it is highly important that we replace junk foods with healthier snack options having better nutritive value. We have the reference of various herbs categorised as *Medhya dravyas* (Mind boosting drugs) in Ayurvedic classics which can be supportive in managing stress related conditions [3]. *Ayurveda* advocates that *Ahara* is equally important as *Aushadha* (medicines) especially when it comes to mental health and advocates that one should avoid unwholesome diet as it affects one's mind in an adverse manner when consumed on a regular basis [4]. Cookies are considered to be a snack which is liked by

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people of all age group. Cookies can be designed incorporating *Medhya dravyas* (mind boosting drugs) such as *Brahmi*, *Shankhapushpi*, *Vacha*, *Jatamamsi*, *Yashtimadhu* thus making it more soothing and palatable with *Godhuma* (wheat) as base and by the addition of ingredients such as *Khandasarkara*, *Goghrita*, *Ela* and *Jatiphala*. Hence, it is aimed to develop a procedure for preparation of *Medhya* Cookies with ingredients such as *Brahmi*, *Shankhapushpi*, *Vacha*, *Jatamamsi*, *Yashtimadhu* as the main ingredients and along with its quality assessment.

OBJECTIVES

- To prepare unit operative procedure for *Medhya* cookies containing *Brahmi*, *Shankhapushpi*, *Vacha*, *Jatamamsi*, *Yashtimadhu* with *Godhuma* (wheat flour) as base.
- Assessment of organoleptic characters of *Medhya* cookies.
- Nutritional evaluation for fat, protein, carbohydrate, moisture and ash content of *Medhya* cookies.
- Evaluation of *Medhya* cookies was conducted based on the following analytical parameters:
 - a. Acid – Insoluble ash
 - b. Alcohol – Soluble extractive
 - c. Water – Soluble extractive
 - d. pH
 - e. Total acidity
 - f. Specific gravity at 25°C
 - g. Active constituents – Tannins, alkaloids
 - h. Total sugars
 - i. Evaluation of constituents of *Medhya* Cookies using HPTLC

MATERIALS AND METHODS

Source of Data

The preparation of *Medhya* cookies, study of organoleptic characters and nutritional evaluation were carried out at A. D. Patel Institute of Technology, Anand and various analytical parameters for standardisation was carried out at Enviro

Laboratories, Rajkot and Vasu Research Centre, Vadodara.

METHODOLOGY

The raw drugs required for the preparation of *Medhya* cookies were collected from Marss Herbals, Ahmedabad, a GMP certified company. The nutritional evaluation such as fat content, protein content, carbohydrate content, moisture content and ash content as per standard procedure mentioned in AOAC, 2000 was also conducted under the guidance of experts from Dept. of Food Processing Technology at A. D. Patel Institute of Technology, Anand.

Preparation of *Medhya* Cookies:

- Sugar candy was powdered using mixer and it was sieved using sieve number 85.
- All the powdered ingredients were weighed, sieved using sieve number 85 and placed in different bowls. (Figure 1.1)
- Weighed amount of Ghee was taken on a stainless-steel platform and rubbing was done using palms until the colour of ghee changed from yellowish to white. (Figure 1.2 & 1.3)
- Powdered sugar was then mixed with ghee and rubbing was continued by palms over a clean stainless-steel platform for mixing until the mixture became fluffy. (Figure 1.4)
- Further, all the dried ingredients were mixed together in a large mixing bowl and the mixture was sieved using sieve number 85. (Figure 1.5)
- The mixture was then added along with the mixture of ghee and sugar and was gently made into a dough using required quantity of milk. (Figure 1.6 & Figure 1.7)
- It was kept into consideration that when the dough is cut, it has a crumbly texture. (Figure 1.8)
- Then, the dough was flattened using palms and rolled out slightly thick with the help of a roller. (Figure 1.9 & Figure 1.10)
- Using cutter, cookies of specific shape was cut and placed in a tray lined with baking paper. (Figure 1.11 & Figure 1.12)
- The cookies were baked in preheated oven at 180°C for 15 minutes or till the edges turn slightly golden. (Figure 1.13 & Figure 1.14)



List of Figures: Preparation of *Medhya* Cookies

Figure 1.1 to Figure 1.16 Different steps of preparation of *Medhya* Cookies



Figure 1.1:
Grouping of the ingredients



Figure 1.2:
Depicting Ghee (Before processing)



Figure 1.3:
Depicting Ghee (After processing)



Figure 1.4
Mixing of sugar with ghee and then continuing the process



Figure 1.5: Mixing of all the dry ingredients except sugar



Figure 1.6:
Mixing of all the dry ingredients with the mixture of ghee and sugar



Figure 1.7:
Adding milk into the mixture to form a dough



Figure 1.8:
Preparation of dough



Figure 1.9:
Dough was spread into sheets by patting it



Figure 1.11:
Using cutter, the cookies were given specific shape



Figure 1.13:
Baking of Cookies



Figure 1.15:
Image of finished product



Figure 1.10:
The sheet was made smooth by rolling it with Roller



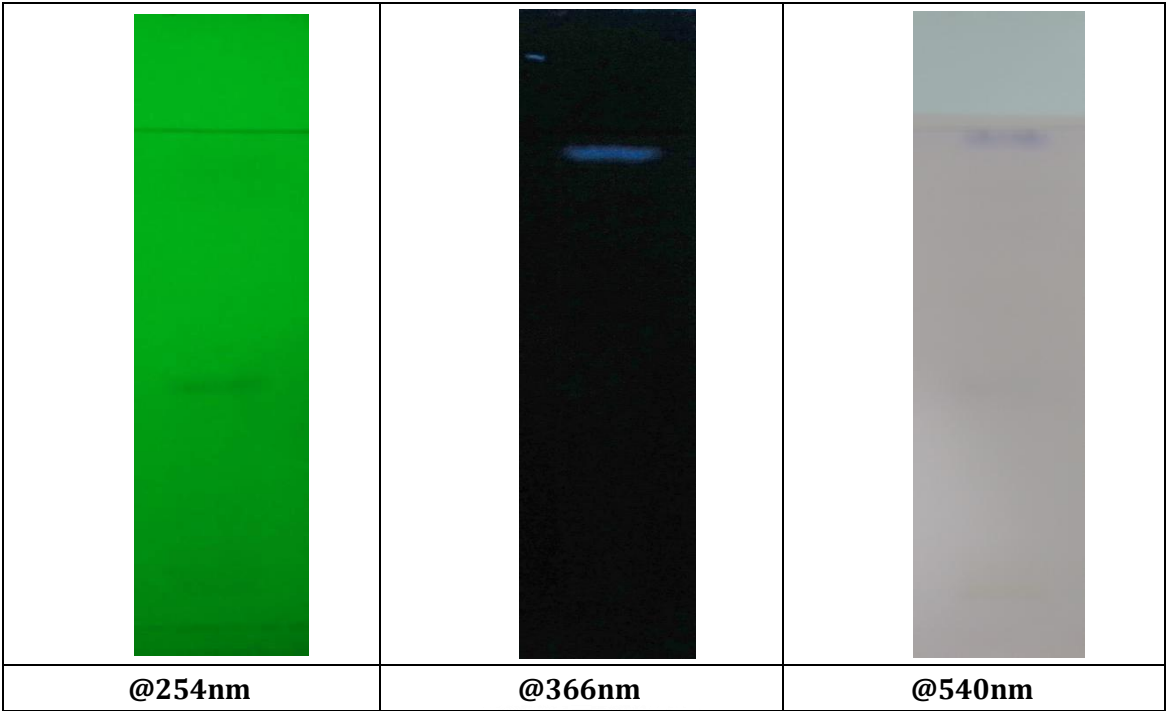
Figure 1.12:
Cookies were carefully kept in tray for processing it further



Figure 1.14:
Final Cookies after baking

HPTLC Photo Documentation of the Sample of *Medhya* Cookies

Figure 2: HPTLC Photo documentation of the sample of *Medhya* Cookies



HPTLC Densitometric Scan of the Sample of *Medhya* Cookies

Figure 3: Densitometric scan of the sample at 254nm

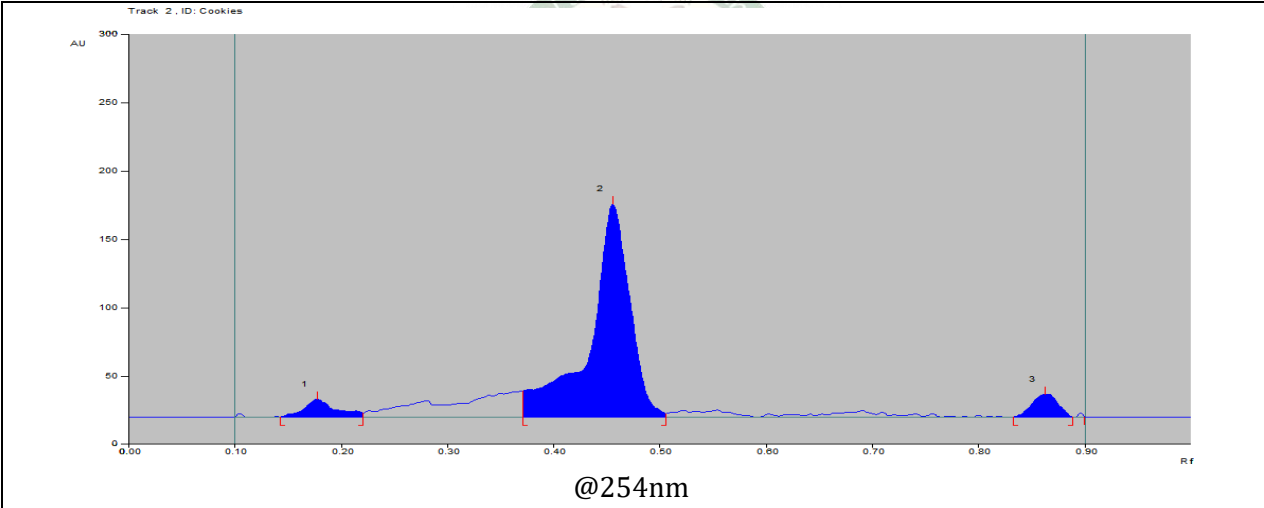


Figure 4: Densitometric scan of the sample at 366nm

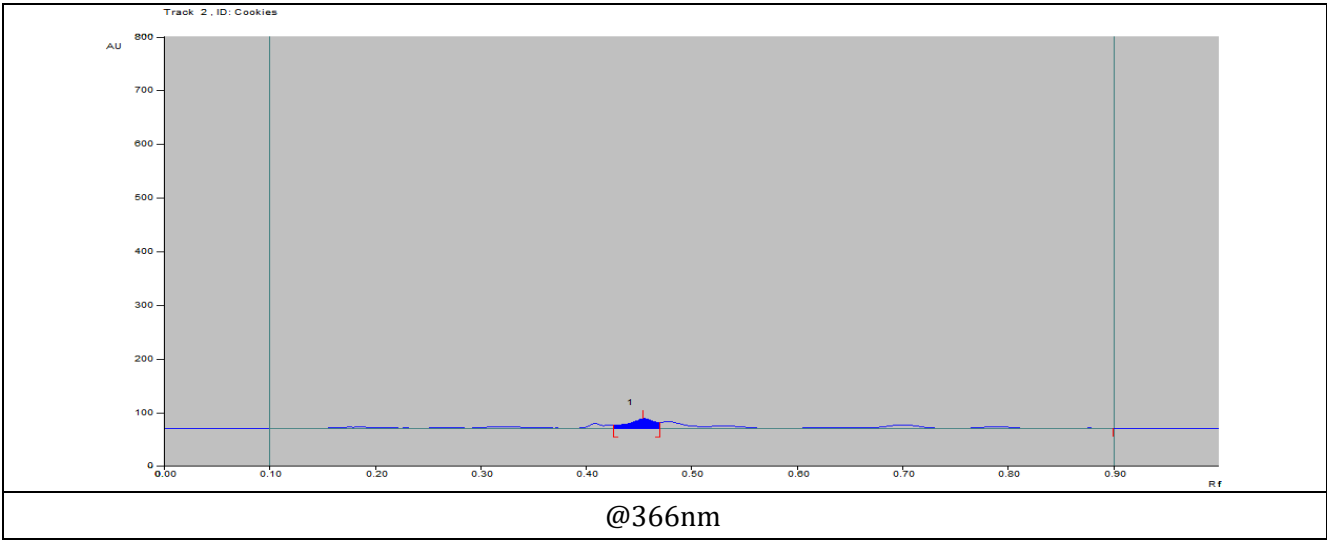
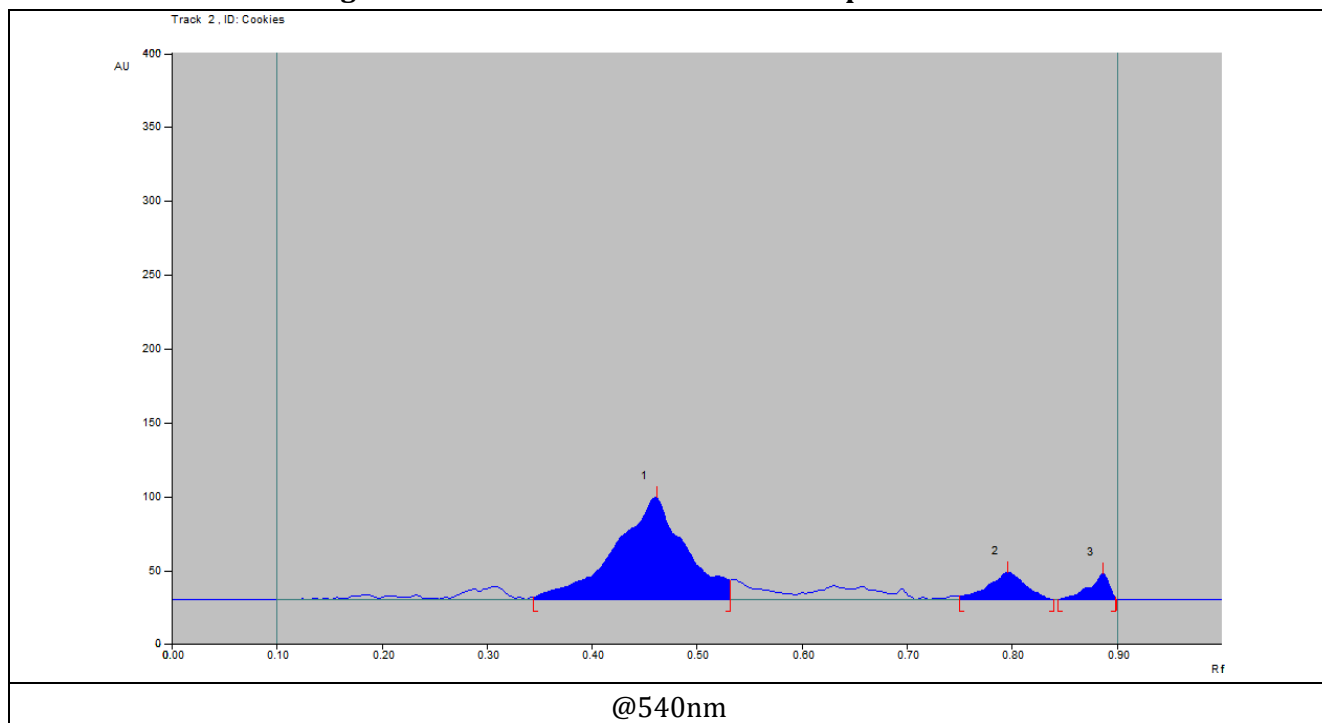


Figure 5: Densitometric scan of the sample at 540nm

The analytical parameters of *Medhya* Cookies were assessed by evaluating acid-insoluble ash^[5], alcohol-insoluble extractive, water-insoluble extractive, pH, total acidity, specific gravity at 25°C, assay of active constituents – total tannins, alkaloids, Total Sugar, Chromatography (HPTLC) as per standard procedure mentioned in protocols for standardisation of Ayurvedic confectionaries under the General

Guidelines for Drug Development of Ayurvedic Formulations by CCRAS.

RESULTS

The results obtained after assessing the organoleptic characters (Table 1), nutritional evaluation (Table 2) and analytical parameters (Table 3) are tabulated as under.

Table 1: Organoleptic characters of *Medhya* Cookies

S.No.	Parameters	<i>Medhya</i> Cookies
1.	Colour	Golden brown to brownish at rim
2.	Odour	Characteristic odour of <i>Ela</i>
3.	Taste	<i>Madhura, Tikta</i>
4.	Appearance	Smooth outside, porous inside
5.	Consistency on cooling	Crispy

Table 2: Results of Nutritional evaluation of *Medhya* Cookies

SNo.	Tests/Parameters	Unit	Result	Method
1.	Moisture content	%	2.88	By hot air oven
2.	Ash content	%	1.85	By muffle furnace
3.	Fat content	%	24.68	By Soxhlet apparatus
4.	Protein content	%	9.26	By Micro-Kjeldahl method
5.	Carbohydrate content	%	61.33	By Difference method

Table 3: Results of Analytical parameters of *Medhya* Cookies

S.No.	Tests/Parameters	Unit	Result
1.	Acid Insoluble Ash	%	0.24
2.	Alcohol Soluble Extractive	%	26.92
3.	Water Soluble Extractive	%	27.61
4.	pH	--	5.86

5.	Total Acidity	%	0.78
6.	Specific Gravity at 20°C	gm/mL	0.60 Approx
7.	Total Sugar (Brix)	%	24
8.	Assay for Active constituents		
	i. Total tannins	g/100g	2.98%
	ii. Total alkaloids	g/100g	Not detected

Table 4: Result of HPTLC of Medhya cookies (R_f value of sample of Medhya Cookies)

Short UV (254nm)	Long UV (366nm)	Post Derivatisation (540nm)
0.18	0.46	0.46
0.46	-	0.86
0.86	-	0.89

The R_f value of the sample of *Medhya* Cookies obtained after HPTLC is depicted in Table 4. The HPTLC photo documentation of sample of *Medhya* cookies is depicted in Figure 2. The densitometric scan reports of the sample of *Medhya* cookies at 254nm, 366nm, 540nm is depicted in Figure 3, 4, 5 respectively.

DISCUSSION

Medha in Ayurveda refers to intellect or cognitive power and *Medhya* is considered to be the *Dravya* (drugs) which enhances it. Most of the drugs used for the preparation of *Medhya* cookies is exhibiting *Medhya* as *Prabhava*. Hence, this can be a replacement which is healthier in terms of its basic composition along with its action to relieve stress, anxiety, depression, sleeplessness, irritability, boost memory, intelligence by merely consuming it on regular basis. Most of the medicinal drugs are bitter in taste and thus people try to avoid them in general. The current study focuses on increasing the palatability along with consideration of its nutritive value and its soothing effect on both mind and body.

On nutritional evaluation, it was observed that the carbohydrate content is 61.33%, protein content is 9.26% and fat content is 24.68%. As carbohydrates are the major source of energy in the diet, it is necessary to assess the proportion of carbohydrate in the prepared formulation. Also, it can be helpful to determine the amount to be consumed per day for individuals managing conditions such as diabetes. Protein is an essential macronutrient that plays a crucial role in various physiological functions, including muscle repair, immune function, and hormone production. By evaluating the protein content in the product, it will help individuals to set their daily intake based upon their diet, especially for athletes, body builders, and fitness enthusiasts. Fat is a key macronutrient that provides essential fatty acids, fat-soluble vitamins, and concentrated energy. Determination of fat content in any food product for nutritional labelling, thus, making it easy for

individuals who manage their weight by specific dietary preferences. Fat contributes to the texture, mouthfeel, and flavour of foods, thus playing crucial role in sensory attributes such as creaminess, richness, and palatability.

The above-mentioned carbohydrate, protein and fat content analysis allows for proper labelling of food products, helping consumers make informed dietary choices based on their needs and preferences.

The moisture content of cookie is estimated to be 2.88%. Moisture content of the drugs/products should meet desired quality standards as it directly impacts on the quality and shelf-life. Excessive moisture can lead to microbial growth, spoilage and textural changes while insufficient moisture can cause drugs/products to become dry and unpalatable. Especially in processes such as baking, controlling moisture levels allows manufacturers to achieve desired product characteristics like texture, appearance and mouthfeel.

The ash content of cookie is estimated to be 1.85%. Ash content plays major role in estimating the authenticity of drug/product and can be an indicator of adulterants added if any. Product's quality and consistency can be assessed based on total ash content. It also provides the information about mineral composition in the drug/food which may contributes to its nutritional value.

The acid-insoluble ash of cookie is estimated to be 0.24%. Determination of acid-insoluble ash is mainly done in drugs/products from plant source as acid insoluble ash mainly consists of silica and silicates, which are naturally occurring minerals found in soil. It is an indication of siliceous impurities. It helps in assessing the quality of the drug thus ensuring efficacy and safety.

The alcohol-soluble extractive of cookie is estimated to be 26.92%. Determination of alcohol-soluble extractive is crucial to support research efforts aimed at understanding the nutritional and health implications of food components. This may help to

enhance the sensory properties or functional benefits of the products. It is also used to evaluate adulteration due to exhausted or improperly processed drugs.

The water-soluble extractive of cookie is estimated to be 27.61%. Determination of water-soluble extractive is crucial to support research efforts aimed at understanding the composition, properties and health effects of food components. This may lead to the development of innovative products with enhanced sensory attributes, nutritional benefits, or functional properties. It can be used to evaluate the quality of the drug by assessing the presence of adulterants.

The pH value of cookie is estimated to be 5.86. Maintaining pH level ensures that the product remain safe for consumption by inhibiting microbial contamination. It also plays role in various aspects including taste, texture, colour and shelf-life. In some formulations, pH level can alter the sensory properties and stability of food products due to interaction of acids and bases.

Apart from quality control, total acidity also plays a significant role in determining the flavour profile and palatability of many foods products. The total acidity of cookie is estimated to be 0.78%. It is often used to monitor fermentation processes, maintain consistency and uniformity in food products.

The specific gravity of cookie is estimated to be 0.60g/mL. Specific gravity measurement can be used for product authentication, detection of adulteration, product stability and shelf-life. It also influences the texture, mouthfeel, and sensory attributes of many food products.

The total sugar content of cookie is estimated to be 24%. Total sugar content is a key component of nutritional labelling on food packaging. Monitoring sugar intake is important for individuals managing conditions such as diabetes, obesity and individuals with poor dental health.

The Assay for active constituents- total tannins of cookie is 2.98% and alkaloids were not detected. Assay for active constituents- tannins, alkaloids is essential for products with standardization levels of active constituents which can be marketed based on their potency and efficacy. This helps to differentiate the products in the competitive food industry. Hence, this information can guide formulation adjustments and product innovations.

On analysing the HPTLC reports, it was observed that at 254nm (Figure 3), three peaks were observed for the sample of *Medhya* Cookies at R_f value of 0.18, 0.46, 0.86. At 366nm (Figure 4), one peak was observed for the sample of *Medhya* cookies at R_f value of 0.46. At 540nm (Figure 5), three peak was observed for the sample of *Medhya* cookies at R_f value of 0.46, 0.86, 0.89. Evaluation using HPTLC is essential for quality control, authenticity verification, process

optimization, allergen detection and nutritional analysis. It also ensures quality and safety of raw herbs as well as food products. It is widely used in food research and development for studying the composition of novel ingredients, exploring new food formulations, and developing analytical methods for emerging food components. The result of HPTLC analysis can be used for fingerprint profile analysis in order to obtain standard markers of the sample drugs.

Limitations of the study

- ✓ For standardization of *Medhya* cookies, HPTLC could have been performed using markers and other parameters like accelerated stability study and shelf-life analysis could also have been conducted.
- ✓ Efficacy and compatibility could have been assessed by performing clinical trials.

CONCLUSION

It can be concluded that the preparation of *Medhya* Cookies can further be used as a standard operative procedure along with the mentioned proportion of ingredients. The study reveals that the results of organoleptic, nutritional and analytical parameters can be further used for standardisation of the formulated *Medhya* cookies. It can be concluded that similar procedures can be developed for large scale production with quality assurance.

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Cite this article as:

Kareena Desai, Aparna Nandakumar Pravin Ganorkar. Preparation and Evaluation of Nutritional and Analytical Parameters of Medhya Cookies: An Ayurvedic Nutraceutical Formulation. International Journal of Ayurveda and Pharma Research. 2026;14(6):109-117.

<https://doi.org/10.47070/ijapr.v14i6.4181>

Source of support: Nil, Conflict of interest: None Declared

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