(10) Publication No: **IN202621042758 A1**
(43) Publication Date: 12-06-2026
(22) Date of Filing: 02-04-2026
Journal No: 24/2026

(19) Intellectual Property Office, India

(12) INDIAN PATENT APPLICATION

(54) Title: **Method for incorporating extracts into chocolate matrix**

(51) International Classification:
A23G 1/00, A23G 1/02, A23G 1/30, A23G 1/32
A23G 1/48, A23L 33/00, A23L 33/10, A23L 33/105

(21) Application No: **202621042758**

(31) Priority Document No: --

(32) Priority Date: --

(86) International Application No: --
Filing Date: --

(87) International Publication No: --

(61) Patent of Addition to Application No: --
Filing Date: --

(62) Divisional to Application No: --
Filing Date: --

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(57) Abstract:

The present invention relates to a process for preparing a chocolate composition containing alcoholic or hydroalcoholic herbal extracts. Sticky herbal extracts are first converted into a free-flowing powder using starch. The powder blend is then mixed into a molten chocolate base through a serial dilution technique to achieve uniform distribution of the extract. The mixture is homogenized, moulded, and cooled to obtain chocolate units containing a predetermined amount of herbal extract. The process provides improved dispersion of extracts, enhanced phytoconstituent stability, uniform content distribution, and acceptable organoleptic properties in the chocolate formulation.

FORM 2

THE PATENTS ACT, 1970

(39 of 1970)

and

THE PATENTS RULES, 2003

COMPLETE SPECIFICATION

(section 10; Rule 13)

Method for Incorporating Herbal Extracts into Chocolate Matrix

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The following Specification describes the invention and the manner in which it is to be performed:

TITLE:

[0001] Method for Incorporating Herbal Extracts into Chocolate Matrix

FIELD OF INVENTION

[0002] The present invention relates to nutraceutical and functional food formulations, particularly to a process for uniformly incorporating alcoholic or hydroalcoholic herbal extracts into a chocolate matrix using a powder blend technique to improve stability and content uniformity.

BACKGROUND OF THE INVENTION

[0003] Herbal extracts prepared using alcoholic or hydroalcoholic solvents are widely utilized in nutraceutical and preventive healthcare formulations due to their high concentration of bioactive phytoconstituents such as polyphenols, alkaloids, glycosides, tannins, and saponin s. These extracts are typically obtained through hot solvent extraction or similar techniques that yield concentrated active fractions. However, the resulting extracts are often sticky, semi-solid, hygroscopic, and resinous in nature, making them difficult to handle and process in solid dosage forms.

[0004] The semi-viscous and moisture-retentive characteristics of alcoholic and hydroalcoholic extracts create significant challenges during formulation, particularly when incorporation into lipid-based matrices such as chocolate is intended. Direct addition of such extracts into molten chocolate or cocoa butter generally leads to poor dispersion, clumping, agglomeration, sedimentation, and phase separation. These issues result in non-uniform distribution of active constituents, thereby compromising dose accuracy and product reliability.

[0005] Chocolate-based delivery systems have gained attention as attractive vehicles for nutraceutical and herbal actives due to their palatability, consumer acceptance, and ability to mask unpleasant tastes. The lipid–sugar matrix of chocolate may also provide

partial protection to sensitive phytoconstituents against environmental factors such as light, oxygen, and humidity. Furthermore, chocolate dosage forms are especially suitable for pediatric, geriatric, and non-compliant populations who may experience difficulty with conventional tablets or capsules.

[0006] Despite these advantages, incorporation of sticky herbal extracts into chocolate presents multiple technical limitations. Attempts to improve dispersion using conventional solubilizers, emulsifiers, or surfactants such as lecithin, polysorbates, glycerine, or propylene glycol have not consistently achieved satisfactory uniformity or long-term stability. The presence of residual moisture in hydroalcoholic extracts may further contribute to sugar bloom, fat bloom, degradation of phytoconstituents, and deterioration of texture during storage.

[0007] Uneven extract distribution within the chocolate matrix can lead to unacceptable content variability between individual units, reduced therapeutic consistency, and analytical difficulties in quantifying active constituents. Additionally, improper mixing conditions or uncontrolled temperature variations may affect cocoa butter polymorphism and compromise the physical stability of the finished product.

[0008] Accordingly, there exists a need for a simple, reproducible, and scalable process that enables effective incorporation of sticky alcoholic or hydroalcoholic herbal extracts into a chocolate matrix while ensuring uniform distribution, phytochemical stability, acceptable organoleptic properties, and reliable dose accuracy. The present invention addresses these limitations by providing a method that converts semi-solid extracts into a free-flowing powder blend prior to incorporation, thereby facilitating improved compatibility and uniform dispersion within the chocolate base.

OBJECTIVE OF INVENTION

[0009] An objective of the present invention is to provide a process for incorporating alcoholic or hydroalcoholic herbal extracts into a chocolate-based delivery system in a uniform and stable manner.

[0010] Another objective of the invention is to convert sticky, semi-solid, or hygroscopic herbal extracts into a free-flowing powder form using suitable edible adsorbents or diluents to improve handling and processability.

[0011] A further objective of the invention is to achieve uniform distribution and content uniformity of herbal extracts throughout the chocolate matrix to ensure accurate and reproducible dosing.

[0012] Another objective is to enhance compatibility between hydrophilic herbal extracts and the lipid-rich chocolate base to prevent clumping, sedimentation, or phase separation.

[0013] It is also an objective of the invention to maintain the stability of phytoconstituents such as polyphenols, alkaloids, glycosides, tannins, and saponins during processing and storage.

[0014] A further objective is to preserve desirable organoleptic properties including taste, texture, mouthfeel, and appearance, thereby improving palatability and consumer compliance.

[0015] Another objective is to provide a nutraceutical chocolate formulation that offers multifunctional health benefits through incorporation of multiple herbal extracts.

[0016] It is also an objective to provide a simple, reproducible, and scalable manufacturing process suitable for laboratory, pilot, and industrial production.

[0017] A further objective is to enable simplified quantitative estimation and analytical evaluation of herbal actives from the chocolate matrix.

[0018] An objective of the present invention is to provide a chocolate-based nutraceutical formulation that is free from added preservatives while maintaining stability and integrity of the herbal constituents.

SUMMARY OF THE INVENTION

[0019] The present invention provides a process for the preparation of a herbal chocolate formulation comprising alcoholic or hydroalcoholic herbal extracts

incorporated into a chocolate matrix. The invention addresses the problem associated with incorporation of sticky and semi-solid herbal extracts into lipid-based chocolate systems, which generally results in poor dispersion, clumping, and non-uniform distribution of active constituents.

[0020] According to the invention, the sticky herbal extract is first converted into a free-flowing powder by blending with suitable edible adsorbents or diluents, preferably corn starch, in an optimized ratio to eliminate stickiness and improve flow properties. The obtained powder blend is dried under controlled temperature and sieved to obtain a uniform fine powder suitable for incorporation into the chocolate base.

[0021] In a further step, a chocolate base is prepared by melting cocoa butter and mixing it with sugar syrup and other excipients under controlled temperature and stirring conditions. The powder blend of herbal extract is then incorporated into the chocolate base using a serial dilution technique, wherein the powder blend is initially mixed with a small portion of molten chocolate base to form a premix and subsequently diluted stepwise with additional chocolate base to achieve uniform distribution.

[0022] The homogenized mixture is then moulded and cooled to obtain solid chocolate units containing a predetermined quantity of herbal extract. The process results in a chocolate-based nutraceutical composition exhibiting uniform distribution of herbal extract, improved stability of phytoconstituents, acceptable organoleptic properties, and reproducible dosage uniformity.

[0023] The invention further provides a herbal chocolate prepared by the above process, characterized by improved dispersion of herbal extracts within the chocolate matrix and enhanced physical and chemical stability.

BRIEF DESCRIPTION OF DRAWINGS

The accompanying drawings illustrate the process for preparation of herbal chocolate according to the present invention. The drawings are provided for the purpose of illustrating the sequence of steps involved in the method and should not be construed as limiting the scope of the invention.

Figure 1: Flow chart illustrating the process for conversion of sticky herbal extract into a free-flowing powder and its incorporation into a chocolate base for preparation of chocolate.

Figure 2: Perspective view of the final prepared herbal chocolate.

DETAILED DESCRIPTION OF THE INVENTION

[0024] The present invention will now be described in detail with reference to specific embodiments and illustrative examples. The following description is provided to enable a person skilled in the art to understand and carry out the invention. However, it will be understood that various modifications, substitutions, and equivalent arrangements may be made without departing from the scope and spirit of the invention as defined in the appended claims.

[0025] The invention provides a process for uniformly incorporating alcoholic or hydroalcoholic herbal extracts into a chocolate-based matrix. The process overcomes the formulation challenges associated with sticky and hygroscopic extracts by converting them into a free-flowing powder blend prior to incorporation into the chocolate base. The invention further includes controlled mixing, serial dilution incorporation, homogenization, moulding, and cooling steps to obtain a stable and uniformly distributed herbal chocolate formulation.

[0026] The detailed description that follows illustrates the process steps, formulation composition, and evaluation parameters used to achieve the desired product characteristics. The examples provided herein are intended for explanatory purposes and should not be construed as limiting the scope of the invention.

[0027] In order to evaluate the effectiveness of the process of the present invention, a series of comparative trials were conducted by modifying or omitting certain critical steps of the process. The observations obtained from these comparative experiments are described below.

[0028] In one comparative experiment, the alcoholic or hydroalcoholic herbal extract was directly incorporated into the molten chocolate base without converting the extract into a free-flowing powder. The extract was found to remain sticky and semi-solid and did not disperse uniformly in the lipid matrix. Agglomeration and localized accumulation of the extract were observed during mixing. After moulding and solidification, different portions of the chocolate units exhibited visible heterogeneity and inconsistent distribution of the extract, indicating poor content uniformity.

[0029] In another comparative experiment, attempts were made to incorporate the sticky extract into the chocolate base using commonly known solubilizers or surfactants such as lecithin, polysorbates, glycerine, and propylene glycol. Although these agents facilitated partial dispersion during mixing, uniform distribution of the extract within the chocolate matrix was not achieved. After cooling and solidification, phase separation and localized sedimentation of the extract were observed, and the resulting chocolate exhibited undesirable changes in texture and mouthfeel.

[0030] Further experiments were conducted to evaluate different adsorbents for conversion of the sticky extract into a free-flowing powder. When natural gums such as agar mucilage, gum karaya, pectin, acacia, and tragacanth were used, the mixture retained significant stickiness and exhibited poor flow properties. In contrast, when edible starches or cellulose derivatives such as corn starch, rice starch, and microcrystalline cellulose were used, the extract was successfully converted into a stable free-flowing powder that could be uniformly dispersed in the chocolate base.

[0031] In additional comparative trials, the ratio of starch to extract was varied. When the proportion of starch was lower than the optimized ratio, the powder blend remained partially sticky and difficult to sieve, resulting in poor flow during mixing. Conversely, when excessive starch was used, the powder became overly bulky and adversely affected the final texture and mouthfeel of the chocolate product. An optimized ratio of corn starch to extract of about 2:1 was found to provide effective conversion into a free-flowing powder with suitable flow characteristics for further processing.

[0032] In a further experiment, the powder blend was directly added into the bulk molten chocolate base without employing the serial dilution described in the present invention. Under these conditions, aggregation of the powder blend occurred within the chocolate mass, resulting in localized concentrations of the herbal extract. Analytical evaluation of different sections of the chocolate units revealed significant variation in phytoconstituent levels, demonstrating that direct addition into the bulk base did not ensure uniform distribution.

[0033] Additional trials were conducted in which homogenization conditions were altered. When mixing was performed for shorter durations or at uncontrolled temperatures, partial sedimentation of the powder blend occurred before moulding. This resulted in stratification of the extract within the chocolate mass and reduced uniformity in the final product. Homogenization at controlled temperature between about 40 °C and 45 °C for sufficient duration was found necessary to maintain uniform dispersion.

[0034] Further comparative evaluation was conducted with respect to moulding and cooling conditions. When the chocolate mass was cooled rapidly or moulded at elevated temperatures, defects such as uneven solidification and surface irregularities were observed. Controlled cooling for approximately 15–20 minutes allowed proper crystallization of cocoa butter and resulted in chocolate units having uniform structure and appearance.

[0035] Overall, the comparative experiments demonstrate that the process steps described in the present invention, including conversion of sticky extract into a free-flowing powder, incorporation through serial dilution, controlled homogenization, and controlled cooling, are essential to achieve uniform distribution of herbal extract, improved physical stability, and acceptable organoleptic properties in the final chocolate formulation.

Powdered extract blend Composition

[0036] The extraction of herbal constituents was carried out using a Soxhlet apparatus, wherein the powdered drug (Aswagandha root powder, Brahmi leaves powder, Aswagandha root powder and Amla fruit powder) placed in a thimble and extracted with 50% ethanol, with sufficient solvent maintained in the round bottom flask. Upon heating, the solvent vaporized, condensed, and percolated through the drug powder, allowing soluble constituents to dissolve. The extract-laden solvent was siphoned back into the flask after reaching the siphon level, completing one cycle, and this process was repeated continuously for about 4–8 hours until the siphoned solvent became colorless, indicating complete extraction. The extraction was performed at a temperature below 55 °C to avoid degradation of heat-sensitive constituents. After completion, heating and cooling were stopped, the apparatus was allowed to cool, and dismantled carefully. The resulting thick, sticky crude extract was collected and weighed to determine the percentage yield.

[0037] The developed nutraceutical chocolate composition contains a polyherbal combination of Ashwagandha, Brahmi, Shatavari, and Amla in the ratio of 20:20:20:40 respectively. Amla is incorporated in higher proportion to enhance sweet after-taste and improve palatability of the final product. The formulation aims to deliver synergistic adaptogenic and cognitive-supportive benefits within a stable chocolate-based delivery system that improves patient compliance. The hydroalcoholic or alcoholic extract is not more that 7 % of the final chocolate composition.

COMPOSITION PREPARATION METHOD

[0038] The preparation of herbal chocolate involves four major stages, namely conversion of extract into a free-flowing powder, preparation of chocolate base, serial dilution incorporation of extract, and moulding with solidification.

[0039] In the first stage, the sticky herbal extract is converted into a free-flowing powder to facilitate uniform dispersion in the chocolate matrix. The sticky extract is blended with corn starch in a ratio of 2:1 (starch: extract) and mixed thoroughly to

eliminate stickiness and improve flow properties. The blended mass is then dried in a hot air oven at a temperature not more than 60°C for 15–20 minutes. After drying, the material is ground to break aggregates and passed through sieves to obtain a fine, uniform powder. Loss on drying is maintained not more than 5% to ensure stability. The final product of this stage is a free-flowing powder blend suitable for incorporation into the chocolate base.

[0040] In the second stage, the chocolate base is prepared. Sugar and water are mixed in a ratio of 1:0.5 (w/v) and heated at 50°C for 4–6 minutes to form sugar syrup, which is then allowed to cool. Cocoa butter is melted separately at 45–50°C and Cocoa powder is added to get cocoa butter chocolate base. The pre-cooled sugar syrup is gradually added to the melted cocoa butter and mixed at 100–300 rpm while maintaining the temperature between 40–45°C for approximately 15 minutes. Flavoring agents, preservatives, stabilizer and other excipients are then incorporated to obtain a uniform chocolate base.

[0041] In the third stage, the free-flowing powder blend of extract is incorporated into the chocolate base using a serial dilution technique to ensure uniform distribution. Initially, 300 mg of herbal powder blend is mixed with 300 mg of melted chocolate base at 40–45°C to form premix of 600mg. Continuously, an additional 300 mg of chocolate base to make the total 900 mg premix. Further dilution is achieved by adding above 900 mg of premix to the remaining chocolate base making the total 9100 mg, resulting uniformly dispersed mixture. The entire mass is continuously homogenized at 40–45°C for 15 minutes, followed by gradual cooling to approximately 37°C to increase viscosity and stabilize the dispersion.

[0042] In the final stage, paste of dates (additive to enhance taste) is placed into moulds. The hebal chocolate mixture is poured into the moulds, ensuring proper filling. The moulds are cooled for 15–20 minutes to allow solidification. After solidification, the chocolates are demoulded, inspected for surface defects, and packed in suitable packaging material.

[0043] The final product obtained is a 10000 mg chocolate unit containing 100 mg of herbal extract, with uniform distribution and acceptable physical characteristics.

Table 1: Chocolate matrix for Hydroalcoholic Extract (Per 10 g Unit)

Sr. No.	**Ingredient**	**Quantity for 10000 mg (10g)**
1	Chocolate base (mixture cocoa butter 4.1gm and cocoa powder 2gm)	9100 mg
2	Soy lecithin	5mg
3	Herbal powder blend (100mg extract: 200mg corn starch)	300 mg
4	Paste of dates	595 mg
	Total	**10000 mg (10g)**

Evaluation of Formulation Methods

[0044] Two formulation approaches were investigated for incorporation of alcoholic and hydroalcoholic extracts into the chocolate matrix. Method involves conversion of sticky extracts into a free-flowing powder prior to dispersion in chocolate. Comparative observations of both methods are presented in Table 1.

Table 2: Comparative Evaluation of Method A

Parameter	**Observation**
Polyphenol Stability	Higher
Surface Water Loss	Not observed

Content Degradation	Minimal
Texture & Compliance	Better

[0045] The results indicate that Method provides superior stability of phytoconstituents, prevents surface moisture migration, and offers improved sensory compliance compared to the emulsion method.

Physicochemical Characterization

[0046] Moisture Content: Moisture content was determined by oven-drying until constant weight. The finished product exhibited a moisture content of 1.20% (w/w), which is within acceptable limits for chocolate-based nutraceutical formulations. Low moisture content contributes to microbiological stability and reduces risk of sugar bloom.

[0047] Water Activity: Water activity was measured under controlled temperature conditions and was found to be 0.47. Since this value is below 0.60, the formulation demonstrates resistance to microbial growth and moisture-mediated degradation.

[0048] pH: The pH of the product was assessed potentiometrically, One gram of chocolate was dispersed in 10 mL of distilled water at 45 °C under magnetic stirring until homogeneous and subsequently measured at 25 ± 1 °C using a calibrated pH meter. The pH of the final product was recorded as 6.4.

[0049] Texture Profile Analysis (TPA): Texture analysis was performed on molded chocolate pieces using a compression test at a test speed of 2 mm/s. The analysis assessed key mechanical parameters including hardness, fracturability, and cohesiveness. The hardness of the formulation was recorded as 30 N, and the chocolate exhibited a clean fracture pattern without crumbling during compression. These results indicate that the incorporation of herbal actives did not adversely affect the mechanical strength or internal structure of the chocolate. The texture parameters were consistent with those of standard chocolate matrices, confirming that the formulation maintained

desirable structural characteristics. Texture profile analysis was performed to determine mechanical properties of the chocolate. The results are presented in Table 3.

Table 3: Texture Profile Analysis

Parameter	Result
Hardness	30 N
Fracturability	Clean snap
Cohesiveness	Acceptable

[0050] The chocolate exhibited adequate hardness and clean fracture characteristics, confirming that incorporation of herbal extract did not compromise structural integrity. A qualitative snap test performed at room temperature demonstrated a distinct clean snap with minimal crumbling, confirming stable cocoa butter crystal formation.

[0051] Snap Test (Qualitative): A qualitative snap test was conducted by manually breaking chocolate bars at room temperature (25 °C) to assess tempering quality and crystalline stability. The chocolate exhibited a distinct clean snap with minimal edge distortion, indicating proper tempering and stable cocoa butter crystal formation. The results confirm that the addition of herbal extract did not interfere with cocoa butter polymorphism or compromise textural quality.

Matrix Stability Studies

[0052] Fat Bloom & Sugar Bloom Assessment: Molded chocolate pieces were stored at 25 ± 2 °C for a period of 30 days and evaluated at predefined intervals on Day 0, 7, 15, and 30 for any signs of visual whitening, streaking, or surface dullness. Throughout the storage period, no visible fat bloom or sugar bloom was observed. These findings indicate that incorporation of the herbal extracts (100 mg per 10 g chocolate unit) did not disrupt cocoa butter polymorphism or promote moisture-mediated sugar recrystallization. The formulation thus maintained structural and surface stability under

normal storage conditions. The absence of bloom formation confirms that the herbal extract incorporation did not destabilize cocoa butter polymorphism.

Table 4: Bloom and Physical Stability Assessment

Test	**Observation**
Fat Bloom (30 days)	Not observed
Sugar Bloom (30 days)	Not observed
Physical Change	None

[0053] Temperature Cycling Stability: Samples were subjected to temperature cycling consisting of three cycles of storage at 4 °C for 24 hours followed by 30 °C for 24 hours. After completion of the cycles, the samples were evaluated for visual and textural changes. No surface whitening, oiling-off, or structural deformation was observed. The chocolate retained its characteristic snap and surface gloss, indicating preservation of cocoa butter crystal structure. These findings demonstrate that temperature stress did not induce bloom formation or phase separation, confirming adequate thermal stability of the chocolate matrix.

[0054] Sensory Evaluation: Organoleptic evaluation was performed using a 9-point hedonic scale with a semi-trained panel. The results are presented in Table 5.

Table 4: Sensory Evaluation Results

Parameter	**Score (Mean ± SD)**
Appearance	7.8 ± 0.2
Aroma	7.3 ± 0.3
Taste	7.1 ± 0.4
Bitterness/Astringency	6.8 ± 0.3

Mouthfeel	7.5 ± 0.3
Aftertaste	7.0 ± 0.3
Overall Acceptability	7.4 ± 0.3

[0055] Weight Variation Study: Twenty chocolate units, each of nominal weight 10 g, were randomly selected and individually weighed. The average weight was calculated and compared with individual unit weights to assess uniformity. The weight variation was found to be not more than 5%, complying with the specified limit and confirming consistency in unit dosing and manufacturing precision.

[0056] Uniform Distribution of Herbal Extract: Uniformity of distribution was assessed by dividing chocolate units into equal sections and performing quantitative estimation of polyphenols, alkaloids, tannins, and saponins in each section. Variation in absorbance values between sections was not more than 5%, confirming effective dispersion of the extract throughout the chocolate matrix.

[0057] Quantitative Estimation of Phytoconstituents: For quantitative estimation of phytoconstituents such as polyphenols, glycosides, alkaloids, tannins, and saponins present in the herbal chocolate formulation, the herbal constituents were first separated from the chocolate matrix. This separation was necessary due to the presence of cocoa butter and other lipid components in the chocolate base, which could interfere with analytical measurements.

[0058] Initially, about 2–5 g of the chocolate sample was weighed and frozen at approximately −20 °C for about 1–2 hours to make the sample brittle. The frozen chocolate was then grated or finely chopped into small pieces to increase the surface area for extraction. Alternatively, the chocolate could be gently melted at about 40–50 °C while ensuring that the temperature remained low enough to avoid degradation of sensitive phytoconstituents such as polyphenols.

[0059] In order to remove cocoa butter and other lipid components, a defatting step was carried out using a non-polar solvent. Approximately 10–20 mL of n-hexane per gram of sample was added to the chopped chocolate in a centrifuge tube. The mixture was vortexed or vigorously shaken for about 10–15 minutes, or alternatively subjected to ultrasonic treatment for about 5–10 minutes. The sample was then centrifuged at about 3000–5000 rpm for approximately 10 minutes to separate the fat layer. The supernatant containing dissolved fats was decanted and discarded. This defatting procedure was repeated two to three times until the supernatant appeared clear, indicating removal of most of the lipid fraction. The resulting defatted residue was air-dried at room temperature or under vacuum for about 12–24 hours to remove residual solvent, thereby yielding defatted chocolate solids containing the phytoconstituents.

[0060] Extraction of polyphenolic and other phytochemical constituents was then performed using aqueous methanol. Approximately 5–10 mL of 70–80% methanol was added per gram of the defatted residue. The mixture was subjected to ultrasonic treatment or shaking for about 20–30 minutes at room temperature while protecting the solution from light to prevent degradation of phenolic compounds. The mixture was centrifuged at about 3000–5000 rpm for approximately 10 minutes, and the supernatant was collected. The extraction process was repeated one or two additional times with fresh solvent to ensure complete extraction of phytoconstituents. All supernatants were combined and filtered through a 0.45 µm membrane filter. If necessary, the filtrate was concentrated under reduced pressure using a rotary evaporator at a temperature below 40 °C or diluted to a known volume for analytical evaluation.

[0061] Polyphenolic content of the extracts was determined using the Folin–Ciocalteu colorimetric method. In this method, the extract solution was reacted with diluted Folin–Ciocalteu reagent followed by addition of sodium carbonate solution. The reaction mixture was incubated at room temperature for approximately 30 minutes to allow development of the characteristic blue coloration. The absorbance of the solution was measured at 765 nm using a UV-visible spectrophotometer. The total polyphenolic

content was calculated using a gallic acid standard calibration curve and expressed as milligrams of gallic acid equivalents per gram of sample.

[0062] Alkaloid content was determined using a colorimetric method involving acid–base extraction followed by reaction with bromocresol green reagent. The drug sample was first extracted with 2% acetic acid in ethanol and the mixture was filtered. The filtrate was then made alkaline using ammonium hydroxide and extracted with chloroform. The chloroform layer containing the alkaloids was separated and evaporated to dryness. The residue was dissolved in ethanol and reacted with bromocresol green reagent in the presence of phosphate buffer. The resulting-colored complex was extracted with chloroform, and the absorbance was measured at 470 nm. Alkaloid content was calculated using an atropine standard calibration curve and expressed as atropine equivalents per gram of sample.

[0063] Tannin content was estimated using the Folin–Denis's method. In this procedure, the sample extract prepared using 70% acetone was reacted with Folin–Denis reagent followed by sodium carbonate solution. After incubation for about 30 minutes, the absorbance of the developed color was measured at 700 nm. The tannin content was determined using a tannic acid standard curve and expressed as milligrams of tannic acid equivalents per gram of sample.

[0064] Saponin content was estimated using the vanillin–sulfuric acid colorimetric method. The sample extract prepared using 80% methanol was reacted with vanillin reagent and concentrated sulfuric acid and incubated at approximately 60 °C for about 10 minutes. After color development, the absorbance of the reaction mixture was measured at 544 nm using a spectrophotometer. The saponin content was calculated using a diosgenin standard calibration curve and expressed as milligrams of diosgenin equivalents per gram of sample.

Stability of Phytoconstituents

[0065] Stability studies conducted for three months demonstrated that reduction in polyphenol content did not exceed 9%, while reduction in glycosides, alkaloids, and

saponins remained within 5% when temperature maintained at 27 ± 2 °C and relative humidity at 65 ± 5%. These findings confirm chemical stability of the herbal actives within the lipid-based matrix under defined storage conditions.

[0066] The stability of major phytoconstituents in the herbal chocolate was evaluated by comparing their initial content with the content after three months of storage as tested by above method. The polyphenol content remained within 17.52% ± 1.0% to 17.40% ± 0.5%, tannins within 14.40% ± 1.5% to 14.15% ± 0.5%, saponins within 7.80% ± 0.5% to 7.60% ± 1%, and alkaloids within 0.77% ± 0.5% to 0.75% ± 1%. These results indicate that the phytoconstituents remained substantially stable within the chocolate matrix during the storage period.

Category	Initial Content Percentage (%)	Degradation (3 Months) Polyphenols
Polyphenols	17.52%± 1.0%	17.40% ± 0.5%
Tannins	14.40% ± 1.5%	14.15% ± 0.5%
Saponins	7.80% ± 0.5%	7.60% ± 1%
Alkaloids	0.77%± 0.5%	0.75% ± 1%

[0067] The individual herbal extract, being inherently sticky and hygroscopic, was found unsuitable for direct incorporation into the chocolate matrix. To overcome this limitation, the extract was converted into a free-flowing powder by blending with selected edible adsorbents and diluents such as starches and semi-synthetic cellulose derivatives. During development, it was unexpectedly observed that corn starch, when used in a ratio of about 2:1 (starch:extract), resulted in a consistently free-flowing, non-sticky powder with superior handling and dispersion characteristics, thereby enabling uniform incorporation into the chocolate base. In comparison, microcrystalline cellulose (1:1) also improved flow properties but did not provide the same level of uniform dispersion during subsequent mixing. Other starches such as rice starch

(2.5:1), wheat starch (3:1), and potato starch (3:1) exhibited acceptable flow but showed minor lump formation and comparatively less consistent performance. Natural gums including agar mucilage, gum karaya, pectin, acacia, and tragacanth were found unsuitable, as they failed to eliminate stickiness and did not produce a free-flowing material. The resulting optimized powder blend was dried at a temperature not exceeding 60 °C for 15–20 minutes to achieve a loss on drying not more than 5%, followed by sieving to obtain a uniform fine powder suitable for further processing.

CLAIMS

We claim,

1. A process for the preparation of herbal chocolate, comprising the steps of converting a sticky herbal extract into a free-flowing powder blend, preparing a chocolate base, incorporating the powder blend into the chocolate base using a serial dilution technique with homogenization, and moulding.
2. The process as claimed in claim 1, wherein the sticky herbal extract is converted into a free-flowing powder by blending with corn starch in an optimized ratio of Starch: sticky herbal extract is 2:1.
3. The process as claimed in claim 1, wherein the blended extract is dried at a temperature not more than 60 °C for 15–20 minutes and subjected to grinding and sieving to obtain a uniform fine powder with loss on drying not more than 5%.
4. The process as claimed in claim 1, wherein the chocolate base is prepared by heating sugar and water in a ratio of 1:0.5 (w/v) at about 50 °C for 4–6 minutes to form sugar syrup, cooling the syrup, melting cocoa butter at 45–50 °C, and mixing both at 40–45 °C with continuous stirring at 100–300 rpm for about 15 minutes.
5. The process as claimed in claim 1, wherein flavoring agents, preservatives, and pharmaceutically acceptable excipients are added to the chocolate base to obtain a uniform composition.
6. The process as claimed in claim 1, wherein the herbal powder blend is incorporated into the chocolate base by initially forming a premix with a small portion of the melted chocolate base followed by gradual addition of the remaining base using a serial dilution or levigation technique to ensure uniform distribution.
7. The process as claimed in claim 1, wherein the mixture is homogenized at 40–45 °C for about 15 minutes and gradually cooled to approximately 37 °C to increase viscosity prior to moulding.
8. The process as claimed in claim 1, wherein the chocolate mass is poured into moulds containing paste of dates and cooled for 15–20 minutes to achieve solidification.

9. An herbal chocolate prepared by the process as claimed in any of the preceding claims, characterized by uniform distribution of herbal extract and improved physical stability.

10. The herbal chocolate as claimed in claim 9, wherein the herbal extract is not more that 7 % of the final chocolate composition.

ABSTRACT

Method for Incorporating Herbal Extracts into Chocolate Matrix

The present invention relates to a process for preparing a chocolate composition containing alcoholic or hydroalcoholic herbal extracts. Sticky herbal extracts are first converted into a free-flowing powder using starch. The powder blend is then mixed into a molten chocolate base through a serial dilution technique to achieve uniform distribution of the extract. The mixture is homogenized, moulded, and cooled to obtain chocolate units containing a predetermined amount of herbal extract. The process provides improved dispersion of extracts, enhanced phytoconstituent stability, uniform content distribution, and acceptable organoleptic properties in the chocolate formulation.