"CHURNA'S STANDARDIZATION PARAMETER ENSURES CONSISTENT QUALITY, ENHANCING EFFICACY AND SAFETY, REFLECTING INNOVATION AND ADHERENCE TO RIGOROUS STANDARDS."

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Abstract:
Ayurvedic medicines, comprising selected herbal ingredients, undergo diverse pharmaceutical processes to produce various dosage forms like churnas, bhasmas, liquids, lehas, pills, and tablets. Churna, a fine powder form, involves meticulous cleaning, thorough drying, pulverization, and sieving of the mentioned herbs. This ensures its free-flowing consistency and a shelf life of one year when stored in airtight containers.
Churna formulations bear similarities to powder formulations in allopathic medicine. Recent innovations have seen churna being transformed into tablet form, simplifying dosage administration. These formulations are favored due to their particle size, where smaller particles lead to enhanced absorption rates from the gastrointestinal tract, thereby increasing bioavailability.
This article aims to delve into the comprehensive details of parameters crucial for standardizing churna products commercially prepared and marketed. By exploring these parameters, it seeks to contribute to the ongoing innovation and quality assurance efforts within the realm of Ayurvedic medicine formulation and production.

Keywords: Traditional medicine, Churna, Ayurvedic medicine etc.

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Introduction:

In recent years, there has been a surge in demand for plant-derived products across developed nations, driven by their growing popularity as medicinal remedies, nutraceuticals, and cosmetics. In India alone, there are approximately 6000 herbal manufacturers, with over 4000 units dedicated to producing Ayurvedic medicines. However, many of these manufacturers operate under challenging conditions due to insufficient infrastructure, a shortage of skilled manpower, unreliable methods, and lax regulatory laws, leading to a tentative production process.

To ensure the quality and consistency of herbal drugs, it has become imperative to develop robust quality control methods that integrate both classical and modern analytical techniques. Standardization plays a pivotal role in this process, encompassing measures taken throughout manufacturing and quality control to achieve reproducible product quality. This holistic approach spans from the initial cultivation of plants to their clinical application, involving adjustments to herbal drug preparations to achieve defined concentrations of active constituents through the addition of excipients or the blending of herbal materials.

Evaluation of herbal drugs involves confirming their identity, assessing their quality and purity, and detecting any adulteration. In Ayurvedic medicine, various formulations like churnas, extracts, kashayas, asavas, and aristas are commonly used, often comprising multiple herbs sourced from diverse geographical locations and harvested during different seasons. As a result, the variability in the number of active constituents present in these formulations can impact their efficacy.

Aligning with modern medicine standards, efforts are underway to standardize Ayurvedic medicines to ensure each batch contains the intended materials in the correct proportions. This article delves into the parameters essential for standardizing churna, a popular Ayurvedic formulation commercially available, shedding light on the intricacies of maintaining quality and consistency in herbal drug production and marketing.

Materials and methods:

Churna sourced from "Pasari Medical" in Dhule's local Ayurvedic market, with solvents procured from Loba Chem.

Figure 1: Different Marketed formulation.

Standardization parameters encompass various aspects to ensure the quality and consistency of herbal products. Physical parameters such as color, odor, appearance, and fluorescence analysis, along with measures like ash value, crude fiber, moisture content, extractive value, swelling index, foaming index, pH value, and flow properties, provide insights into the product's characteristics. Additionally, calculations of bulk and tap density, compressibility index, and determination of tannins contribute to assessing physical attributes.

Chemical parameters involve limit tests and chemical analyses to determine the composition and purity of the product. Chromatographic techniques including TLC, HPLC, HPTLC, GC, UV, GC-MS, and fluorimetry are utilized for detailed chemical analysis.

Microbiological parameters focus on evaluating microbial contamination, including total viable content, total mold count, total enterobacterial count, and detection of aflatoxin, ensuring product safety and hygiene standards are met.

These comprehensive parameters play a crucial role in standardizing herbal products, enabling manufacturers to maintain quality, consistency, and safety across batches.

Physical Parameters:

Fluorescence Analysis: Involves molecules absorbing light within a specific wavelength range, becoming excited, and emitting radiation upon returning to their original state. This phenomenon aids in detecting adulteration in powdered drugs.

Method: For the method, approximately 1 gram of powdered drug was placed in a petri dish and treated with various reagents: methanol, 1N methanolic sodium hydroxide, ethanol, 1N ethanolic sodium hydroxide, 1N HCl, 1N NaOH, 50% H_2SO_4, 50% HNO_3, 5% potassium hydroxide, and acetone. The observations were made under light wavelengths of 254 nm, 365 nm, and visible light. The emitted color radiations were compared with a standard color chart. Prior to fluorescence analysis, the powdered drug was sieved through a 60-mesh sieve, and observations were conducted following Chase and Pratt's method.

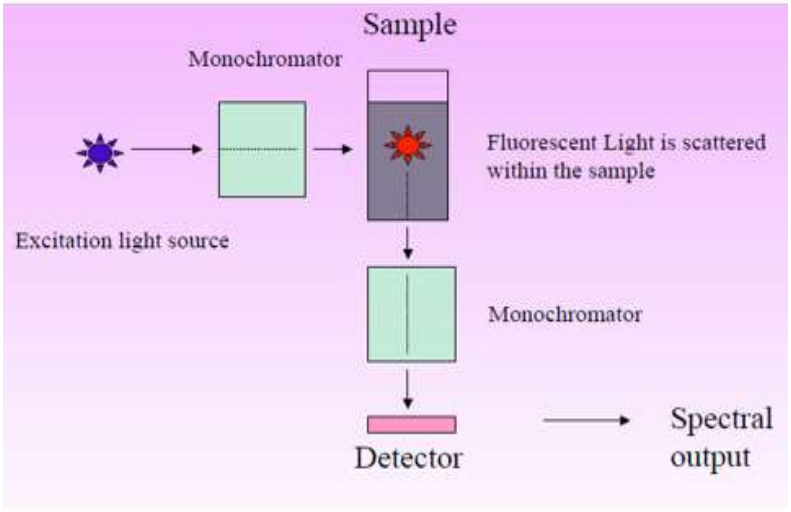

Figure 2: Fluorescence Analysis method.

Ash Value Determination:

Involves assessing the total amount of material remaining after complete incineration of the crude drug. This method is essential for detecting contamination and adulteration, such as the presence of sand, earth, or other unwanted substances mixed in the crude drug. Various types of ash include Total Ash, Physiological Ash, Non-Physiological Ash, Carbonated Ash, Sulphated Ash, Nitrate Ash, Acid-Insoluble Ash, and Water-Soluble Ash.

Method:

For Total Ash determination, approximately 2 to 4 grams of ground material, as specified in the drug monograph, is placed in a crucible and ignited until it turns white.

To determine Acid Insoluble Ash, the residue from total ash extraction with hydrochloric acid (HCl) is used. The ash is boiled with 25 ml of 2M HCl for 5 minutes, and the resulting residue is collected on ashless filter paper, washed with hot water, ignited, cooled in a desiccator, and weighed.

Water Soluble Ash represents the portion of total ash soluble in water, indicating previous extraction of water-soluble salts or incorrect preparation. The total ash is boiled for 5 minutes in 25 ml of distilled water. The insoluble residue is collected on ashless filter paper, washed with hot water, ignited, cooled in a desiccator, and weighed. Subtracting the weight of insoluble matter from the total ash weight yields the water-soluble ash value.

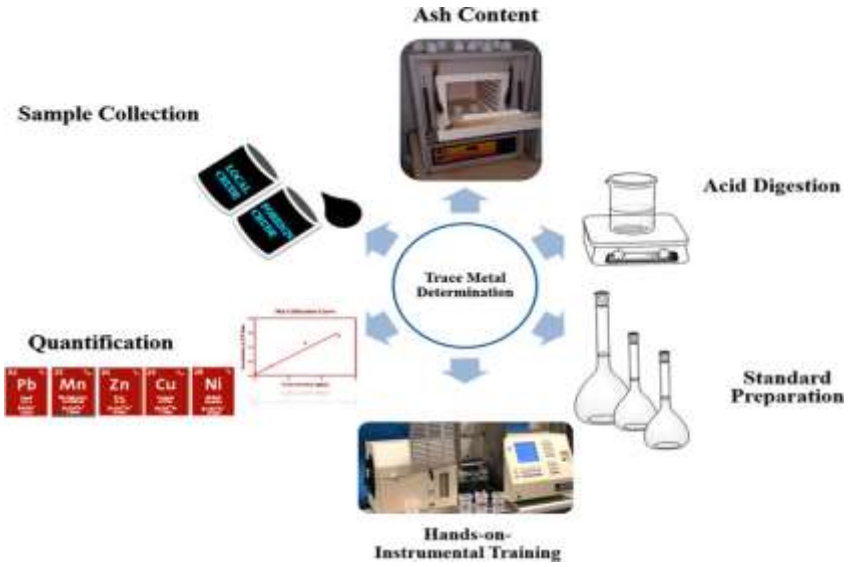

Figure 3: Ash Value Determination.

Crude Fiber Determination: Involves measuring the cellulose, lignin, and cork cell content in plant tissue. It represents the non-ash material insoluble in water and indigestible by boiling in H2SO4 or NaOH. This method identifies resistant plant cell components, including cellulose and pectin, indicating adulteration containing sclerenchyma or other resistant tissue.

Figure 4: Crude Fiber Determination.

Method:
Approximately 2 grams of the drug sample is accurately weighed and extracted with ether. Then, 200 ml of 1.25% H2SO4 is added to the extracted drug, and the mixture is boiled under reflux in a 500 ml flask for 30 minutes. After filtration, the residue is washed with boiling water until free of acid. Next, the entire residue is transferred back into the flask with 200 ml of 1.25% NaOH and boiled under reflux for another 30 minutes. The liquid is quickly filtered, and the residue is washed with boiling water until neutral. It is then dried at 110°C to a constant weight and weighed (W1). Subsequently, the residue is incinerated in a crucible to form ash (W2). The difference in weight indicates the weight of crude fiber content in the drug.

Moisture Content Determination:
assesses the water content in a crude drug, a crucial step for preservation and quality. Excessive moisture can lead to microbial growth and degradation of active constituents. Ensuring moisture levels are below the critical threshold is essential for maintaining drug integrity and preventing spoilage. High moisture content not only affects pricing but also indicates improper preparation or storage.

Figure 5: Moisture Content Determination

Method:
Loss on Drying, Azeotropic Distillation, and Karl Fischer methods are employed for determining moisture content in crude drugs. For Loss on Drying, a specified quantity of the sample, as per the drug monograph, is dried in a hot air oven at 105°C until a constant weight is achieved. The difference in weight indicates the moisture content of the drug.

Extractive Value Determination:
Involves extracting a crude drug with a specific solvent to obtain a solution containing various phytoconstituents. The composition of these constituents depends on the nature of the drug and the solvent used. This method quantifies the number of active constituents present in a given amount of medicinal plant material when extracted with a solvent. It is particularly useful for materials lacking other chemical or biological assay methods.
As per the Indian Pharmacopoeia (IP) 1996 and British Pharmacopoeia (BP) 1980, the determination of water-soluble and alcohol-soluble extractives is utilized to evaluate crude drugs that are not easily estimated by other means.

Figure 6: Extractive Value Determination.

Method:
For Water Soluble Extractive determination, 5 grams of air-dried, coarsely powdered drug is macerated with 100 ml of water in a closed flask for 24 hours, with intermittent shaking during the first 6 hours and subsequent standing for 18 hours. The filtrate is then evaporated to dryness at 105°C, and the residue is weighed.
Similarly, for Alcohol Soluble Extractive determination, 5 grams of air-dried, coarsely powdered drug is macerated with 100 ml of specified-strength ethanol in a closed flask for 24 hours, with the same shaking and standing protocol. The filtrate is evaporated to dryness at 105°C, and the residue is weighed.

The Swelling Index determines: The volume of liquid absorbed by 1 gram of plant material under specified conditions, crucial for assessing therapeutic and pharmaceutical properties, especially in gums and substances rich in mucilage, pectin, or hemicelluloses.

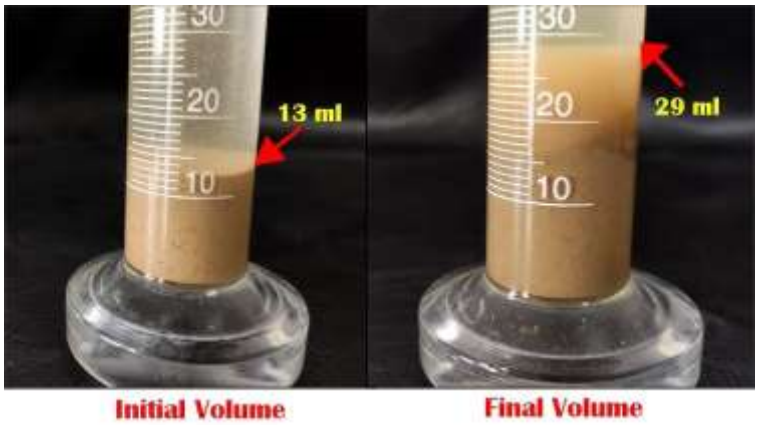

Figure 7: The Swelling Index determines.

Method:
In the method, a specified quantity of finely powdered plant material is accurately weighed and placed in a 25 ml glass stoppered measuring cylinder. Water (or a specified swelling agent) is added, and the mixture is shaken every 10 minutes for 1 hour. After allowing it to stand for 3 hours at room temperature, the volume occupied by the plant material is measured. The result is expressed as the mean value per gram of plant material.

The Foaming Index determines: the foaming ability of plant materials, particularly those rich in saponins, known for their detergent properties. These high molecular weight phytoconstituents, found in various medicinal plants, can produce persistent foam in aqueous decoctions.

Figure 8: The Foaming Index determines.

Method:
In the method, approximately 1 gram of the plant material is coarse powdered (sieved size No. 1250) and accurately weighed. It is then transferred to a 500 ml conical flask containing 100 ml of boiling water, maintaining moderate boiling for 30 minutes. After cooling and filtration into a 100 ml volumetric flask, sufficient water is added through the filter for dilution.

The resulting decoction is poured into 10 ml stoppered test tubes (16 cm height, 16 mm diameter) in successive portions (1 ml, 2 ml, 3 ml) and adjusted to 10 ml volume with water. The tubes are stoppered, shaken lengthwise for 15 seconds at a rate of two shakes per second, and allowed to stand for 15 minutes. The height of the foam is then measured.

The pH Value determination: Assesses the acidity or alkalinity of an aqueous solution, crucial for stability and physiological suitability of pharmacopoeias substances. The determination is typically conducted at a temperature of 25°C ± 2°C, as specified in individual monographs.

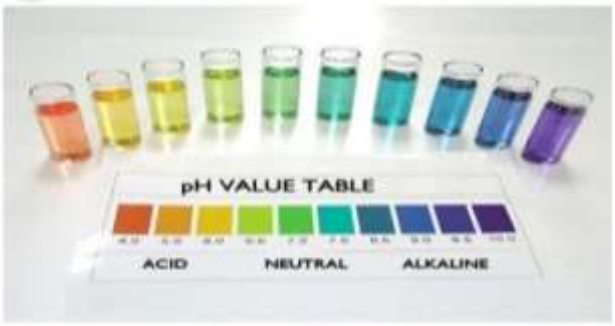

Figure 9: The pH Value determination.

Apparatus:

The pH value is determined potentiometrically using a glass electrode and a pH meter, which can be either digital or analogue. Calibration of the apparatus is done using buffer solution D as the primary standard, adjusting the meter to read the appropriate pH value from a corresponding table based on the solution temperature. The apparatus is further calibrated using a second reference buffer solution, such as buffer solution A, E, or G, or a third buffer solution of intermediate pH. The pH reading of the intermediate solution must not differ by more than 0.05 from the corresponding table value.

Preparation of Reference Buffer Solution:

Prepare the required buffer solutions using carbon dioxide-free water and store them in alkali-free glass bottles. These buffer solutions must be used within 3 months after preparation and stored in bottles previously dried at 110°C for 2 hours.

Sr. No.	pH type	Composition
1	**A**	1.271 % w/v solution of potassium tetra oxalate solution
2	**B**	A freshly prepared solution, saturated at 25^0C of potassium dihydrogen tartarate.
3	**C**	A freshly prepared 1.151 % w/v solution of potassium dihydrogen citrate
4	**D**	A 1.021 % w/v solution of potassium hydrogen phthalate previously dried at 1100C for 2 hours.
5	**E**	A mixture containing 0.340 % w/v potassium dihydrogen phosphate and 0.355 % w/v of anhydrous disodium hydrogen phosphate both previously dried at 1100C for 2 hours.
6	**F**	A mixture containing 0.1184 % w/v of potassium dihydrogen phosphate and 0.4303 % w/v of anhydrous disodium hydrogen phosphate both previously dried at 1100C for 2 hours.
7	**G**	A 0.3814 % w/v solution of sodium tetraborate stored protected from carbon dioxide.
8	**H**	A mixture containing 0.7155 % w/v of sodium carbonate and 0.210% w/v of sodium bicarbonate.

Method:

The electrode is submerged in the solution under examination, and the pH is measured at the same temperature as the standard solutions. After completing the measurements, record the pH of the solution used to calibrate the meter and electrodes. If the difference between this reading and the original value exceeds 0.05, the set of measurements should be discarded. All solutions and suspensions of the substance under examination must be prepared using carbon dioxide-free water.

Temp t^0	**pH type**							
	A	**B**	C	D	E	F	G	H
15	1.67	_	3.80	4.00	6.90	7.45	9.28	10.12
20	1.68	_	3.79	4.00	6.88	7.43	9.23	10.06
25	1.68	3.56	3.78	4.01	6.87	7.41	9.18	10.01
30	1.68	3.55	3.77	4.02	6.85	7.40	9.14	9.97
35	1.69	3.55	3.76	4.02	6.84	7.39	9.10	9.93
ΔpH/Δt	+ 0.001	-0.0014	-0.0022	+0.0012	-0.0028	-0.0028	-0.0082	-0.0096

Determination of Angle of Repose and Flow Rate:

Flow properties are crucial for pharmaceutical product development, especially powder formulations. The angle of repose, defined as the maximum angle between the surface of a sample pile and the horizontal plane, evaluates interparticle forces and powder flow characteristics. Factors affecting the angle of repose include moisture content, particle size and shape, percentage of fines, and the presence of glidants and lubricants. Higher moisture content can increase stickiness, while smaller particle sizes enhance powder flow. Monitoring the angle of repose is essential for assessing the quality of powdered or granular pharmaceutical formulations, with a desirable angle of repose typically less than 30 degrees.

Figure 10: Determination of Angle of Repose and Flow Rate.

Method:

1. Use a clean, dry funnel with a round stem of 20 to 30 mm diameter and a flat tip, attached to a burette stand.
2. Place a sheet of graph paper below the funnel on a clean, dry platform.
3. Adjust the distance between the lower tip of the funnel and the sheet to a specified height.
4. Carefully pour the sample into the funnel from the top until a heap of powder forms and touches the lower tip of the funnel.
5. Repeat the procedure four times to obtain an average reading.
6. Determine the average diameter and radius of each drawn circle.

Angle of repose Calculation:

1. Radius determination - r = diameter of heap (d) / height of heap (h)
2. Average radius determination – r = r1 + r1 + r1 + r1/4
3. Angle of repose (θ) - tan-1 (h/r)
4. Flow rate calculation = mass of powder / time required for flow = W2/t (gm/sec)

Determination of Bulk and Tap Density and Compressibility Index

Requirement: Graduated measuring cylinder and bulk density apparatus and weighing balance.

Method:

1. Weigh accurately 25 g of powder (W1).
2. Place it in dried graduated measuring cylinder and note the volume as V1 ml.
3. Place the cylinder containing sample in bulk density apparatus for 100 tapping and operate it. Record the volume occupied by the powder as V2 ml.

Figure 11: Determination of Bulk and Tap Density and Compressibility Index.

Bulk and tap density Calculation:

1. Bulk density = Mass / Bulk volume = W1 / V1 (g/ml)
2. Tap density = Mass / Tap volume = W1 / V2 (g/ml)
3. Compressibility index = tap density – Bulk density / tap density

Lower the compressibility index value better flow rate of powder.

Chemical Parameters:

Limit Test: Arsenic Content

Preparation of Standard Solution (10 PPM):

0.33 grams of arsenic trioxide is dissolved in 5 ml of 2M Sodium hydroxide solution and diluted to 250 ml with water. One volume of this solution is further diluted to 100 volumes with water.

Figure 12: Limit Test for Arsenic Content.

Preparation of Sample: Churna Solution Preparation:

1 gram of churna is diluted to 100 ml using distilled water. This solution is used for limit testing for iron and lead, and qualitative testing for mercury. 10 ml of churna solution is pipetted into a flask, and approximately 10 ml of concentrated nitric acid is added. The mixture is evaporated to dryness on a water bath, dried at 130°C for 30 minutes, and then treated with hydrazine molybdate reagent under reflux for 20 minutes. The solution is cooled, and the absorbance of both the standard and test solutions is measured at 800 nm using a Perkin Elmer UV spectrophotometer.

Limit Test for Iron: Preparation of Standard Solution (20 PPM):

A 0.1726% w/v solution of ferric ammonium sulfate is diluted in 0.05 M sulfuric acid to ten volumes using distilled water.

Procedure:

The limit test is performed in Nessler's cylinder. 2 ml of test and standard solutions are taken in separate cylinders, followed by the addition of 2 ml of 20% citric acid solution and 0.1 ml thioglycolic acid. The solutions are mixed and made alkaline with iron-free ammonia, diluted to 50 ml with distilled water, and allowed to stand. The color obtained in the sample is compared with that of the standard color. If the color in the test solution is

more intense than the standard solution, the sample fails the limit test.

Limit Test for Lead: Preparation of Standard (20 PPM):
0.4 grams of lead nitrate is dissolved in water containing 2 ml of nitric acid and sufficient water to produce 250 ml. One volume of this solution is diluted to 10 volumes using distilled water.

Procedure:
The limit test is performed in Nessler's cylinder. 1 ml of standard lead solution and test solution are taken in separate cylinders, diluted to 25 ml using distilled water, and adjusted to pH 3-4. The solutions are then diluted to 35 ml using distilled water, and 10 ml of freshly prepared hydrogen sulfide solution is added. After standing for 5 minutes, the color of the test solution should not be more intense than that of the standard solution.

Test for Mercury:
10 drops of the test solution are treated with 6M HCl to obtain a white precipitate. The precipitate is then treated with 6M ammonia solution. A change in color of the precipitate to grey or black indicates the presence of mercury.

Chemical Testing:
Phytochemical testing on churna extracts is conducted according to the procedures outlined in Dr. Khandelwal K.R.'s Practical Pharmacognosy book, covering both primary and secondary metabolites.

Chromatographic Analysis Methods Utilized for Churna:
Thin Layer Chromatography (TLC): Separation based on differential migration rates on a thin layer of adsorbent. High Performance Liquid Chromatography (HPLC): Separation using high pressure to push a liquid solvent through a column filled with adsorbent material. High Performance Thin Layer Chromatography (HPTLC): Similar to TLC but with higher resolution and accuracy, often for quantitative analysis.
Gas Chromatography (GC): Separation of volatile components based on differential partitioning between a mobile gas phase and a stationary liquid or solid phase. Gas Chromatography-Mass Spectrometry (GC-MS): Identifies and quantifies components based on their mass-to-charge ratio after separation by GC.
Ultraviolet Spectroscopy (UV): Detection and quantification based on absorbance of ultraviolet light.
Fluorimetry: Detection based on fluorescence properties upon excitation with specific wavelengths of light.

Table 2: Chromatographic Analysis of Churna:

No	Name of churn	Chromatographic method uses	Method Details
1	Pancasama Churna	HPTLC	1.Stationary Phase: Silica gel 60 F254 of 0.2 mm 2. Mobile Phase: Toluene: Ethyl acetate: Formic acid (5.0:3.5:1.0 v/v) 3. Visualization: Under UV cabinet (254 nm & 366 nm) 4. Derivatization: by using Vanillin: sulphuric acid
2	Haritaki Churna	HPLC	1. HPLC system use: Waters chromatographic system consisting Waters 2695 separation module (quaternary pump) equipped with an auto injector and Waters 2998 photodiode array detector. 2. Colum use: Thermo Scientific BDS HYPERSIL Phenyl reversed phase column (100mm×4.6mm,3µm). 3. Mobile phase: 0.02% triethyl amine aqueous pH 3.0 with ortho-phosphoric acid and acetonitrile. 4. Flow rate: - The flow rate was 1.0ml/min and aliquots of 10µl were injected.
3	Pippali Churna	TLC	1. Stationary Phase: Silica gel 60 F254 of 0.2 mm 2. Mobile Phase: Toluene: ethyl acetate: formic acid (5: 15: 0.5) Visualization: Under UV cabinet (366 nm)
4		UV-Visible	1. Instrument use: UV- spectrophotometric 2. Std. Piperine solution preparation: Piperine (100mg) was dissolved in methanol and volume was made up to 100ml with

	Sitopaladi churna	Spectrophotometric	methanol in volumetric flask. Two ml of this solution was diluted with methanol up to 100ml in volumetric flask to give 20µg/ml piperine solution. 3. Preparation of piperine extract of Sitopaladi churna: Reflux the powder Sitopaladi churna (1gm) with 60 ml ethanol for 1 hour. Filter the extract and reflux the marc left with 40 ml of methanol for another 1 hr. filter and combine the filtrate. Concentrate the methanol extract under vacuum till the semisolid mass is obtained. Dissolve the residue in 75 ml methanol and filter through sintered glass funnel (G-2) by vacuum filtration assembly. The filtrate was centrifuged at 2000 rpm for 20 minutes, the supernatant was collected in 100ml volumetric flask and volume was made with methanol.

UV Spectrophotometric Analysis:
Instrument Used:
UV-spectrophotometric

Standard Piperine Solution Preparation:
Piperine (100 mg) was dissolved in methanol and made up to 100 ml in a volumetric flask. Two ml of this solution was diluted with methanol to a final volume of 100 ml in a volumetric flask, resulting in a 20 µg/ml piperine solution.

Preparation of Piperine Extract from Sitopaladi Churna:
Sitopaladi churna powder (1 gm) was refluxed with 60 ml of ethanol for 1 hour. The extract was filtered, and the remaining marc was refluxed with 40 ml of methanol for another 1 hour. After filtering and combining the filtrates, the methanol extract was concentrated under vacuum until a semisolid mass was obtained. The residue was dissolved in 75 ml of methanol and filtered through a sintered glass funnel (G-2) using a vacuum filtration assembly. The filtrate was centrifuged at 2000 rpm for 20 minutes, and the supernatant was collected in a 100 ml volumetric flask and made up to volume with methanol.

Microbiological Parameters:
Determination of Microbial Content:
1 gram of churna was dissolved in lactose broth and adjusted to a volume of 100 ml with the same medium. About 10 ml of the sample was transferred into 100 ml of MacConkey broth and incubated for 18-24 hours at 43-45°C. A subculture was prepared on a plate with MacConkey agar and incubated at 43-45°C for 18-24 hours. The growth of red, generally non-mucoid colonies of gram-negative rods appearing as reddish zones indicates the presence of E. coli, while the absence of such growth indicates the absence of E. coli.

Figure 13: Determination of Microbial Content.

Detection of Aflatoxin:
Aflatoxin, a toxin from Aspergillus flavus and Aspergillus parasiticus, with the chemical formula $C_{12}H_{12}O_6$, may cause hepatic carcinoma in humans. The test for aflatoxin as prescribed by WHO for herbal drugs is designed to detect the presence of B1, B2, and G1, G2, which are dangerous contaminants in any plant material of plant origin.

Method:
Not less than 100 grams of two crude drugs of plant origin are ground to a moderately fine powder (sieve 355/180). 50 grams of the powder material is mixed with 170 ml of methanol and 30 ml of water in a conical stopper flask and shaken vigorously using a mechanical device for 30 minutes. The mixture is then filtered through a

medium porosity filter paper. 100 ml of the filtrate from the start of flow (filtrate - A) is collected. Alternatively, the first 50 ml of the filtrate is discarded, and the next 40 ml of the filtrate is collected (Filtrate - B).
100 ml of the filtrate is transferred into another flask, and 20 ml of zinc acetate-aluminum chloride and 80 ml of water are added. It is stirred and allowed to stand for 5 minutes. 5 grams of filter aids like diatomaceous earth are added, mixed, and filtered through a medium porosity filter paper. The first 50 ml of the filtrate is discarded, and the next 80 ml is collected (filtrate - C). Either filtrate B or C is transferred to a separating funnel, and 40 ml of sodium chloride (100 g/l) and 25 ml of light petroleum ether are added and shaken for one minute. The layers are allowed to separate, and the lower layer is transferred to a second separating funnel. It is extracted twice with 25 ml of dichloromethane and shaken for 1 minute. The layers are allowed to separate, and each of the lower layers is combined in a 125 ml conical flask. Several boiling chips are added, and it is evaporated to dryness on a water bath. The residue obtained is used for TLC. To the residue obtained above, 0.2 ml of a mixture of chloroform and acetonitrile (98:2) is added and closed properly. It is shaken vigorously until the residue is dissolved.

The chromatographic detail as follows:
1. Stationary phase – Silica G
2. Mobile Phase – chloroform: acetone: 2-propanol (85:10:5)
3. Std: - 2.5, 5, 7.5 and 10 µl aflatoxin
4. Visualization: - UV light at 365 nm. [Blue spot for aflatoxin]

Result and discussion:
Ayurvedic medicines, derived from selected herbal ingredients, undergo complex pharmaceutical processes to yield diverse dosage forms such as churnas, bhasmas, liquids, lehas, pills, and tablets. Churna, in particular, involves a meticulous process of cleaning, drying, pulverizing, and sieving herbs to achieve a fine powder consistency, ensuring free-flowing properties and a one-year shelf life when stored properly.
These churna formulations share similarities with powder formulations in allopathic medicine. Notably, recent advancements have led to the transformation of churna into tablet form, simplifying dosage administration. This transition is driven by the favorable characteristics of churna formulations, particularly their particle size, where smaller particles facilitate improved absorption rates in the gastrointestinal tract, thereby enhancing bioavailability.
This article aims to comprehensively explore the essential parameters for standardizing commercially prepared and marketed churna products. By delving into these parameters, it contributes to the ongoing efforts in innovation and quality assurance within the domain of Ayurvedic medicine formulation and production, ultimately aiming to elevate the standards of churna products in the market.

Conclusions:
In the dynamic landscape of Ayurvedic medicine, innovation continues to shape the future of churna products. By meticulously analyzing standardization parameters, we pave the way for enhanced efficacy and quality assurance in churna formulations. The transformation of churna into tablet form signifies a progressive shift in dosage administration, promising improved patient outcomes. With a focus on smaller particle sizes and heightened bioavailability, the future holds great potential for advancements in gastrointestinal absorption rates. As we delve deeper into these parameters, we embark on a journey of ongoing innovation, ensuring the continued evolution and excellence of Ayurvedic medicine formulation and production.

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