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Research Article

STANDARDIZATION AND QUALITY ASSESSMENT OF *DRAKSHAVALEHA*: INSIGHTS FROM THREE MARKETED BRANDS

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ABSTRACT

Drakshavaleha, a traditional Ayurvedic formulation, is widely used for its therapeutic benefits in treating respiratory and digestive ailments. This study aims to standardize and evaluate the quality of *Drakshavaleha* from three different marketed brands through a comprehensive assessment of their physicochemical and pharmacognostical properties, alongside an estimation of toxic heavy metals content and microbial contamination, and phytochemical profiles. **Materials and Methods**: Three brands of *Drakshavaleha* were meticulously assessed through a range of tests, including organoleptic analysis, physicochemical evaluations, heavy metal content analysis, microbial contamination assessments, and qualitative phytochemical screenings. Standardized protocols and methodologies from pharmacopoeias were used for all evaluations to ensure reliable and consistent results. **Results and Discussion**: The findings indicated notable variations in the evaluation parameters of the different brands. Physicochemical and Pharmaceutical analysis revealed disparities in pH levels and total reducing sugar levels. Heavy metal testing and microbial contamination levels were within acceptable ranges for all samples. The qualitative phytochemical screening identified differences in the concentration of key active ingredients, potentially impacting therapeutic efficacy. **Conclusion**: This study underscores the importance of standardization in maintaining the safety and efficacy of Ayurvedic formulations. By identifying variations in quality and safety parameters, it provides critical insights for manufacturers to improve their production processes. Ultimately, this research advocates for enhanced quality assurance practices to uphold the integrity of Ayurvedic medicine in the global market.

INTRODUCTION

Rasayana therapy, a fundamental component of Ayurveda, encompasses a diverse range of single or polyherbal formulations derived from plant extracts. These formulations are extensively utilized to enhance overall health and promote longevity. It plays a pivotal role in maintaining balance among the three psychobiological dimensions known as *Doshas*, along with regulating biological rhythms essential for optimal physiological function.

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Rasayanas are renowned for their multifaceted benefits, including immunomodulatory, antioxidant, and anti-tumor properties. They enhance cognitive functions such as memory and intelligence, rejuvenate youthfulness, improve complexion, and enhance overall efficiency. *Drakshavaleha*, a specific *Rasayana* formulation, holds significant therapeutic value in treating conditions such as *Pandu* (anemia) and *Kamala* (jaundice).[1]

Drakshavaleha is a traditional Ayurvedic formulation renowned for its therapeutic properties and health benefits. Rooted in ancient Indian medicine, *Drakshavaleha* is a herbal jam primarily composed of grapes (*Vitis vinifera*) and various other medicinal herbs. The term "*Draksha*" means grapes, and "*Leha*" refers to a linctus or a semi-solid herbal preparation, signifying that the primary ingredient of this formulation is grapes, which are known for their rejuvenating and nourishing properties.[2]

The primary ingredient of *Drakshavaleha* is dried grapes, which are known for their rich nutritional profile and antioxidant properties. Along with grapes, the formulation includes sugar, honey, ghee (clarified butter), and an array of potent herbs and spices. Some of the commonly used herbs in *Drakshavaleha* include:

- ***Pippali* (*Piper longum*):** Enhances respiratory health and acts as a bio-enhancer.
- ***Haritaki* (*Terminalia chebula*):** Promotes digestive health and detoxification.
- ***Bibhitaki* (*Terminalia bellirica*):** Supports respiratory and digestive systems.
- ***Amla* (*Emblica officinalis*):** Rich in Vitamin C, boosts immunity and provides antioxidant benefits.

These ingredients work together synergistically to amplify the overall therapeutic effects of the formulation.

Drakshavaleha is very well known for its wide-ranging health benefits, addressing various ailments such as:

- **Respiratory Health:** Acts as an expectorant and bronchodilator, beneficial in conditions like asthma, bronchitis, and chronic cough.
- **Liver Health:** Aids in detoxifying the liver and improving its function, thanks to its antioxidant properties.
- **Digestive Aid:** Enhances digestion, relieves constipation, and promotes overall digestive wellness.
- **Immunity Booster:** Strengthens the immune system, helping the body resist infections and illnesses.
- **Nutritional Supplement:** Provides relief from fatigue and general debility, and is helpful in treating anaemia and nutritional deficiencies.[3]

Drakshavaleha stands out as a potent Ayurvedic formulation with a wide array of health benefits. Its holistic approach to health, combining respiratory support, digestive aid, immune enhancement, and nutritional supplementation, makes it a valuable addition to traditional medicine.

In order to ensure safety and optimize health benefits, it's crucial to choose *Drakshavaleha* from reliable sources and perform comprehensive quality checks. While generally safe, sourcing from reputable manufacturers adhering to high-quality standards is essential to minimize contamination risks. Thorough quality assessments, such as physicochemical analysis, heavy metal testing, and microbial contamination checks, are imperative to validate *Drakshavaleha* safety and effectiveness.

According to Ayurvedic Pharmacopoeia of India, the typical composition of *Drakshavaleha* consists of around 7 medicinal herbs a primary ingredient with honey. The composition of the formulation is mentioned in Table-1.

Table 1: Composition of *Drakshavaleha* according to Ayurvedic Pharmacopoeia of India[4]

S.No.	Name of Drug	Latin Name
1.	*Draksha* API	*Vitis vinifera*
2.	*Kana (Pippali)* API	*Piper longum*
3.	*Sharkara* API	Sugar
4.	*Madhuka (Yashti)* API	*Glycyrrhiza glabra*
5.	*Shunthi* API	*Zingiber officinale*
6.	*Tvakkshiri (Vamsha* API)	*Bambusa arundinacea*
7.	*Dhatri (Amalaki) Phalarasa*	*Embelica officinalis*
8.	*Madhu*	Honey

MATERIALS AND METHODS [5-14]

Procurement of samples

All brands of the *Drakshavaleha* were procured from the local market from the registered Ayurvedic pharmacy. The following marketed *Drakshavaleha* preparations were used in the present study (Table-2):

Table 2: Details of Formulations procured from the market for conducting the proposed study

Brand	Brand Name	Code Assigned	Net Volume/ Quantity	Batch No.	Mfg. Date	Expiry Date
Brand A	Dabur	HI/CL/04/DB	250 gm	SB0 0559	Sep-21	Aug-23
Brand B	Baidyanath	HI/CL/04/BD	400 gm	119	Jul-21	Jun-24
Brand C	Jagriti	HI/CL/04/JG	250 gm	496	Mar-21	Feb-24

Organoleptic Evaluation

All the organoleptic properties viz., color, odor and taste were performed as per standard procedure and noted down.

Physico-chemical Evaluation

Physicochemical parameters like moisture content (loss on drying), pH, total ash, acid insoluble ash, water-soluble extractive, alcohol soluble extractive values of all three samples were determined as per standard protocols as mentioned in various volumes of Ayurvedic Pharmacopoeia of India. All the procedures are described as follows:

Determination of moisture content/ loss on drying (LOD)

An accurately weighed 5g of polyherbal formulation was taken in a tarred evaporating dish. The crude drug was then heated at 105°C in an oven for 3 hours. The drying and weighing was continued at half an hour interval until difference between two successive weighing corresponded to, not more than 0.25 per cent.

Formula for calculation

$$\% \, LOD = \frac{W_2 - W_3}{W_3 - W_1} \times 100 \, \%$$

Determination of loss on ignition (LOI)

An accurately weighed 5g of polyherbal formulation was taken in a previously ignited and tared silica crucible and was heated in the oven at 105°C overnight (or the previously dried sample can also be used). The crucible was cooled and reweighed. The crucible was then placed into the furnace tray and was ignited in the Muffle Furnace at 500°C for about 4 hrs. The sample was then cooled in a desiccator for 30 min. and reweighed with the ash in it (W_A). The observations were noted.

Formula for calculation

$$\% \, LOI = \frac{W_S - W_A}{W_S - W_C} \times 100 \, \%$$

Determination of total ash

An accurately weighed 3 g of the sample was taken in a previously ignited and tared silica dish/crucible. The material was evenly spread and ignited in a Muffle Furnace by gradually increasing the temperature to not more than 450°C - 600°C till the carbon free ash was not obtained.

Formula for calculation

$$\% \, Total \; Ash \; = \frac{Weight \; of \; Ash}{Weight \; of \; sample \; taken} \times 100 \, \%$$

Determination of acid insoluble ash

Ash above obtained, was boiled for 5 min with 25ml of 1M Hydrochloric acid and filtered using an ash less filter paper. Insoluble matter retained on filter paper was washed with hot water and filter paper was burnt to a constant weight in a muffle furnace.

Formula for calculation

$$\% \, Acid - Insoluble \; Ash = \frac{Weight \; of \; acid \; insoluble \; residue}{Weight \; of \; sample \; taken} \times 100 \, \%$$

Determination of water-soluble ash

1g of ash obtained in total ash experiment was boiled for 5 min with 25ml water and insoluble matter collected on an ashless filter paper which was then washed with hot water and ignited for 15 min at a temperature not exceeding 450°C in a muffle furnace. Difference in weight of ash and weight of insoluble matter was determined as difference represents the value.

Formula for calculation

$$\% \, Water \; Soluble \;\; Ash = \frac{Weight \; of \; water \; soluble \; residue}{Weight \; of \; sample \; taken} \times 100 \, \%$$

Determination of extractive values

Determination of alcohol soluble extractives

5gm of polyherbal formulation was accurately weighed and placed inside a glass stoppered conical flask. It was then macerated with 100ml of ethanol. The flask was shaken frequently during the first 6 hours and was kept aside without disturbing for 18 hours. It was then filtered and about 25ml of filtrate was transferred into a tared flat-bottomed shallow dish and was evaporated to dryness on a water bath. It was then dried to 105°C for 6 hours, cooled and finally weighed.

Formula for calculation

$$\% \, Alcohol \; Soluble \; Extractive = \frac{Weight \; of \;\; residue \times 100 \times 100}{25 \times Weight \; of \; sample \; taken} \, \%$$

Determination of water-soluble extractives

Proceed as directed for determination of alcohol soluble extractive, using chloroform water (2.5ml chloroform in purified water to produce 1000ml) instead of ethanol.

Determination of pH value

The sample was weighed to about 5g and immersed in 100ml of water in a beaker. The beaker was closed with aluminium foil and left behind for 24 hours in room temperature. Later the supernatant solution was decanted into another beaker and the pH of the formulation was determined using a calibrated digital pH meter.

Pharmaceutical Evaluation

Determination of Total Solids

Transfer accurately 5gm of the *Avaleha* to an evaporating dish, which have been dried to a constant weight and evaporate to dryness on a water bath, then dry at 105°C for three hours.

After cooling the dish containing the residue in a desiccator for 30 min.; weigh it immediately.

The weight of the residue should comply with the requirements stated under the individual monograph.

Formula for calculation

$$\%\ Residue = W_2 - W_1$$

Determination of saponification value

Weigh accurately about 2g of the substance in a tared 250ml flask, add 25ml of the alcoholic solution of potassium hydroxide, attach a reflux condenser and boil on a water bath for one hour, frequently rotating the contents of the flask, cool and add 1ml of solution of phenolphthalein and titrate the excess of alkali with 0.5N hydrochloric acid. Note the number of ml required (a). Repeat the experiment with the same quantities of the same reagents in the manner omitting the substance. Note the number of ml required (b)

Calculate the saponification value from the following formula:

Formula for calculation

$$Saponification\ Value = 0.02805 \times 1.000 \times \frac{(b-a)}{w}$$

Determination of acid value

Weigh accurately about 10g of the substance (1 to 5) in the case of a resin into a 250ml flask and add 50 ml of a mixture of equal volumes of alcohol and solvent ether, which has been neutralized after the addition of 1ml of solution of phenolphthalein. Heat gently on a water-bath, if necessary, until the substance has completely melted, titrate with 0.1N potassium hydroxide, shaking constantly until a pink colour which persists for fifteen seconds is obtained. Note the number of ml required. Calculate the acid value from the following formula:

$$Acid\ Value = 0.00561 \times 1000 \times \frac{a}{w}$$

Determination of ester value

Determine the acid value, and the saponification value, of the substance under examination. Calculate the ester value from the expression:

$$Ester\ value = Saponification\ value - Acid\ value$$

Determination of iodine value

Place the substance accurately weighed, in dry iodine flask, add 10ml of carbon tetrachloride, and dissolve. Add 20ml of iodine monochloride solution, insert the stopper, previously moistened with solution of potassium iodine and allow to stand in a dark place at a temperature of about 170 or thirty minutes. Add 15 ml of solution of potassium iodine and 100 ml water; shake, and titrate with 0.1N sodium thiosulphate, using solution of starch as indicator. Note the number of ml required (a). At the same time carry out the operation in exactly the same manner, but without the substance being tested, and note the number of ml of 0.1 N sodium thiosulphate required (b). Calculate the iodine value from the formula:

Formula for calculation

$$Acid\ Value = 0.01269 \times 100 \times \frac{(b-a)}{w}$$

Determination of total fat content

Weigh accurately 5gm of the formulation and carry out 3-4 successive extractions using diethyl ether. The extracts are then decanted in a tared flat bottom dish. The solvent is then evaporated keeping on the water bath. It was then cooled and weighed. The difference in weight gives the total fat content of the sample for the amount of sample taken.

$$\%\ Residue = W_2 - W_1$$

Determination of total sugar

The method of Lane and Eyonon by reduction of Fehling's solution is the most generally applied volumetric method, the use of methylene blue as an internal indicator increasing the accuracy of the process.

Formula for calculation

$$\%\ Total\ sugars\ (as\ invert\ sugars) = \frac{0.5 \times V_1 \times V_2}{V_3 \times W}$$

Determination of reducing sugar

Formula for calculation

$$\%\ Total\ reducing\ sugars = \frac{0.25 \times V_1 \times V_2}{V_4 \times W}$$

Determination of non-reducing sugar

Total sugars comprise of reducing sugars and non-reducing sugars, which can be hydrolysed into reducing sugars under the experimental conditions. This non-reducing sugar is usually expressed in terms of sucrose.

$$\%\ Total\ sugars = (\%\ Reducing\ sugars + \%\ Sucrose)$$

Formula for calculation

As 0.95 g sucrose on hydrolysis yields 1 g invert sugar (glucose + fructose):

$$\%\ Sucrose\ in\ the\ sample = (Y - X) \times 0.95$$

Where, Y = Percentage of Total Sugar in the sample (As invert sugar)

X= Percentage of Reducing Sugar present in the sample

Phytochemical Evaluation

The aqueous and alcoholic extracts of the respective formulations were prepared and were subjected to preliminary phytochemical screening. These tests reveal the presence of various bioactive secondary metabolites which might be responsible for their medicinal attributes. Methods for preliminary qualitative phytochemical tests of the plant extracts are given below in the Table 3.

Table 3: Preliminary Phytochemical Tests for Plant Extracts

S.No.	Phyto-Constituents	Name of Tests	Procedure	Observation
1.	Alkaloids	Mayer's test	2ml extract + few drops of HCl + Mayer's reagent	Cream Precipitation
		Hager's test	2ml extract + few drops of HCl + Hager's reagent	Yellow Precipitation
		Wagner's test	2ml extract + few drops of HCl + Wagner's reagent	Reddish brown color
2.	Carbohydrates	Molisch's test	2ml extract + 2 Drops of Molisch reagent + few drops of Conc. H_2SO_4	Violet or Reddish color
3.	Reducing sugars	Fehling's test	1 ml extract + 1 ml Fehling Solution (A and B)	First a Yellow and then Brick Red Precipitation
4.	Flavonoids	Alkaline reagent test	2ml extract + few drops of 40% NaOH solution	Intense yellow color forms which become colorless on addition of dil. acid
		Lead acetate test	2 ml extract + few drops of Lead Acetate solution	Yellow precipitation
5.	Saponins	Foam test	2ml extract + 4 ml distilled H_2O Mix well and shake vigorously	Foam formation
6.	Tannins	Braymer's test	2ml extract + 2 ml H_2O + 2-3 drops of 5% $FeCl_3$	Black green or bluish color
7.	Steroids	Salkowski's test	2ml extract + 2 ml Chloroform + 2 ml Conc. H_2SO_4	Chloroform layer appears red and acid layer shows greenish-yellow fluorescence
8.	Proteins	Millon's test	3ml extract + 5 ml Millon's reagent	White precipitate which turns brick red on warming
9.	Glycosides	Keller Killiani's test	2ml extract + Glacial acetic Acid + 1 drop of 5% $FeCl_3$ + Conc. H_2SO_4	Reddish brown color appears at the junction of 2 layers and upper layer appears bluish green
10.	Phenols	-	2-3ml of extract + few drops of 5% $FeCl_3$ solution	Deep blue-black color
			2-3ml of extract + few drops of Lead Acetate solution	White precipitate
11.	Amino acids	Ninhydrin test	3ml of extract + 3 drops of 5% Ninhydrin solution Keep in boiling water bath for 10 min.	Purple or bluish color appears
12.	Terpenoids	Copper Acetate test	2 ml extract dissolved in water + 3-4 drops of Copper Acetate solution	Emerald green color

Determination of heavy metals (Lead and Cadmium)

Method (Direct Calibration Method)

Three reference solutions of the element being examined having different concentrations were prepared covering the range recommended by the instrument manufacturer. Separately the corresponding reagents were added for the test solution and the blank solution was prepared with the corresponding reagents. The absorbance of the blank solution and each reference solution were measured separately, and the readings were recorded. A calibration curve was prepared.

Preparation of Lead and Cadmium standard solutions

Lead and Cadmium standard solutions were prepared from Stock solution (1000 ppm Sisco Research Laboratories Pvt. Ltd. stock solution). Standard solutions of concentrations, 2, 4, 6, 8 and 10 ppm for Lead and of concentrations 0.2, 0.4, 0.6, 0.8 and 1.0 ppm for Cadmium were prepared. The

absorption of standard solution was measured at 217 nm (for Lead) and 228.8 nm (for Cadmium) using hollow cathode lamp as a light source & air acetylene blue flame on atomic absorption Spectrophotometer.

Preparation of Test solution

10gm of the semisolid preparation was oven dried for several hours till the sample is free from moisture. The oven dried sample was burnt to ash in Muffle Furnace till the sample is free from carbon. The obtained ash of the substance being examined, was transferred into a casparian flask, and 20 ml of the mixture of nitric acid (HNO_3) and perchloric acid ($HClO_4$) (4:1) was added, macerated overnight. The samples were then heated to slake on the electric hot plate continuously till the solution became clear and transparent, then temperature was raised, heated continuously to thick smoke, till white smoke dispersed, the slaked solution becomes colorless and transparent or a little yellow. The solution was then cooled and transferred into a volumetric flask. Wash the container with 2% nitric acid solution (HNO_3), add the washing solution into the same volumetric flask and dilute with the same solvent to the volume, shake well. Synchronously the reagent blank solution was prepared according to the above procedure.

Sample analysis

The analysis of the digested samples was carried out using an Atomic Absorption Spectrophotometer (Agilent Technologies VARIAN Spectro AA220FS Atomic Absorption Spectrophotometer) for Lead and Cadmium. The instrumental conditions for Lead and Cadmium analysis are depicted in Table 4.

Table 4: Instrumental Conditions for Analysis of Lead and Cadmium

Parameters	Pb	Cd
Wavelength (nm)	217	228.8
Slit width (nm)	1.0	0.5
Light Source	Hollow Cathode Lamp	Hollow Cathode Lamp
Flame type	Air/C_2H_2	Air/C_2H_2
Current (mA)	5	4
AAS Technique	Flame	Flame
Flame Emission Wavelength (nm)	405.8	326.1

Microbial limit test

1. Pretreat the sample of the product being examined as described in the method prescribed in Pharmacopoeia.
2. Plate count

For bacteria

Using Petri dishes 9 to 10cm in diameter, add to each dish a mixture of 1 ml of the pretreated preparation and about 15ml of liquified casein soyabean digest agar (SCA) at no more than 45°. Alternatively, spread the pretreated preparation on the surface of the solidified medium in a Petri dish of the same diameter. If necessary, dilute the pretreated preparation as described above so that a colony count of not more than 300 may be expected. Prepare at least two such Petri dishes using the same dilution and incubate at 30° to 35° for 5 days, unless a more reliable count is obtained in a shorter time. Count the number of colonies that are formed. Calculate the results using plates with the greatest number of colonies but taking 300 colonies per plate as the maximum consistent with good evaluation.

For fungi

Proceed as described in the test for bacteria but use Sabouraud dextrose agar (SDA) with antibiotics in place of casein soyabean digest agar and incubate the plates at 20° to 25° for 5 days, unless a more reliable count is obtained in a shorter time. Calculate the results using plates with not more than 100 colonies.

The standard values for Microbial Contamination Limit are represented in Table-5.

Table 5: Microbial Contamination Limits

S.No.	Parameters	Permissible limits
1.	Total microbial plate count (TPC)	10^5/g
2.	Total Yeast & Mould	10^3/g

RESULTS

Organoleptic evaluation

The observations for the organoleptic evaluation of three brands of *Drakshavaleha* are reported in Table-6.

Table 6: Results for Organoleptic Evaluation of different brands of *Drakshavaleha*

S.No.	Properties	Dabur	Baidyanath	Jagriti	Standard (API vol-1)
1.	Description	Semisolid, Sticky	Semisolid, Sticky	Semisolid, Sticky	Semisolid, Malleable, Sticky
2.	Color	Dark Brown	Dark Brown	Dark Brown	Dark Brown
3.	Odor	Spicy	Spicy	Spicy	Spicy
4.	Taste	Sour, Sweet, Pungent	Sour, Sweet, Pungent	Sour, Sweet, Pungent	Sour, Sweet, Pungent

Physico-chemical Evaluation

The observations for the physico-chemical evaluation of three brands of *Drakshavaleha* are reported in Table-7.

Table 7: Results for Physico-chemical Evaluation of different brands of *Drakshavaleha*

S. No.	Properties	Dabur	Baidyanath	Jagriti	Standard (API vol-1)
1.	pH	3.4	3.3	3.6	3.35-3.75
2.	Loss on Drying	10.18%	8.57%	11.96%	-
3.	Total Ash Value	2.10%	1.89%	1.36%	NMT 2.5%
4.	Acid Insoluble Ash	0.19%	0.17%	0.28%	NMT 0.8%
5.	Water Soluble Extractives	67.54%	66.82%	69.65%	NLT 65.0%
6.	Alcohol Soluble Extractives	56.15%	58.25%	60.20%	NLT 55.0%

Pharmaceutical evaluation

The observations for the pharmaceutical evaluation of three brands of *Drakshavaleha* are reported in Table-8.

Table 8: Results for Pharmaceutical Evaluation of different brands of *Drakshavaleha*

S.No.	Properties	Dabur	Baidyanath	Jagriti	Standard (API Vol-1)
1.	Total Solids	89.82%	91.43%	88.04%	-
2.	Total Sugar	43.35%	44.90%	42.89%	-
3.	Total Reducing Sugar	38.45%	39.50%	36.79%	37-40%
4.	Non-Reducing sugar	4.90%	5.40%	6.10%	4.7-6.3%
5.	Total Fat content	2.67%	1.78%	1.24%	-
6.	Saponification Value	15.23	16.25	11.13	-
7.	Acid Value	2.24	1.82	1.67	-
8.	Ester Value	10.43	9.82	8.76	-

Determination of heavy metals (lead and cadmium)

The observations for the heavy metal determination of three brands of *Drakshavaleha* are reported in Table-9.

Table 9: Heavy metal analysis of *Drakshavaleha*

S. No.	Properties	Dabur	Baidyanath	Jagriti	Standard (API Vol-1)
1.	Heavy Metal Concentration (ppm)				
a.	Lead	0.157	0.217	0.229	10 ppm
b.	Cadmium	0.013	0.01	0.01	0.3 ppm

Microbial limit test

The observations for the Microbial Lilit test of three brands of *Drakshavaleha* are reported in Table-10.

Table 10: Microbial Limit test of *Drakshavaleha*

S. No.	Properties	Dabur	Baidyanath	Jagriti	Standard (API Vol-1)
1.	Microbial contamination				
a.	Total fungal count	2	<1	2	10^3 CFU/g
b.	Total bacterial count	18	5	8	10^5 CFU/g

Phytochemical evaluation

The observations for the phytochemical evaluation of three brands of Chyawanprash are reported in Table-11.

Table 11: Phytochemical Screening of *Drakshavaleha*

S. No.	Phyto-constituent	Name of tests	Dabur		Baidyanath		Jagriti	
			Aq.	Alco.	Aq.	Alco.	Aq.	Alco.
1.	Alkaloids	Hager's test	-	+	-	+	-	+
		Wagner's test	-	+	-	+	-	+
		Mayer's test	-	+	-	+	-	+
2.	Glycosides	Keller Killiani's test	+	+	+	+	+	+
3.	Carbohydrates	Molisch's test	+	+	+	+	+	+
4.	Reducing Sugars	Fehling's test	+	+	+	+	+	+
5.	Proteins	Biuret's test	-	-	-	-	-	-
		Millon's test	-	-	-	-	-	-
6.	Amino Acids	Ninhydrin' s test	-	-	-	-	-	-
7.	Steroids	Salkowski's test	+	+	+	+	+	+
8.	Flavonoids	Alkaline Reagent test	+	-	+	+	+	-
		Lead acetate test	+	-	+	+	+	-
9.	Terpenoids	Copper Acetate test	+	+	+	+	+	+
10.	Tannins	Ferric Chloride test	+	+	+	+	+	+
11.	Saponins	Foam test	-	-	-	-	-	-
12.	Phenols	Ferric Chloride test	+	+	+	+	+	+
		Lead Acetate test	+	+	+	+	+	+

The pictorial representation of results for Microbial Limit test are given in Table-12.

Table 12: Pictorial representation of results for Microbial Limit test

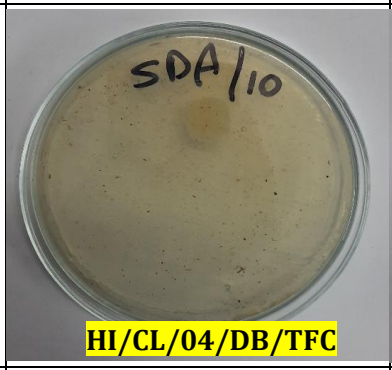
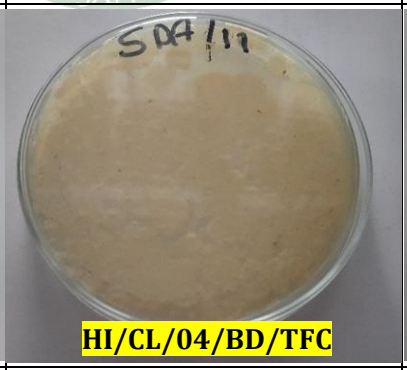
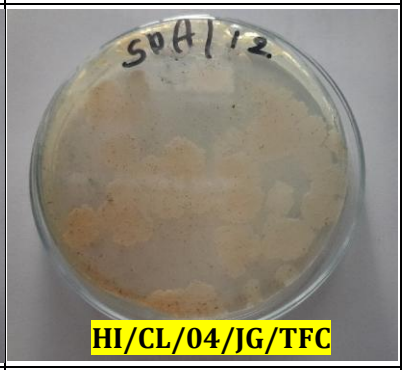
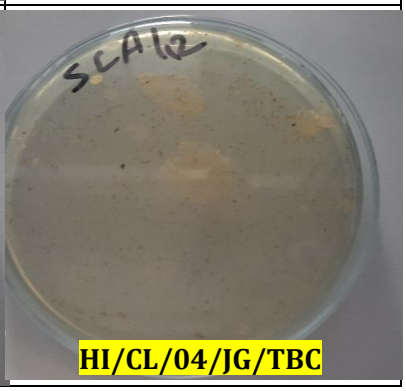
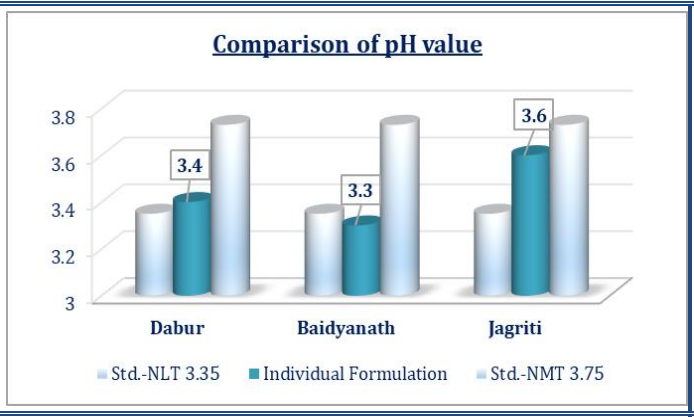
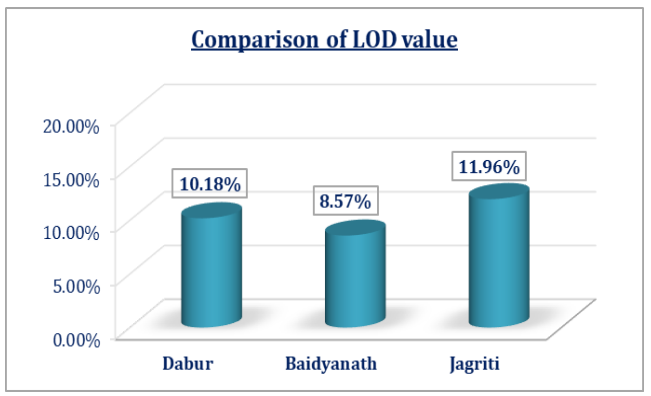
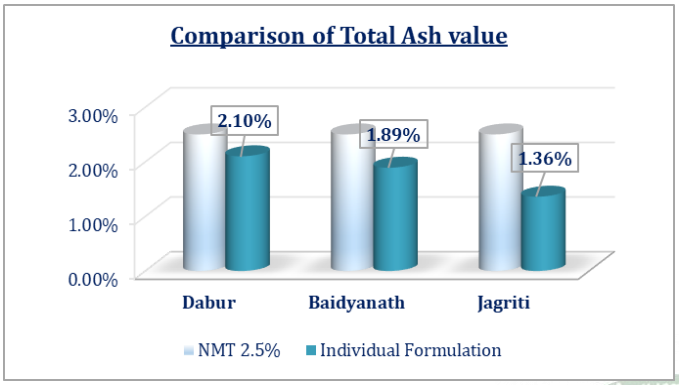
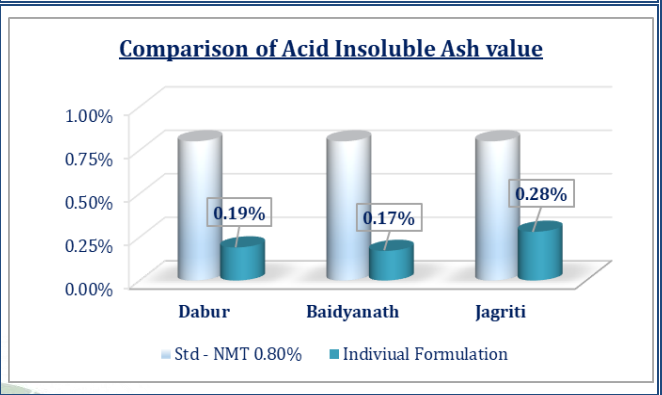
	Dabur	Baidyanath	Jagriti
Total Fungal Count	 **HI/CL/04/DB/TFC**	 **HI/CL/04/BD/TFC**	 **HI/CL/04/JG/TFC**
Total Bacterial Count	 **HI/CL/04/DB/TBC**	 **HI/CL/04/BD/TBC**	 **HI/CL/04/JG/TBC**

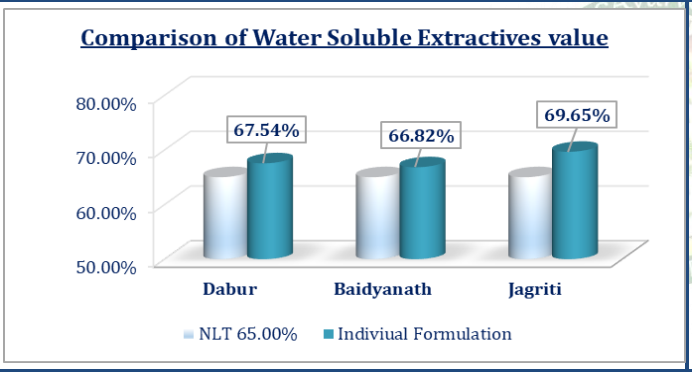
Table 13: Graphs for Physico-chemical parameters of different brands of *Drakshavaleha*

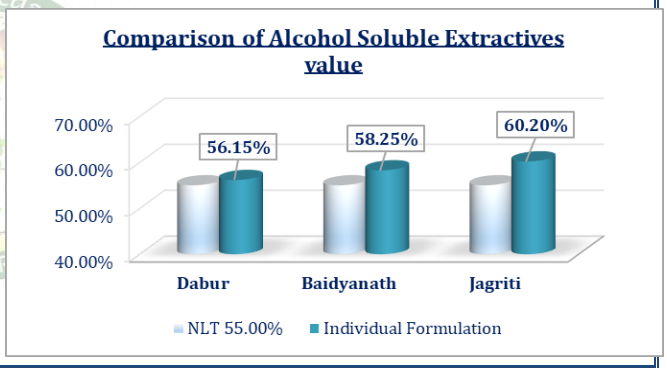


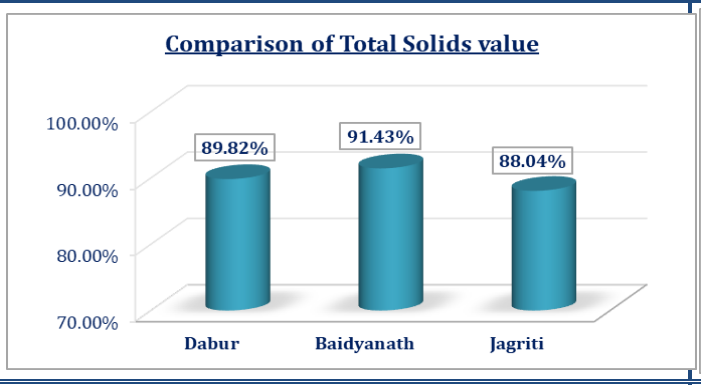


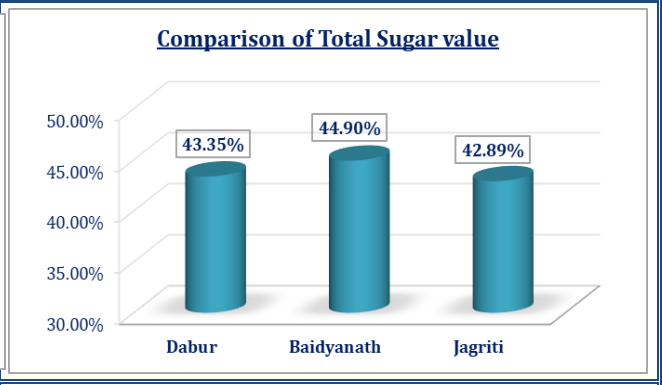


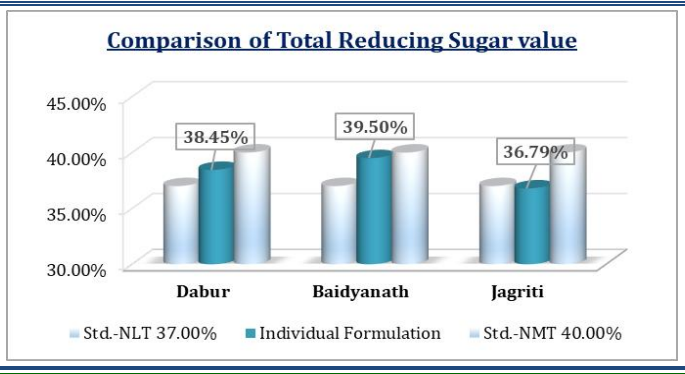


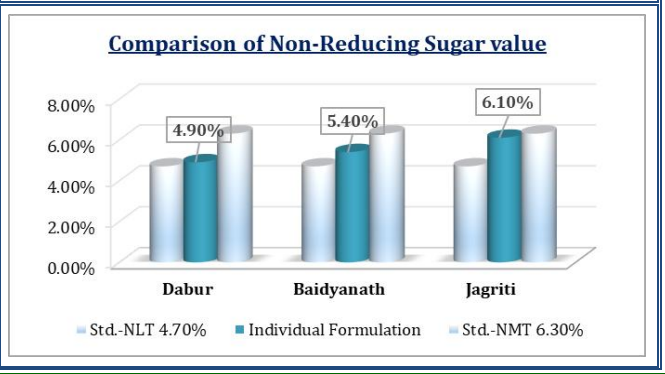












DISCUSSION

The following table represents that whether the results of evaluation parameters are complying with the standard value prescribed in the Ayurvedic Pharmacopoeia or not. Those complying with the standard value are indicated with "**C**" and those that are not complying with the standard value are indicated with "NC".

S. No.	Properties	Dabur	Baidyanath	Jagriti
1.	pH	C	NC	C
2.	Loss on Drying	C	C	C
3.	Total Ash Value	C	C	C
4.	Acid Insoluble Ash	C	C	C
5.	Water Soluble Extractives	C	C	C
6.	Alcohol Soluble Extractives	C	C	C
7.	Total Reducing Sugar	C	C	C
8.	Non-Reducing sugar	C	C	NC
9.	Heavy Metal Concentration (ppm)			
a.	Lead	C	C	C
b.	Cadmium	C	C	C
10.	Microbial contamination			
a.	Total bacterial count	C	C	C
b.	Total fungal count	C	C	C

Apart from the pharmacopoeial standards, the results of other parameters are as follows:

Drakshavaleha of *Dabur* was of semi-solid, sticky state of dark brown color, spicy odor and sour, sweet and pungent taste. The physicochemical investigation revealed pH as 3.4, LOD value of 10.18%, total ash value of 2.10% with 0.19% acid insoluble ash and water and alcohol soluble extractives as 67.54% and 56.15% respectively. This preparation had a total solid content, total sugar, total reducing and non-reducing sugars of 89.82% w/w, 43.35%, 38.45% and 4.90% respectively. The total fat content of the preparation was 2.67%. The preparation had the saponification value, acid value and ester values as 15.23, 2.24 and 10.43 respectively. The concentration of lead and cadmium was found to be 0.157 and 0.013 respectively which were within the prescribed limits. The sample also passed the test for microbial contamination. The phytochemical screening revealed the presence of glycosides, carbohydrates, reducing sugars, steroids, tannins, terpenoids and phenols in both the extracts and of alkaloids in alcoholic extract only while of flavonoids in aqueous extract only.

Drakshavaleha of *Baidyanath* was of semi-solid, sticky state of dark brown color, spicy odor and sour, sweet and pungent taste. The physicochemical investigation revealed pH as 3.3 (a bit less than the prescribed value), LOD value of 8.57%, total ash value of 1.89% with 0.17% acid insoluble ash and water and alcohol soluble extractives as 66.82% and 58.25% respectively. This preparation had a total solid content, total sugar, total reducing and non-reducing sugars of 91.43%, 44.90% w/w, 39.50%, and 5.40% respectively. The total fat content of the preparation was 1.78%. The preparation had the saponification value, acid value and ester values as 16.25, 1.82 and 9.82 respectively. The concentration of lead and cadmium was found to be 0.217 and 0.01 respectively which were within the prescribed limits. The sample also passed the test for microbial contamination. The phytochemical screening revealed the presence of glycosides, carbohydrates, reducing sugars, steroids, flavonoids, tannins, terpenoids and phenols in both the extracts and of alkaloids in alcoholic extract only.

Drakshavaleha of *Jagriti* was of semi-solid, sticky state of dark brown color, spicy odor and sour, sweet and pungent taste. The physicochemical investigation revealed pH as 3.6, LOD value of 11.96%, total ash value of 1.36% with 0.28% acid insoluble ash and water and alcohol soluble extractives as 69.65% and 60.20% respectively. This preparation had a total solid content, total sugar, total reducing and non-reducing sugars of 88.04% w/w, 42.89%, 36.79% and 6.10% respectively. The total fat content of the preparation was 1.24%. The preparation had the saponification value, acid value and ester values as 11.13, 1.67 and 8.76 respectively. the concentration of lead and cadmium was found to be 0.229 and 0.01 respectively which were within the prescribed limits. The sample also passed the test for microbial contamination. The phytochemical screening revealed the presence of glycosides, carbohydrates, reducing sugars, steroids, tannins, terpenoids and phenols in both the extracts and of alkaloids in alcoholic extract only while of flavonoids in aqueous extract only.

CONCLUSION

Thus, all the parameters of three brands of *Drakshavaleha* had approximately similar values and were compatible with the standard values mentioned in the Pharmacopoeias except the pH of Baidyanath was little less than the standard values. The Total reducing sugar content of Jagriti was lesser than the standard values. Phytochemical screening revealed the absence of flavonoids in the alcoholic extracts of Dabur and Jagriti and of alkaloids in the aqueous extract of all the three formulations. There was also a considerable difference among the values of pharmaceutical parameters which represents the existence of variation among the formulations.

This study enhances current knowledge on Quality control of *Drakshavaleha*, providing consumers, industry stakeholders, and regulatory bodies with crucial insights into the quality variations among top brands. These findings support informed decision-making on importance of standardisation and Quality evaluation of such formulations thereby improving consumer health and industry standards.

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Conflict of Interest

We declare that this is a self-funded research work and the author has not received any kind of financial grant from any organization. We have no conflict of interest.

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