



## Formulation and comparison of triphala churna with their ingredients and marketed products

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### Abstract

**Introduction:** In the recent years there has been rapid growth in the field of herbal medicine most of the tradition systems of medicine are accepted universally after standardization only. It is very important to develop an essential technique to standardization of herbal related drugs. This polyherbal churna used to treat the constipation and other gastric disorders.

**Methods:** In this study, Triphala churna are formulated in laboratory and this formulated triphala churna are compared with 3 brands of triphala churna obtained from the market. For the standardization of above formulations are done by evaluating the Organoleptic, Pharmaceutical & Physico-chemical evaluation and TLC to assess the quality and safety of formulation.

**Results and Conclusion:-**The data analysis revealed that all the parameters of formulated churna and three brands of Triphala Churna had approximately similar values with some significant variations in a few parameters and were compatible with the standard values.

**Keywords:** triphala churna, standardization, tlc, pharmaceutical evaluation, physico-chemical evaluation

### Introduction

Herbal medicine Plant kingdom had played vital role in man's existence on this earth. Nature has always been stands as a golden mark to amplify the outstanding phenomenon of symbiosis. [1]

Herbal medicaments, as a significant cure in the traditional clinical system, have been utilized in clinical practice for a huge number of years and have made an extraordinary commitment to keeping up human wellbeing. [2] Evaluation of the quality of herbal formulations is important to justify their acceptability and safety. The standardization of herbal formulations is essential for assessing the quality of drugs. [3] Churna is blend of powdered herbs and additionally minerals utilized in ayurvedic drugs. [4] Triphala (Sanskrit; tri = three and phala = fruits) is a well-recognized and revered polyherbal medicine consisting of dried fruits of the three plant species *Emblica officinalis* (Family Euphorbiaceae),

*Terminalia bellerica* (Family Combretaceae), and *Terminalia chebula* (Family Combretaceae) that are native to the Indian subcontinent. It is classified as a tridoshic rasayana in Ayurvedic medicine as it promotes longevity and rejuvenation in patients of all constitutions and ages. The formula consists of the fruits Amalaki or the Indian Gooseberry, Bibhitaki, and Haritaki of the three plants generally in equal proportions (1:1:1) and has been used in traditional medicine in India for over 1000 years. [5]

### Advantages of Churna

1. Improvement of absorption
2. Relief from clogging
3. Beneficial in vision-related difficulties [19]

### Plants Description

#### Amla (*Emblica officinalis*)



Fig 1: Amla Plant

**Biological source:** This is consists of dried as well as fresh fruits pericarp of the plant *Emblica officinalis* Gaerth *Phyllanthus emblica* Linn. It contains not less than 1.0% w/w of Gallic acid calculated on dry basis.

**Family:** Euphorbiaceae [6]

**Taxonomic Position:** [7]

**Kingdom:** Plantae

**Division:** Spermatophyta

**Subdivision:** Angiospermae

**Class:** Dicotyledonae

Natural order: Geraniales

**Family:** Euphorbiaceae

**Genus:** *Emblica*

**Vernacular Names:** [8]**English:** Emblic Myrobalan, Indian gooseberry**Sanskrit:** Aamalaki**Hindi:** Amla**Marathi:** Amla**Gujarati:** Ambla**Kashmir:** Aonla**Chemical Constituents** [9]

- Chebulinic acid
- Chebulagic acid
- Emblicanin-A & Emblicanin-B
- Gallic acid
- Quarcetin
- Phyllantine
- Phyllantidine
- Punigluconin
- Pedunculagin

**Uses:** [10]

It enhances production of red blood cells & Strengthens the teeth, hair & nail, as well as regulating blood sugar. Used in bleeding, hemorrhoids, anemia, diabetes, gout, vertigo, obesity, hyperacidity, eczema, infection, psoriasis, hoarse voice, sore throat, hepatitis-B, glaucoma, diarrhea, constipation, hair loss, a couple of voice, and eyes. Seeds used for bronchial asthma, bronchitis and biliousness.

**Baheda (*Terminalia Bellerica*)****Fig 2:** Baheda Plant

**Biological source:** It consists of dried ripe fruits of the plant *Terminalia bellerica* Linn.

**Family:** Combretaceae [11]**Taxonomic Position:** [12]**Kingdom:** Plantae**Division:** Magnoliophyta**Class:** Magnoliopsida**Order:** Myrtales**Family:** Combretaceae**Genus:** Terminalia**Species:** *Terminalia bellerica***Vernacular Names:** [13]**Assam:** Bhomora, Bhomra, Bhaira**English:** Beleric Myrobalan**Gujarati:** Bahedam, Baheda**Hindi:** Bahera**Kannada:** Shanti, shantikayi, Tare**Malayalam:** Tanni, Tannikai**Orisha:** Baheda, Bhara**Sanskrit:** Vibhita, Aksha, Akasaka, Bibhitaki**Tamil:** Thanakkai, Tanri, Tani**Telugu:** Tannikkaya, Vibhitakami, Tani**Chemical constituents:** [13]

- Glucoside
- Gallo-tannic acid
- Tannin
- Ellagic acid
- Gallic acid
- Lignans (termilignan and thanni lignin)
- Ethyl gallate
- Chebulaginic acid
- Phenyllembin
- B-sitosterol
- Mannitol
- Glucose
- Fructose

**Uses:** [13]

It is used as bitter, acrid, astringent, laxative, germicidal and antipyretic and is applied in a diverse range of conditions including cough, tuberculosis, eye diseases, dyspepsia, diarrhea and dysentery, inflammation of small intestine, liver disease and leprosy.

**Harde (*Terminalia Chebula*)****Fig 3:** Harde Plant

**Biological Source:** It consists of dried, ripe & fully matured fruits of *Terminalia vhebula Retz.* It contains not less than 5% of chebulagic acid & not less than 12.5% of chebulinic acid.

**Family:** Combretaceae [14]**Taxonomic Position:** [15]**Kingdom:** Plantae-Plants**Subkingdom:** Tracheobionta-Vascular plants**Superdivision:** Spermatophyta-seed plants**Division:** Magnoliophyta-flowering plants**Class:** Magnoliopsida-dicotyledons**Subclass:** Rosidae**Order:** Myrtales**Family:** Combretaceae-Indian almond family**Genus:** Terminalia L-tropical almond

**Species:** *T. Chebula* (Geartn) Retz.-myrobalan.

**Vernacular Names:** [16]

**India:** Haritaki, Harad, Hirada, Alalekayi, Kadukkai, Horitoky, Hilikha, Karakkaya

**Srilanka:** Aralu

**China:** Zhang-Qin-Ge, Hezi

**Tibet:** Harra, Harro

**Germany:** Myrobalane

**France:** Myrobalan

**Chemical Constituents:** [17]

*T. Chebula* contains:-

- Tannins
- Flavonoids
- Sterols
- Aminoacids
- Fructose
- Resin
- Fixed oils.

Main components of tannins are:

- Chebullic acid
- Chebulinic acid
- Chebulagic acid
- Galic acid
- Corilagin
- Ellagic acid.

**Uses:** [18]

The fruit is mild laxative, stomachic, tonic, Alterative, antispasmodic. It is useful in ophthalmia, hemorrhoids, dental caries, bleeding gums, ulcerated oral cavity. Its paste with water is found to be anti-inflammatory, analgesic and having purifying and healing capacity for wounds. Its decoction is used as gargle in oral ulcers, sore throat.

## Materials and Methods

### Collection of Herbal Material [19]

The ingredients used in the *Triphala Churna* are Amlaki (*Embellica officinalis*), Bibhitaka (*Terminalia bellerica*) and Haritaki (*Terminalia chebhula*) wre purchased from Jiva Hakim store at vadodara local market. Drug are cleaned and dried properly.

### Chemicals and requirements [19]

Water bath, beaker, funnel, tripod stand, stirrer, wire gauze, Petri dish are equipments used and Chemical used in them are such as Ethyl acetate, Fromic acid, methanol, toluene, acetate acid, methanolic acid, 5% fecl<sup>3</sup> solution, Benzene, Dragendroff reagent.

### Formulation of Triphala Churna [19]

- Drug are kept separately and crushed accordingly.
- Each Powdered drug are sieved using 40 mesh sieve and each one of them weighed separately and mixed in a suitable proportion.
- Now, Triphala churna is ready and it is processed for the standardization.

- This formulated churna is compared with 3 brands of Triphala churna (Divya, Baidhyanath & Zandu) procured from the local market.

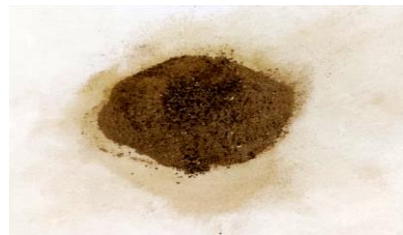


Fig 4: Formulated Triphala Churna

### Comparative brands of Triphala churna



Fig 5: Zand Triphala Churna



Fig 6: Divya Triphala Churna



Fig 7: Baidyanath Triphala chura

**Standardization parameters****Organoleptic Evaluation** <sup>[20]</sup>

All the organoleptic properties viz. color; odour, taste, appearance & texture of the drug to touch were performed as per standard procedure and noted down.

**Pharmaceutical Evaluation** <sup>[20]</sup>

Pharmaceutical parameters like Bulk density, Tapped density, Carr's Index, Hausner's Ratio and Angle of repose were determined as per standard protocols.

**Determination of Bulk Density and Tapped Density**

Bulk density is defined as the mass of many particles of the material divided by the total volume they occupy. The total volume includes particle volume, inter-particle void volume and internal pore volume. Tapped density is the term used to describe the bulk density of a powder (or granular solid) after consolidation/compression prescribed in terms of "tapping" the container of powder a measured number of times, usually from a predetermined height. The term bulk density refers to a measure used to describe a packing of particles or granules and the term Tapped density refers to the true density of the particles or granules.

Formula for calculation:

**Bulk Density (BD) = Weight of the powder taken/Untapped Volume of powder**

**Tapped density (TD) = Weight of the powder taken/Tapped Volume of powder**

**Determination of Carr's Compressibility Index:** The Carr index is an indication of the compressibility of a powder. It is another indirect method of measuring the powder flow from bulk and tapped density.

Formula for Calculation:-

$$\text{Carr's index (\%)} = [(TD-BD) \times 100]/BD$$

**Determination of Hausner's Ratio:** Hausner's ratio is related to inter-particle friction and as such can be used to predict the powder flow properties.

Formula for calculation:

Hausner's Ratio = Tapped density/Bulk density

**Determination of Angle of Repose:** The angle of repose is a parameter used to estimate the flowability of a powder. It is defined as the maximum angle possible between the surface of the pile of powder and the horizontal plane. Powders with low angles of repose will flow freely and powders with high angles of repose will flow poorly.

$$\text{Formula for calculation: } \tan \theta = h/r$$

Where,

$\theta$  = Angle of repose

h = Height of pile

r = radius of the base of pile  $\tan \theta = h/r$

**Relationship of Angle of repose, Carr's index & Hausner's Ratio with Powder flow properties**

Table 1

Angle of Repose	Carr's Index	Hausner's Ratio	Flow Properties
25-30	<10	1.00-1.11	Excellent
31-35	11-15	1.12-1.18	Good
36-40	16-20	1.19-1.25	Fair
41-45	21-25	1.26-1.34	Passable
46-55	26-31	1.35-1.45	Poor
56-65	32-37	1.46-1.59	Very poor
>66	>38	>1.60	Very very poor

**Physico-chemical evaluation** <sup>[21]</sup>

**Determination of loss on drying (moisture content):** -2 gm of powdered drug was taken in tarred china dish. Dried in the oven at 100°C or 105°C, cooled in a desiccators and watch. After that the loss was recorded as moisture. The procedure was continued for at least two common readings.

**Determination of alcohol-soluble extractive**

Macerated 5 g of shade dried coarse powder of leaves with 100 ml of alcohol (90%) in two separate closed flasks for 24 hrs, shaking frequently during first 6h and allowed to stand for another 18 hrs. Filtered rapidly, taking precautions against loss of alcohol. Evaporated 25 ml of the filtrate to dryness in a tarred flat bottomed shallow dish. Dried at 105°C and weighed. Calculated the percentage of alcohol soluble extract with reference to the shade dried drug.

**Determination of water soluble extractive**

The same procedure was followed as directed for the determination of the alcohol soluble extractive by using chloroform water instead of alcohol. The extractive values of drugs were calculated and recorded.

**TLC of triphala churna** <sup>[21]</sup>**TLC for tannins**

**Stationary phase:** aluminum-backed silica gel 60 f254 plates (e. Merck)

**Solvent system:** toluene: ethyl acetate: formic acid: methanol (3:3:0.8:0.2)

**Chamber saturation:** 30 min.

**Standard solution:** standard gallic acid dissolved in methanol.

**Test solution:** triphala churna (laboratory and market samples) and its ingredients (amla, baheda, harde) were extracted with methanol by cold maceration and methanol extracts were used for tlc fingerprinting.

**Detection:** detection carried with this wavelength's uv 254nm uv 366nm before and after spraying with 5% fecl3 reagent.

**TLC for alkaloids**

**Stationary phase:** aluminum-backed silica gel 60 f254 plates

**Solvent system:** benzene: ethyl acetate (2:1)

**Chamber saturation:** 30 min

**Standard solution:** standard piperine dissolved in methanol.

**Test solution:** triphala churna (laboratory and market samples) and its ingredients were extracted with methanol by cold maceration and methanolic extracts were used for tlc fingerprinting.



**Detection:** detection carried with this wavelength's uv 254nm uv 366nm before and after spraying with dragendrof's reagent.

### Organoleptic evaluation

The observation for the organoleptic evaluation of three brand and formulated triphala churna are reported in table 2.

### Results

**Table 2**

Sr. No.	Properties	Formulated Triphala Churna	Brand A (Zandu)	Brand B (Divya)	Brand C (Baidhyanath)
1.	Appearance	Powder	Powder	Powder	Powder
2.	Color	Yellowish brown	Light Brown	Brown	Brown
3.	Odour	Astringent	Characteristic	Characteristic	Characteristic
4.	Taste	Bitter	Bitter	Bitter	Bitter
5.	Texture	Fine powder	Fine Powder	Fine Powder	Fine Powder

### Pharmaceutical evaluation

The observation for the pharmaceutical evaluations of three

brands and formulated Triphala Churna are reported in table 3.

**Table 3**

Sr. No.	Properties	Formulated Triphala churna	Brand A (Zandu)	Brand B (Divya)	Brand C (Baidhyanath)
1.	Bulk Density	0.455	0.435	0.455	0.4
2.	Tapped Density	0.55	0.526	0.55	0.476
3.	Hausner's Ratio	1.21	1.21	1.21	1.19
4.	Carr's Index	20.1	20.9	20.1	19
5.	Angle of Repose	37.2 <sup>0</sup>	36.03 <sup>0</sup>	36.5 <sup>0</sup>	36 <sup>0</sup>

**Physico-Chemical Evaluation:** The observation for the physico-chemical evaluation of three brands of Triphala Churna and

formulated Triphala churna are reported in Table 4.

**Table 4**

Sr. No.	Properties	Formulated Triphala Churna	Brand-A (Zandu)	Brand-B (Divya)	Brand-C (Baidhyanath)
1.	Loss on Drying (LOD)	45%	23.2%	42.2%	60.8%
2.	Water Soluble extractive	9.6%	19%	5.4%	8.2%
3.	Alcohol soluble extractive	7.1%	7.6%	8.4%	12.2%

**TLC evaluation for Triphala Churna:** The observation for the TLC evaluation of three brands of Triphala Churna and

formulated Triphala churna are reported in Table 5.

**Table 5**

Sr. No.	Properties	Formulated Triphala Churna	Brand-A (Zandu)	Brand-B (Divya)	Brand-C (Baidhyanath)
1.	TLC for Tannin	0.7	0.7	0.7	0.5
2.	TLC for Alkaloids	0.6	0.6	0.8	0.7

### Discussion

Comparative standardization for formulated and marketed preparation of Triphala Churna was completed and after that, we can demonstrate that such results. Out come from our formulated Triphala churna was powder form of yellowish Brown color with a characteristic odor and Bitter taste. This preparation had Loss on drying value of 45%w/w. Preparation had alcohol soluble extractives and water soluble extractive values of 7.1%w/w and 9.6%w/w respectively. The Bulk density and Tapped density of thee powder were 0.455 and 0.55 respectively. The powder flow was fair as it had the Carr's index of 20.1% (Fair), Hausner's ratio of 1.21(Fair) and Angle of repose of 37.2<sup>0</sup>(Fair). TLC evaluation for Tannin 0.7 and TLC evaluation for Alkaloids 0.6.

Triphala churna of Brand A (Zandu) was powder form of Light Brown color with a characteristic odor and Bitter taste. This preparation had Loss on drying value of 23.2%w/w. Preparation had alcohol soluble extractives and water soluble extractive values of 7.6%w/w and 19%w/w respectively. The Bulk density

and Tapped density of thee powder were 0.435 and 0.526 respectively. The powder flow was fair as it had the Carr's index of 20.9% (Fair), Hausner's ratio of 1.21 (Fair), and Angle of repose of 36.03<sup>0</sup>(Fair). TLC evaluation for Tannin 0.7 and TLC evaluation for Alkaloids 0.6. Triphala churna of Brand B (Divya) was powder form of Brown color with a characteristic odor and Bitter taste. This preparation had Loss on drying value of 42.2%w/w. Preparation had alcohol soluble extractives and water soluble extractive values of 8.4%w/w and 5.4%w/w respectively. The Bulk density and Tapped density of thee powder were 0.455 and 0.55 respectively. The powder flow was fair as it had the Carr's index of 20.1% (Fair), Hausner's ratio of 1.21 (Fair), and Angle of repose of 36.5<sup>0</sup>(Fair). TLC evaluation for Tannin 0.7 and TLC evaluation for Alkaloids 0.8.

Triphala churna of Brand C (Baidhyanath) was powder form of Brown color with a characteristic odor and Bitter taste. This preparation had Loss on drying value of 60.8%w/w. Preparation had alcohol soluble extractives and water soluble extractive

values of 8.2%w/w and 12.2%w/w respectively. The Bulk density and Tapped density of the powder were 0.4 and 0.476 respectively. The powder flow was fair as it had the Carr's index of 19% (Fair), Hausner's ratio of 1.19 (Fair), and Angle of repose of 36° (Fair). TLC evaluation for Tannin 0.5 and TLC evaluation for Alkaloids 0.7.

### Conclusion

Standardization of Triphala churna was done using the different Organoleptic evaluation, Pharmaceutical evaluation, Physico-chemical evaluation parameters and TLC. Three marketed brand sample was evaluated and compared with the formulated Triphala churna. The powder flow property of formulated Triphala churna and three brands' of Triphala churna having same flow property. There was some variation between marketed sample and formulated sample regarding LOD, Water soluble extractive, Alcohol soluble extractive and TLC.

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### Abbreviations

**BD:** Bulk Density

**TD:** Tapped Density

**LOD:** Loss on Drying

**TLC:** Thin layer Chromatography

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