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Original Article
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Pharmacognostical and Preliminary Physico-chemical Profiles of *Ashtangavaleha* in Powder and Linctus forms

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ABSTRACT

Introduction: *Avaleha* (linctus) is the secondary dosage form which is widely acceptable and palatable in Ayurvedic system of medicine. In classics, most of the *Avaleha* are either prepared with sweetening agent like jaggery, sugar or mentioned in the powder form; and are advised to be licked with honey etc. *Ashtangavaleha* is a herbal formulation mentioned in classics to treat *Shwasa Roga* (asthma disease). This formulation consists of eight powders in equal proportion to be taken with *Ardraka Swarasa* (expressed juice of fresh rhizome of *Zingiber officinalis* Roscoe.) or licked with honey as *Anupana* (vehicle). In current attempt, for benefits like palatability, ease to administer; *Ashtangavaleha* powder was converted to linctus. Aim of the study is to screen the differences in pharmocognostical and physico-chemical profile of *Ashtangavaleha* powder (AP) and *Ashtangavaleha* linctus (AL). ***Methods:*** Raw materials were procured, authenticated and both samples i.e. AP and AL were prepared in *Rashashastra* and *Bhaishajya Kalpana* Laboratory following classical guidelines. According to Chakradutta, *Anupana* of *Asthangavaleha* is *Ardraka Swarasa,* so one *Bhavana* (immersion) of *Ardraka Swarasa* was subjected to *Ashtangavaleha* for powder batch (AP). While AL was prepared in presence of sweetening agent i.e. jaggery. ***Results:*** In powder batch, after *Bhavana* significant changes were found in stone cells of *Pippali, Katphala* and starch grains of *Shunthi,* fibres of *Katphala* and cellular contents; while in linctus form, oleo-resin content of *Shunthi* and *Pippali,* pollen grains of honey, brown content and black debris of *Shringi* were found. There are significant differences in the physico-chemical profile of AP and AL. ***Conclusion:*** Thus it is evident from the evaluation that due to adoption of different procedures for preparation, changes are found in pharmacognostical and physico-chemical parameters of both samples.

KEYWORDS

Ardraka, Ashtangavaleha, Bhavana, Pharmacognosy, *Shwasa.*

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Different classical texts of Ayurveda have described *Avaleha* in powder form which is to be licked with some sweetening agent or with some *Anupana* or *Sahapana*.[1,2] *Avaleha* is the semi-solid dosage form,[3] having long shelf-life[4] in comparison to primary dosage forms, and can be administered to all the three age groups, i.e. *Bala* (children), *Yuva* (young) and *Vriddha* (old).[5] *Bhavana* is one of the *Samskara* in which the powder of the drug is immersed with liquid media of same drug or other drug according to need and suitability for specific disease condition or further processing.[6] It has been postulated in *Charaka Samhita* that such preparation results in quicker and amplified action with minimum dosage.[7] *Ashtangavaleha* is a compound formulation being used for *Shwasa Roga* and *Anupana* prescribed for the same is *Ardraka Swarasa*.[8,9]

With the current scenario, conversion of classical to new dosage forms that are more palatable, easily absorbable, having more shelf life and enhanced therapeutic efficacy becomes the demand of nowadays. Powder form has some demerits like bitter taste, difficulty in administration etc. To overcome the problems, attempt had been made to prepare linctus. So in the current attempt; it had been attempted to convert *Ashtangavaleha* powder (AP) into linctus form (AL) which is convenient in handling, dispensing, storage and increase the palatability. The form of *Ashtangavaleha* is powder that is to be licked by adding *Ardraka Swarasa* in sufficient quantity. So, one *Bhavana* is given to *Ashtangavaleha* powder.

Due to the difference in pharmaceutical procedures; there may be difference among pharmacognostical and preliminary physico-chemical profiles of both samples. So it is the need of an hour to find out these possible differences of the two dosage forms with same ingredients. Hence, for the present study; an attempt has been made to develop the pharmacognostical and preliminary physico-chemical profiles of AP and AL.

MATERIALS AND METHODS

Collection and preparation of samples

All the raw materials were procured from Pharmacy, Institute for Post Graduate Teaching & Research in Ayurveda (IPGT & RA), Gujarat Ayurved University, Jamnagar (Table 1). After identification and authentication of the ingredients, voucher specimen of both the samples viz. *Ashtangavaleha* in powder form and linctus (*Avaleha*) form were preserved in the Pharmacognosy Laboratory, IPGT & RA, Gujarat Ayurved University, Jamnagar (No. IPGT & RA Phm 6220/16-17 for AP and IPGT & RA Phm 6221/16-17 for AL). While mature and fresh rhizomes of *Ardraka* (*Zingiber officinalis* Roscoe., Family: *Zingiberaceae*) were procured from the local market of Jamnagar. After washing and cutting into small slices, these pieces were crushed to extract juice from it with the help of industrial juicer and *Swarasa* (juice) was obtained by squeezing through clean cotton cloth.

Table 1. Ingredients of *Ashtangavaleha*

SN	Ingredients	Latin name / English name	Part used	Proportion
1	*Katphala*	*Myrica esculenta* Buch-Ham.	Dried Stem bark	1 part
2	*Pushkaramoola*	*Inula Racemosa* Hook. f.	Dried Root	1 part
3	*Shringi*	*Pistacia integerrima* Stew. Ex Brandis	Dried Gall	1 part
4	*Yavani*	*Trachyspermum ammi* Linn.	Dried Fruit	1 part
5	*Krishna jeeraka*	*Carum carvi* Linn.	Dried Fruit	1 part
6	*Shunthi*	*Zingiber officinale* Roscoe.	Dried Rhizome	1 part
7	*Maricha*	*Piper nigrum* Linn.	Dried Fruit	1 part
8	*Pippali*	*Piper longum* Linn.	Dried Fruit	1 part
9	*Madhu*	Honey	--	Q.S.
10	*Ardraka Swarasa*	Juice of *Zinger officinale* Roscoe.	Fresh Rhizome	Q.S.
11	*Guda**	Jaggery	--	64part

*Proportion of ingredients for *Avaleha* batch changes and jaggery is added to *Avaleha* batch only

All the eight dried ingredients of *Ashtangavaleha* powder (AP) were mixed and levigated with fresh juice of *Ardraka* in an end runner (Bol volume 100L, motor 5HP, L×W×H-1220×1250×1300(mm), motor speed-15 RPM). The process was continued for 42 hours till it got dried with *Subhavita Lakshana*.[10] Afterwards, this homogenous blend is again powdered and passed through sieve 72#.

For preparing *Ashtangavaleha* linctus, jaggery was dissolved in *Ardraka Swarasa* and heated till semisolid desired consistency obtained, then adjuvants like *Pippali, Maricha, Shunthi, Katphala, Shringi, Krishnajeeraka, Yavani, Pushkaramoola* were added thereafter along with honey on self cooling and packed in air tight containers.

Pharmacognostical evaluation

Macroscopic characterization of AP and AL

Macroscopic characters of both samples of *Ashtangavaleha* were done by naked eye observations on following parameters like colour, odour, taste and touch.[11]

Microscopic Characterization of AP and AL

Powder microscopy of shade-dried powder of *Ashtangavaleha* with *Bhavana* (72#) and *Ashtangavaleha* linctus was carried out using suitable method.[12]

The powder was uniformly spread on glass slides and observed under microscope at different magnifications. For the detection of lignified tissues, the powder was stained with phloroglucinol and hydrochloric acid and to observe the starch grains, the powder was stained with iodine solution.[13] Photomicrographs were taken by using Carl zeiss trinocular microscope attached with camera.[14]

Physico-chemical parameters of AP and AL

Physico-chemical parameters of both samples of *Ashtangavaleha* were determined as per Ayurvedic Pharmacopoeia of India. Moisture content, total ash value, acid insoluble ash, alcohol soluble extractive value and water soluble extractive value[15] were determined.

Preliminary phyto-chemical screening of AP and AL

The methanolic extract of both samples of *Ashtangavaleha* was prepared and subjected to detect the presence of various functional groups like alkaloids, tannins, phenols, carbohydrates, glycosides, flavonoids, steroids, saponins by using relevant reagents.[15]

High Performance Thin Layer Chromatography

For High Performance Thin Layer Chromatography (HPTLC), methanol extract of both samples of *Ashtangavaleha* viz. classical powder form and modified form i.e. linctus was prepared by taking 5 g of drug in 100 ml of methanol, it was shaken for some time; mild heat was provided to it for half an hour and then filtered on cooling. The filtrate is evaporated on water bath to approximately 20 ml and used. A CAMAG (Switzerland) HPTLC system equipped with a sample applicator Linomat V was used for application of samples. CAMAG TLC Scanner 3, Reprostar and Wincats 4.02 were used for scanning the plates.

CAMAG twin through glass chamber was used for developing the plates. Pre-coated silica gel GF 254 plate was used as stationary phase. Toluene : Ethyl acetate : formic acid (7 : 2 : 1) v/v was used as mobile phase. After 30 minutes of chamber saturation, plate was developed, and then scanned under short UV (254 nm) and long UV (366 nm).[16,17]

RESULTS AND DISCUSSION

Macroscopic characters of AP and AL

Organoleptic characters of *Ashtangavaleha* powder and *Ashtangavaleha* linctus like colour, taste, odour and touch were done. The results are depicted in Table 2. The organoleptic characters showed that the colour of AP was blackish grey and chocolate brown in AL. Astringent taste was found with tingling sensation in powder while *Ashtangavaleha* linctus has sweetish and spicy taste and is semisolid in appearance. The sweetness in linctus is due to addition of jaggery and honey, which makes it more palatable and masks the bitter taste of powder. Most of the *Avaleha* (linctus) contains *Madhura Dravya, Ghrita* and *Prakshepa Dravya* as base ingredients. Here, the use of *Madhura Dravya* is of great importance because it reduces the *Tikta, Katu, Kashaya* taste of drug, ultimately making it more palatable, and it also nourishes all *Dhatus* along with *Oja*.[18] *Prakshepa Dravya* (adjuvant) serve specific functions, e.g. *Pippali* (*Piper longum*) acts as a bioavailability enhancer[19] and is anti-bacterial.[20]

Table 2. Organoleptic characters of *Ashtangavaleha* Powder and *Ashtangavaleha* Linctus

SN	Character	*Ashtangavaleha* powder	*Ashtangavaleha* linctus
1	Colour	Blackish grey	Choclate brown
2	Odour	Pungent	Sweetish
3	Touch	Coarse, smooth	Smooth and semisolid in appearance
4	Taste	*Kashaya, Tikta, Katu* followed by tingling sensation	Sweetish and Spicy

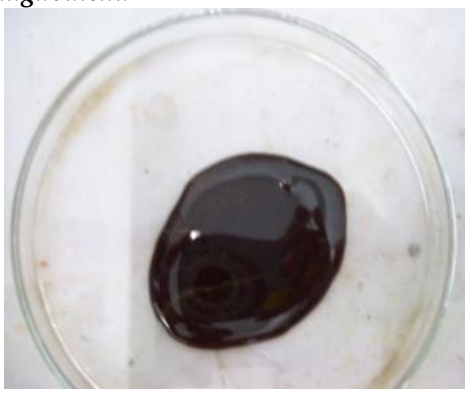
Macro-microscopic characteristics

Macroscopy of Ashtangavaleha powder and Ashtangavaleha linctus

Macroscopic characters of both samples of *Ashtangavaleha* were done by naked eye observations. *Ashtangavaleha* powder was blackish grey, coarse in touch, bitter in taste with pungent odour. *Ashtangavaleha* linctus was chocolate brown in color, semisolid, sweetish and spicy in taste with sweetish odor (Figure 1).

Figure 1. Macroscopy of *Ashtangavaleha*

1.1 *Ashtangavaleha* powder

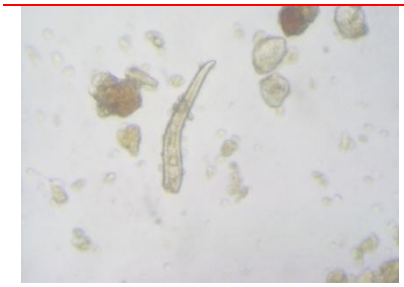


1.2 *Ashtangavaleha* linctus

Microscopy of Ashtangavaleha powder

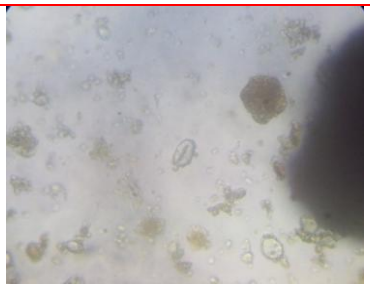
The plant cellular inclusions observed under microscope for *Ashtangavaleha* powder form i.e. after *Bhavana* shows brown content of *Katphala* (a), oil globules of *Karvi* (b), stone cells of *Pippali* (c), black debris of *Maricha* (d), oil globules of *Yavani* (e), stone cells of *Katphala* (f), fibres of *Katphala* (g) (Figure 2). The powder microscopy shows most of the cellular characters become softened and smoother, demorpholised in powder form. Accumulation of starch grains concentration of *Shunthi* gets increased in powder due to *Bhavana* with *Ardraka Swarasa.* Clumped black masses are seen all over. The walls of stone cells of *Pippali* become smoothened and ruptured. Most of the tannin content of the stone cells of *Katphala* were ruptured and tannin content came out. Black debris of *Maricha* mostly levigated out and very least amount of black debris observed. The fibres of *Katphala* are white lumened and walls are ruptured after *Bhavana.* After *Bhavana* for 42 hours duration in *Ashtangavaleha* powder, cellular constituent easily released out and increases the bioavailability of drug. As a result of *Bhavana,* the intracellular content locked in the cellular compartment is freed which might result in increased bioavailabilty.[21]

Figure 2. Microscopy of *Ashtangavaleha* powder

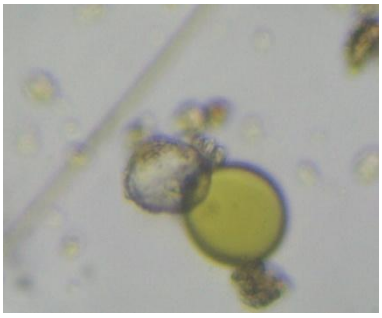


a. Fibres of tannin

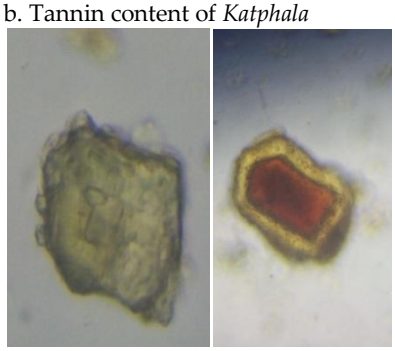
b. Tannin content of *Katphala*



c. Starch grains of *Shunthi*



d. Oil globules of *Yavani*



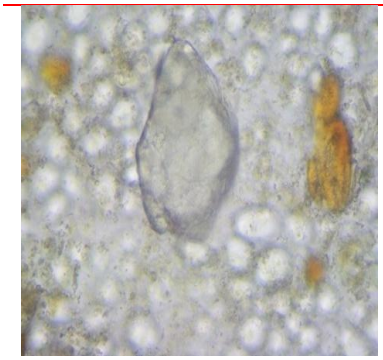
e. Stone cells of *Katphala* with and without tannin

f. Stone cells of *Pippali*

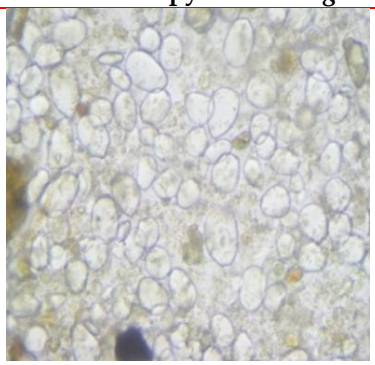
Microscopy of Ashtangavaleha linctus

The plant cells observed under microscope for *Ashtangavaleha* shows starch grains of *Shunthi* (a), stone cells of *Katphala* (b), group fibres of *Katphala* (c), oleo-resin content of *Shunthi* (d), *Annular* and *Scleriform* vessels of *Shunthi* (e), Black debris of *Maricha* (f), Epicarp cells with oleo-resin content of *Pippali* (g), stone cells of *Pippali* (h), Fibres of *Shunthi* (i), Cork cells of *Katphala* (j), Stone cells of *Maricha* (k), Pollen grains of Honey (l), Brown content and black debris of *Shringi* (m), Epidermal cells of *Yavani* (n), Lignified stone cells of *Katphala* (o), Lignified stone cells of *Maricha* (p) (Figure 3). In linctus, concentration of starch grains of *Shunthi* is high. More of the oleo-resin contents are released into linctus. While in linctus preparation, heating and addition of jaggery are additional procedures. So this variation may occur due to difference in preparation of both samples and type of dosage form also.

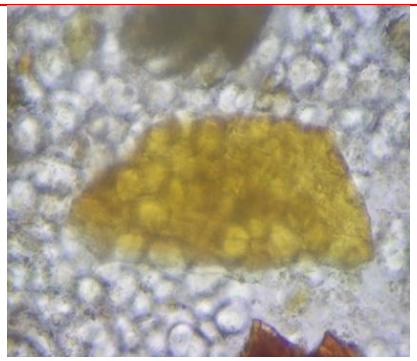
Figure 3. Microscopy of *Ashtangavaleha* linctus



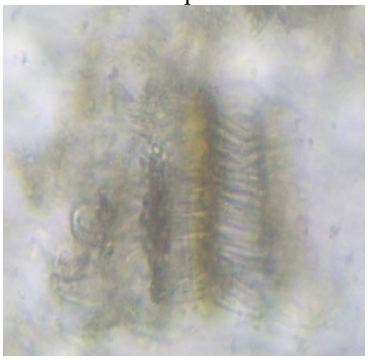
a. Silica deposition



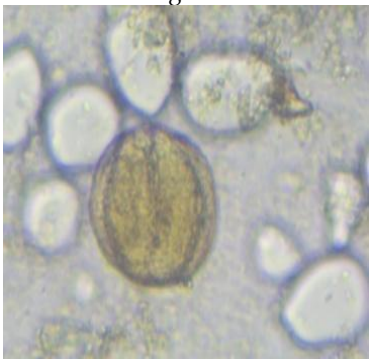
b. Starch grains of *Shunthi*



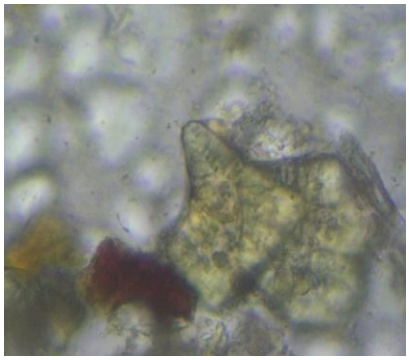
c. Oleo-resin content of *Shunthi*



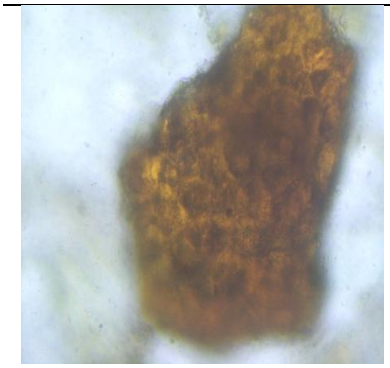
d. Scleriform and annular vessels of *Shunthi*



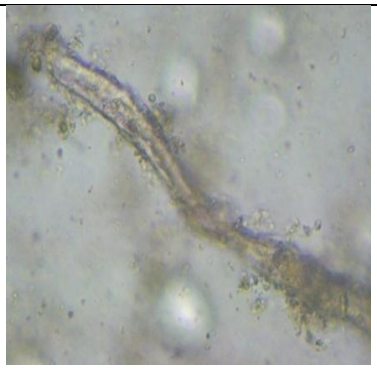
e. Pollen grains of honey



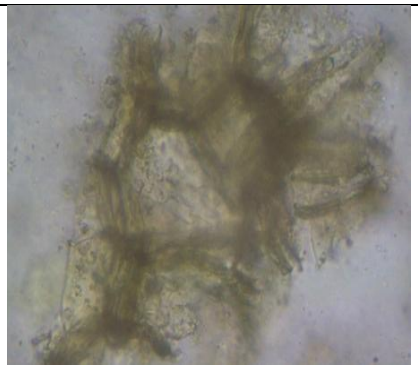
f. Stone cells of *Pippali*



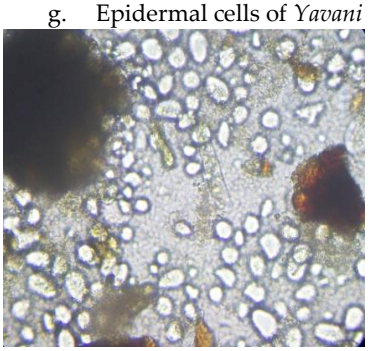
g. Epidermal cells of *Yavani*



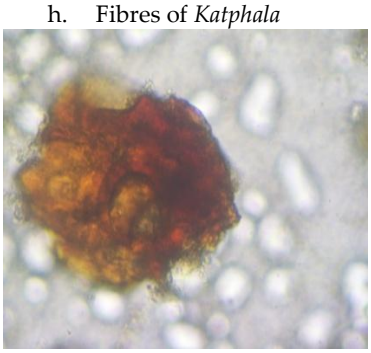
h. Fibres of *Katphala*



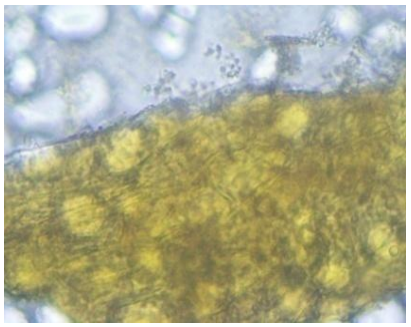
i. Cork cells of *Shunthi*



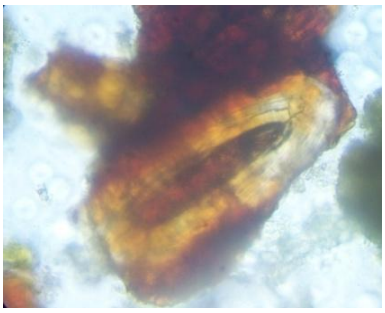
j. Brown content and black debris of *Shunthi*



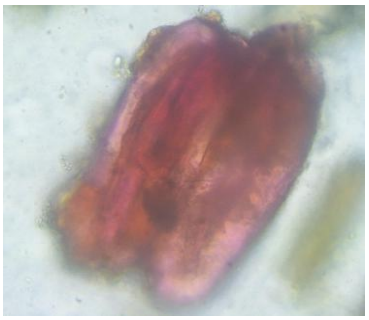
k. Oleo resin content of *Pippali*



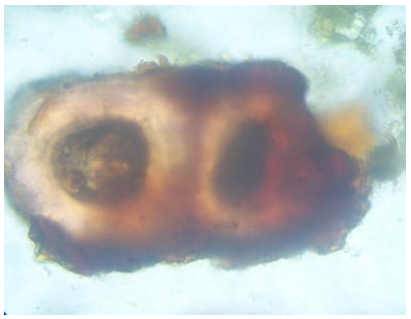
l. Epidermal cells of *Yavani*



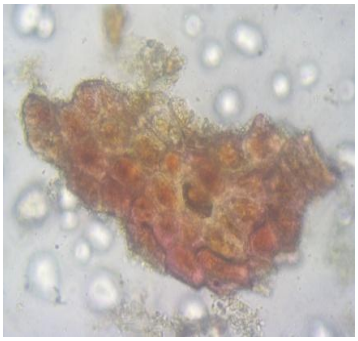
l. Lignified stone cells of *Katphala*



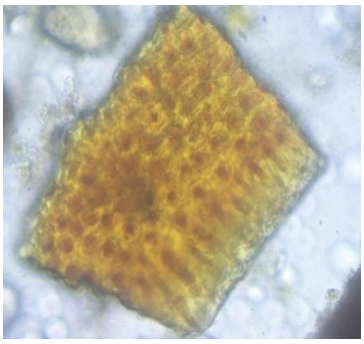
m. Lignified stone cells of *Maricha*



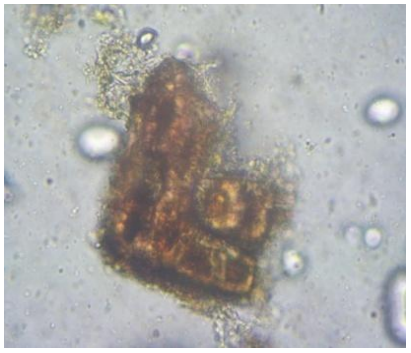
n. Stone cells of *Katphala*



o. Cork cells of *Katphala*



p. Epidermal cells of *Yavani*



q. Lignified stone cells of *Pippali*

The changes found in cellular constituents due to *Bhavana* in powder sample and addition of jaggery and heating process in linctus may increase the bioavailability and potency of the drug. However, such need to be validated only through clinical study and further requires detailed chemical aspects and research work.

Physicochemical parameters of AP and AL

Results of physicochemical parameters of both samples of *Ashtangavaleha* are provided in (Table 3). The differences in the physico-chemical profile of AP and AL are significant; as they vary in type of dosage form and preparation method. Most of the physico-chemical parameters of AL are complying with the standards laid down in API parameters. Because total sugar, reducing sugar, non reducing sugar estimation are not mentioned in API. Hence the observation of these parameters cannot be comparable.

Table 3. Physicochemical evaluations of *Ashtangavaleha* Powder and *Ashtangavaleha* Linctus

Parameters	AP (%)	AL (%)	API Parameters (%)[15]
pH	6.5	6.5	6.3 to 6.6
Loss on drying	8.93 w/w	13.42	Not more than 32%
Ash Value	8.66 w/w	2.517	Not more than 2.70%
Acid insoluble ash	0.68 w/w	0.30	Not more than 0.50%
Water soluble extractive	14.30 w/w	77.3	Not less than 47.0%
Alcohol soluble extractive	7.70 w/w	84.1	Not less than 51%
Reducing Sugar	-	39.25	-
Non reducing Sugar	-	46.622	-
Total Reducing Sugar	-	85.872	-

AP- *Ashtangavaleha* powder, AL- *Ashtangavaleha* linctus

Preliminary phytochemical screening of AP and AL

Qualitative analysis for the presence of various functional groups was carried out in methanol soluble extractive of both samples (Table 4).

Table 4. Qualitative analysis for functional groups in methanolic extract *Ashtangavaleha* powder and linctus

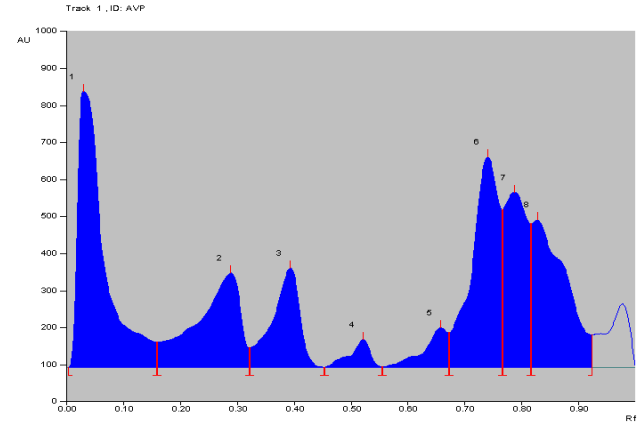
SN	Reagents	Functional groups	Observation	Result
1	Dragendorff's reagent	Alkaloids	No Brown ppt.	Present
2	Dil. FeCl3	Tannins	Blue brownish color	Present
3	Neutral FeCl3	Phenols	Violet color	Present
4	Benedict's reagent	Carbohydrates	Yellow ppt.	Present
5	Conc.H2SO4	Glycosides	Brown colour disappears	Present
6	Lead acetate	flavonoid	Yellow color	Present
7	Chloroform, Conc.H2SO4, distilled water	Steroids	Brown ring with rinse	Present
8	Shaking in test-tube	Saponins	Frothing with honeycomb appearance	Present

*Methanolic extract of *Ashtangavaleha* powder and *Ashtangavaleha* linctus were prepared individually

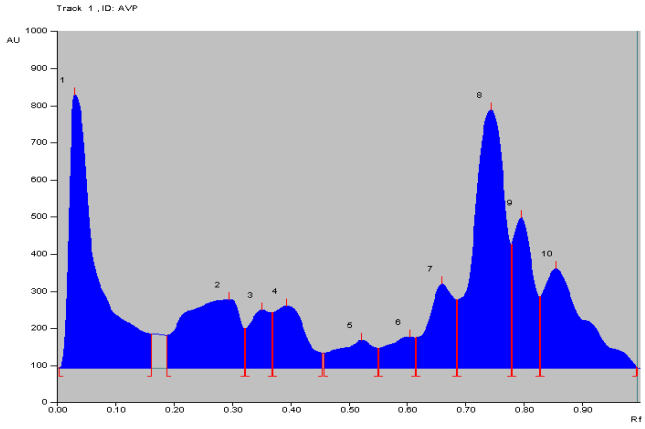
HPTLC

Alcoholic extract of *Ashtangavaleha* of both samples at short UV (254 nm), long UV (366 nm) and spectra comparison of AP and AL at Rf 0.75, 0.78 and 0.84 are depicted in Table 5 (Figure 3, 4). The findings of HPTLC at 254nm and 366nm showed presence of 8 spots in AP and 7 spots in AL at short wave (UV@ 254 nm) whereas at long wave (UV@ 366 nm), 10 spots in AP and 8 spots in AL were visible in both samples. HPTLC for *Ashtangavaleha* is not mentioned in API. So HPTLC done in current attempt cannot be comparable but may be taken as preliminary standards for both samples.

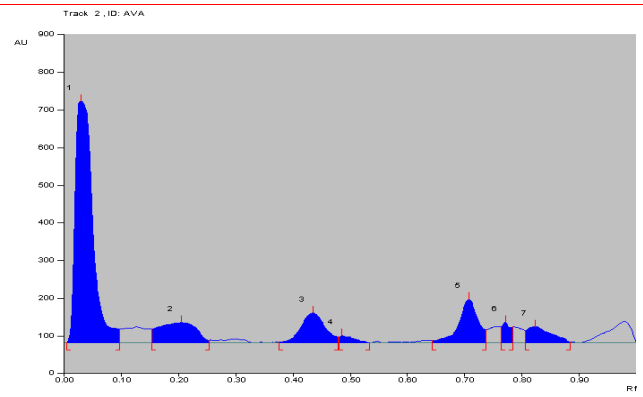
Figure 4. HPTLC of *Ashtangavaleha* Powder and *Ashtangavaleha* Linctus at 254nm and 366nm



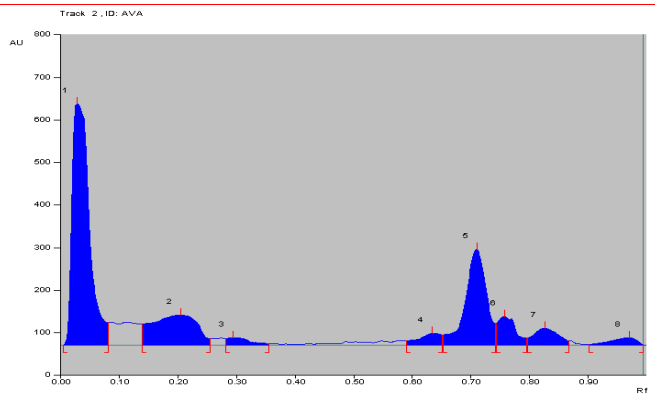
Ashtangavaleha powder at 254nm



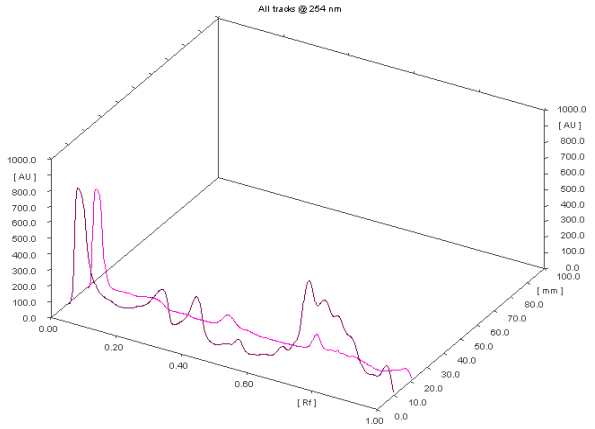
Ashtangavaleha powder at 366nm



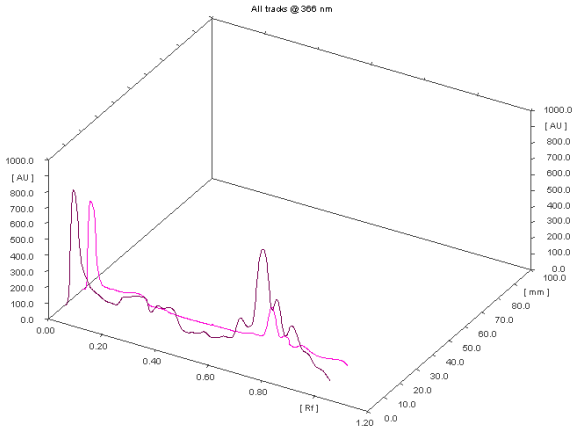
Ashtangavaleha linctus 254nm



Ashtangavaleha linctus at 366nm



3D Graph at 254nm

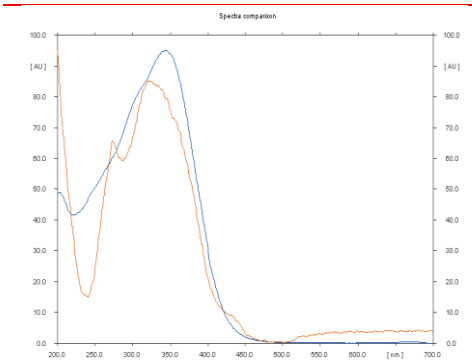


3D Graph at 366nm

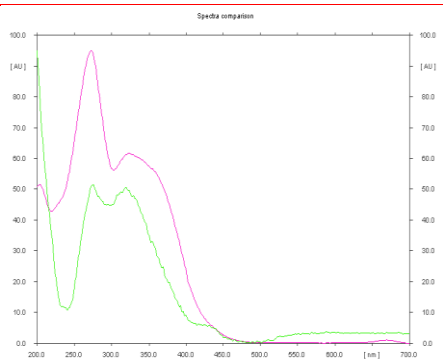
Table 5. HPTLC of *Ashtangavaleha* powder and linctus

Formulation	Chromatogram	No. of spots	Max. R_f value
Powder (AP)	254 nm	8	0.03, 0.29, 0.39, 0.52, 0.66, 0.74, 0.79, 0.83
	366 nm	10	0.03, 0.29, 0.35, 0.52, 0.60, 0.66, 0.74, 0.79, 0.85
Linctus (AL)	254 nm	7	0.03, 0.21, 0.43, 0.49, 0.71, 0.77, 0.82
	366 nm	8	0.03, 0.20, 0.29, 0.63, 0.71, 0.76, 0.83, 0.97

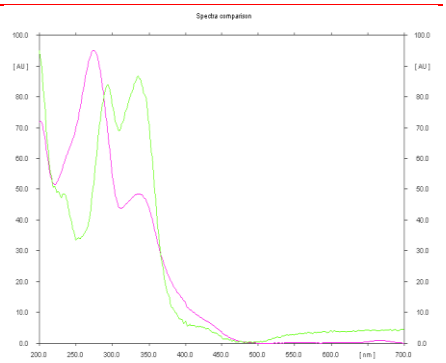
Figure 5. Spectra comparison of *Ashtangavaleha* powder and linctus



Spectra at Rf 0.75 in both samples



Spectra at Rf 0.78 in both samples



Spectra at Rf 0.84 in both samples

CONCLUSION

Asthangavaleha powder form after *Bhavana* showed significant changes in stone cells of *Pippali, Katphala* and starch grains of *Shunthi,* fibres of *Katphala* and cellular contents; while in *Ashtangavaleha* linctus form, oleo-resin content of *Shunthi* and *Pippali,*

pollen grains of honey, brown content and black debris of *Shringi* were found. The differences in the physico-chemical profile of *Ashtangavaleha* powder and *Ashtangavaleha* linctus form are significant; as the pharmaceutical procedure varies for preparation of both samples and as they differ in type of dosage form also. Most of the physico-chemical parameters of *Ashtangavaleha* linctus form are complying with the API parameters. Thus it is evident from the evaluation that though the ingredients for preparation were same, but due to adoption of different procedures for preparation, changes are found in pharmacognostical and physico-chemical parameters of both samples.

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CONFLICT OF INTEREST

Nil

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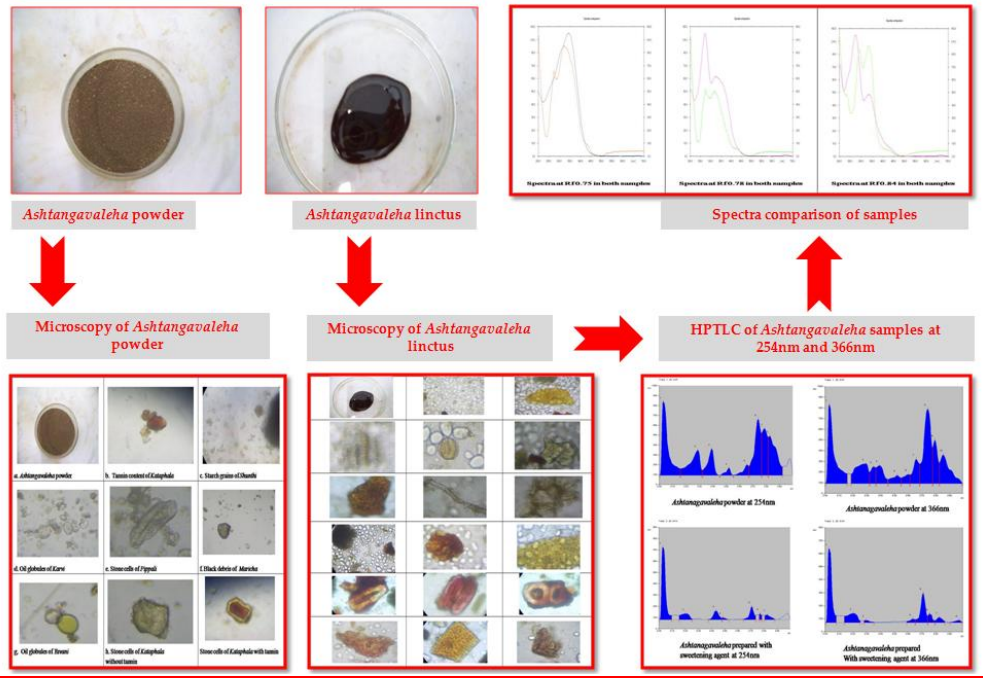
GRAPHICAL ABSTRACT



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