



Preliminary Standardization of *Bala Moola Ksheerapaka* and *Atibala Moola Ksheerapaka* – Two Herbal Formulations for *Sandhigatavata*

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ABSTRACT

Kshaya or degeneration is a gradually progressive deterioration and loss of function in the tissues. As *vridhnavastha* proceeds it leads to *kshaya* of all the *dhatu*s. This aggravates the *vata dosha*. *Sandhigata vata* is a disorder which nearly affects all the aged people. On the basis of symptomology it resembles with that of osteoarthritis. *Bala* and *Atibala* are ayurvedic drugs which is *vatapittahara* in nature and commonly used in management of *Vatavyadhi*. *Ksheerapaka* of *bala* and *atibala* has an additional nutritive value along with curing the disease and hence the study is taken to see the efficacy in *Sandhigatavata*.

Key Words: *Sandhigatavata*, *Bala*, *Atibala*, *Ksheerapaka*

INTRODUCTION

Joint pain is a world wide problem. Osteoarthritis of the knee joint is one of the major cause of functional disability in elderly people. The prevalence of knee osteoarthritis is high. It is associated with pain in knee joint, swelling and poor mobility of joints which makes the patient restricted to reduced physical tasks and activities. This condition is progressive and failure to control the disease progression on time affects not only patients health but his social and financial status also. Acharya Charaka and Acharya Vagbhatta has explained the *lakshnas* as *vatapurnadrutisparsha*, *shopha*, *prasaranaakunchana* *apravritti*, *vedana*^{1,2}. Whereas Acharya Sushruta and Yogratnakara^{3,4} has mentioned the symptoms as

shula, *shotha* and *hantisandhigatah* i.e diminution of the movement of the joints involved. *Sandhigatavata* is a *madhyamarogamargavyadhi* involving the *marma*. *Dhatukshaya* in *vridhnavastha* adds to the *kashtasadhyata* of the disease.

Ayurveda has propagated the usage of naturally available resources for effective management of various ailments. *Bala* (*Sidacordifolia* Linn.) and *Atibala* (*Abutilon indicum* Linn.) both together are called as *BalaDwayam*^{5,6}. Qualities of both are nearly identical. Both the Medicinal plants are said to be *Vatapittahara*, *balya*, *brimhana* and *vrushya*. *Siddha ksheera* or *ksheerapaka* of herbal drugs has also been advised for various disease condition. *Ksheera* is easily available and is an important

mode for administrating various herbal drugs. Milk contains fat, protein, carbohydrates vit A, B complex, C, various enzymes and minerals. Thus it maintains physical and mental well being. *Ksheerapaka* refers to medicated milk which is prepared by boiling the milk with drug and water until only milk part remains⁷. According to Ayurveda *ksheerapaka* nourishes the tissues and improves anabolic effects.

AIMS AND OBJECTIVES

1. Collection, identification and authentication of raw drugs.
2. Preparation of the drug

Table 1 Identification of Drugs

Sr. No.	Name of Drug	Latin Name	Family	Part used
1.	<i>Bala</i>	<i>Sida cordifolia</i>	Malvaceae	Root
2.	<i>Atibala</i>	<i>Abutilon Indicum</i>	Malvaceae	Root

- **Microscopy Study of *Bala* root** - Magnifications of the figures are indicated by the scale-bars as shown in Figure I (Ia – If)

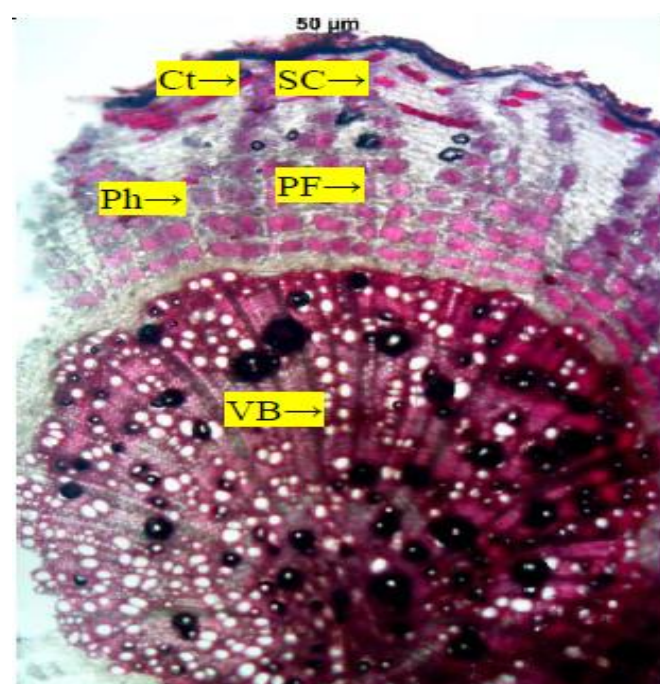


Figure I a. T.S of Bala root

3. Phytochemical analysis of compound drugs

MATERIALS & METHODS

1. Authentication of *Bala moola* and *Atibala moola*
2. Standardization and HPTLC of *Bala moola*, *Atibala moola*, *Bala moola ksheerapaka* and *Atibamoola ksheerapaka*.

- **Collection , identification and authentication of raw drugs-**

The medicinal herbs were collected from Pune, Maharashtra. The raw drugs are identified as *Sida cordifolia* and *Abutilon indicum* belonging from Malvaceae family which is shown in Table no 1- Identification of Drugs.

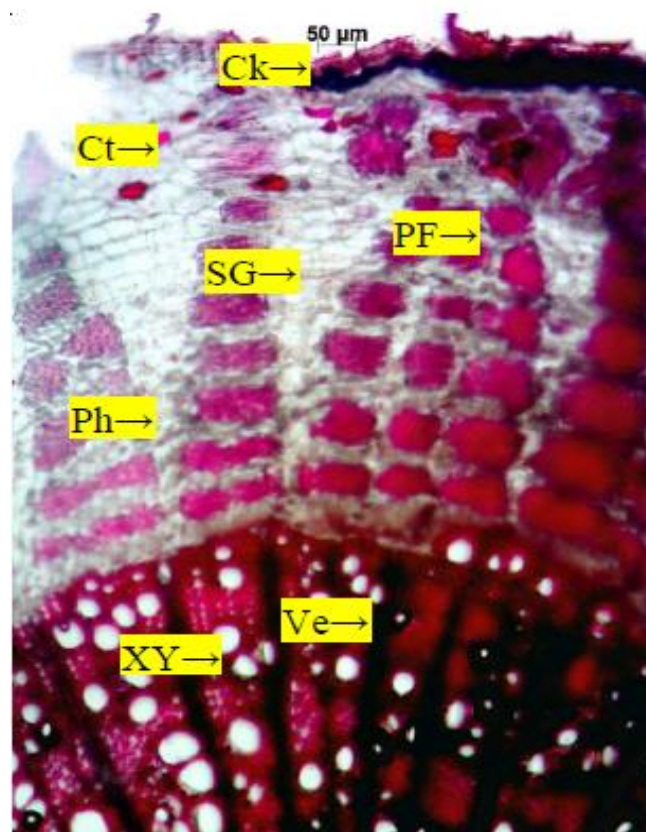


Figure I b. A portion of T.S enlarged

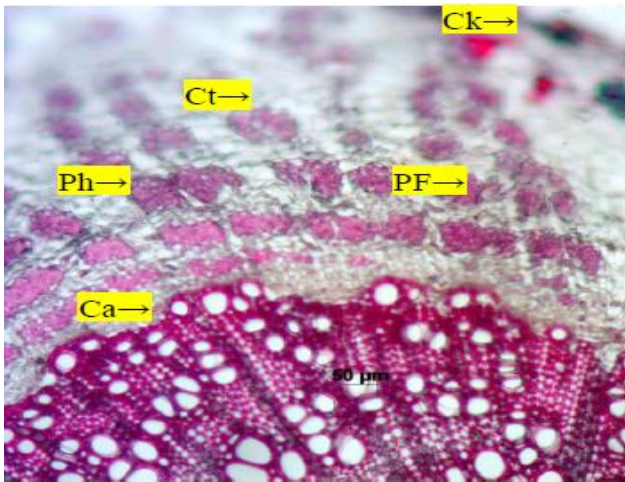


Figure I c. Cork , cortex, phloem, xylem

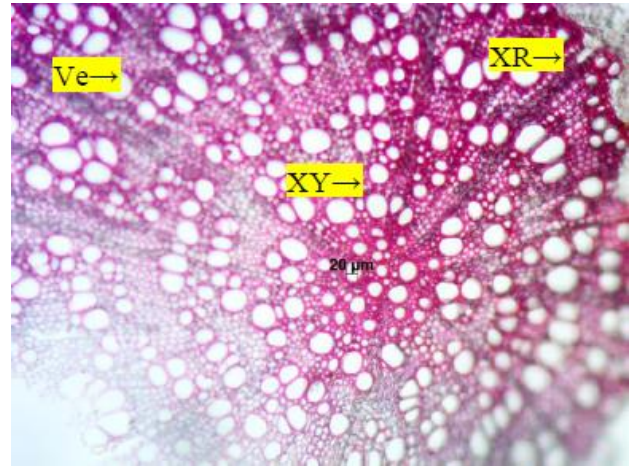


Figure I f. Xylem

Ca –cambium; Ck – cork; Ct – cortex; Ph – phloem;
PF – phloem fibres; SC – stone cells; SG – starch
grains; Ve – xylem vessels; XY – xylem

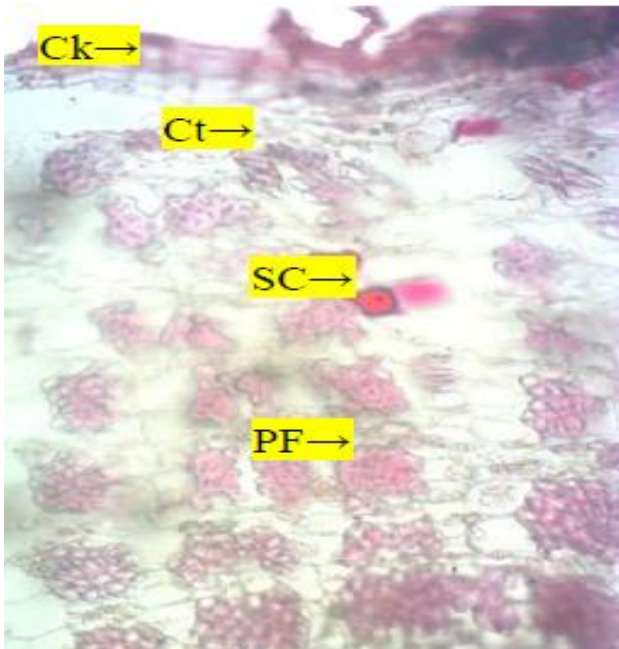


Figure I d. Cork, cortex, Phloem fibres

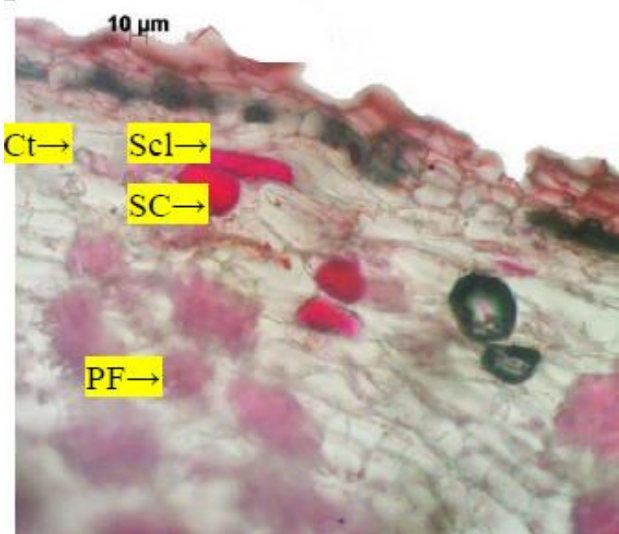


Figure I e. Cortex

• **Microscopy Study of Atibala root** -
Magnifications of the figures are indicated by the
scale-bars as shown in Figure II (Iia – Iig)

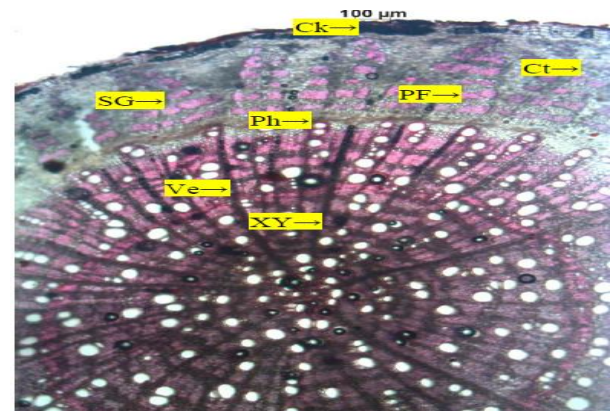


Figure II a. T.S of root

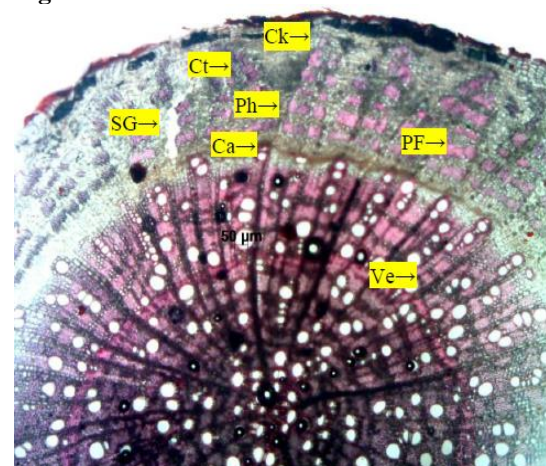


Figure II b. A portion of T.S enlarged

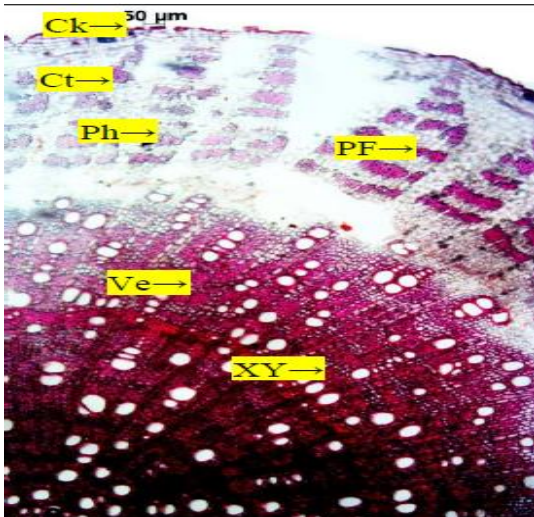


Figure II c. Cork, Cortex, Xylem

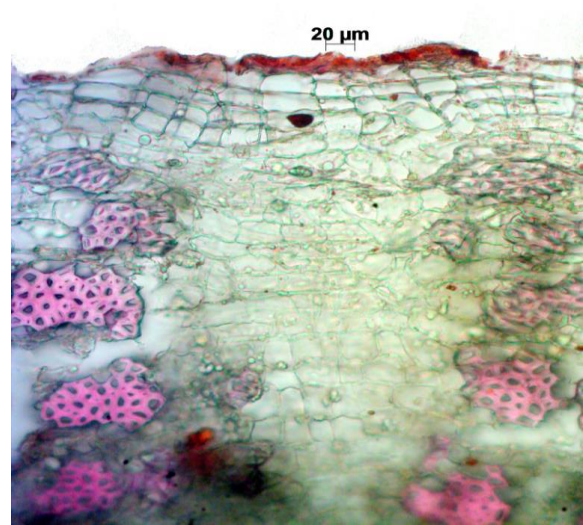


Figure II f. Cortex and Phloem

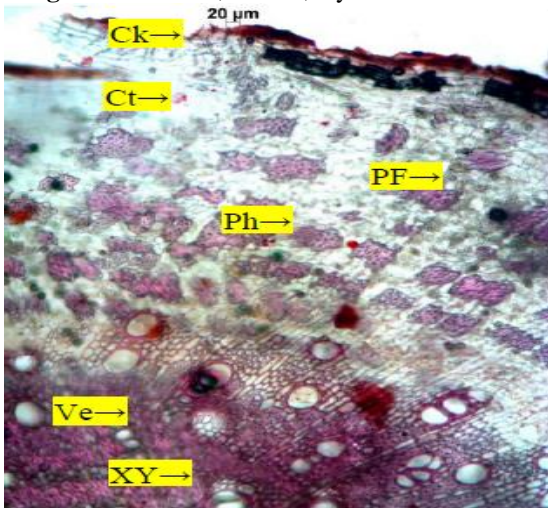


Figure II d. Outer region of bark

Ca – cambium; Ck – cork; Ct – cortex; Ph – phloem;
PF – phloem fibres; Scl – sclereids; SG – starch
grains; Ve – xylem vessels; XY – xylem

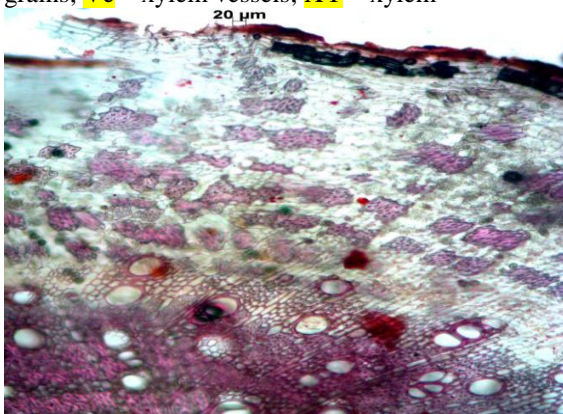


Figure II e. Cork, Cortex, Phloem (Outer region)

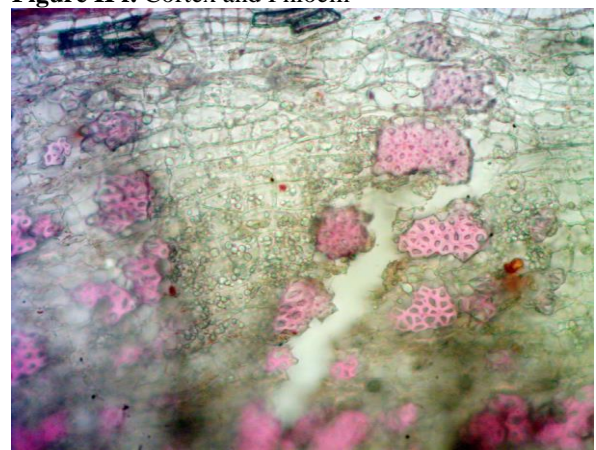


Figure II g. Phloem containing starch grains and Phloem fibres

Figure II: Microscopy of *Abutilon indicum* (*Atibala*) root

Ck – cork; Ct – cortex; Pa – parenchyma; Ph – phloem; PF – phloem fibres; Scl – sclereids; SG – starch grains; Ve – xylem vessels; XY – xylem

• Preparation of Decoction (*Ksheerapaka*)

Preparation of *Ksheerapaka* (*Bala & Atibala*)

Add 8 parts milk and 32 parts of water in 1 part
Churna

Boil the decoction till milk remains in the vessel.

Filter the decoction.

Ksheerapaka



• **Phytochemical analysis of compound drugs** – This study was conducted at S.D.M. College of Ayurveda, Udupi, Karnataka which is

depicted in Table No.2 to Table No.6. and photodocumentation of Bala and Atibala with their Chromatograph in Figures III to VI.

Table 2 Results of standardization parameters of *Sida cordifolia* and *Abutilon indicum*

Parameter	Results n = 3%w/w	
	<i>Sida cordifolia</i> (Avg±SEM)	<i>Abutilon indicum</i> (Avg±SEM)
Loss on drying	10.63±0.01	10.63±0.01
Total Ash	5.74±0.04	5.74±0.04
Acid Insoluble Ash	0.19±0.00	0.19±0.00
Water soluble Ash	5.69±0.01	5.69±0.01
Alcohol soluble extractive value	0.62±0.20	0.62±0.20
Water soluble extractive value	8.06±2.19	8.06±2.19

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Water soluble Ash	5.69±0.01	5.69±0.01
Alcohol soluble extractive value	0.62±0.20	0.62±0.20
Water soluble extractive value	8.06±2.19	8.06±2.19

Table 3 Results of standardization parameters of *Bala ksheerapaka* and *Atibala ksheerapaka*

Parameter	Results n = 3%w/w	
	<i>Sida cordifolia</i> (<i>Ksheerapaka</i>)	<i>Abutilon indicum</i> (<i>Ksheerapaka</i>)
Refractive index	1.34932	1.34282
Specific gravity	1.0345	0.9847
Viscosity	1.31	1.27

Table 4 R_f values of sample

At short UV			
<i>Sida cordifolia</i> (<i>Bala</i>)	<i>Sida cordifolia</i> (<i>Bala ksheerapaka</i>)	<i>Abutilon indicum</i> (<i>Atibala</i>)	<i>Abutilon indicum</i> (<i>Atibala ksheerapaka</i>)
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-
-	-	-	-

Table 5 R_f values of sample

At long UV			
<i>Sida cordifolia</i> (<i>Bala</i>)	<i>Sida cordifolia</i> (<i>Bala ksheerapaka</i>)	<i>Abutilon indicum</i> (<i>Atibala</i>)	<i>Abutilon indicum</i> (<i>Atibala ksheerapaka</i>)
-	-	0.07 (F. blue)	-
-	-	0.12 (F. blue)	-
0.17 (F. blue)	-	-	-
0.20 (F. blue)	-	-	-
0.30 (F. red)	-	0.30 (F. red)	-
0.35 (F. red)	-	0.34 (F. blue)	-



0.45 (F. Aqua blue)	0.46 (F. Aqua blue)	0.44 (F. Aqua blue)	-
0.49 (F. red)	-	0.48 (F.red)	-
0.55 (F. red)	-	0.54 (F.red)	-
-	-	0.57 (F.red)	-
0.84 (F. blue)	-	0.84 (F.blue)	-

*F-fluorescent

Table 6 R_f values of sample

After derivatiation				
<i>Sida cordifolia</i> (Bala)	<i>Sida cordifolia</i> (Bala ksheerapaka)	<i>Abutilon</i> (Atibala)	<i>indicum</i>	<i>Abutilon indicum</i> (Atibala ksheerapaka)
-	0.11 (Purple)	-	-	0.11 (Purple)
-	-	0.16 (Purple)	-	-
-	-	0.24 (Purple)	-	-
0.32 (Purple)	0.32 (Purple)	0.32 (Purple)	-	0.32 (Purple)
-	-	0.47 (Purple)	-	-
-	-	0.97 (Purple)	-	-

RESULTS AND DISCUSSION

The plant sources are widely and commonly used in ayurvedic treatments. The pH of the *ksheerapaka* was measured for both the samples. It helps to understand the pharmacological activity of drug absorption and metabolism. The pH of *Balamoola Ksheerapaka* was 6.56 and that of *Atibala moola ksheerapaka* was 6.45.

Under long UV there were 8 bands for *Sida cordifolia* (Bala) at R_f 0.17, 0.20, 0.45, 0.84 (F.

blue) and 0.30, 0.35, 0.49, 0.55 (F. red) and for *Sida cordifolia* (Bala ksheerapaka) band was evident at R_f 0.46 (F. aqua blue). *Abutilon indicum* (Atibala) is identified with 9 bands at R_f 0.07, 0.12, 0.34, 0.44, 0.84 (all F. blue) and in *Abutilon indicum* (Atibala ksheerapaka) there were no bands identified as shown in Figure III - HPTLC Photodocumentation of sample of *Sida cordifolia*, *Abutilon indicum*.

Figure. No. IV Densitometric scan of the samples at 254nm

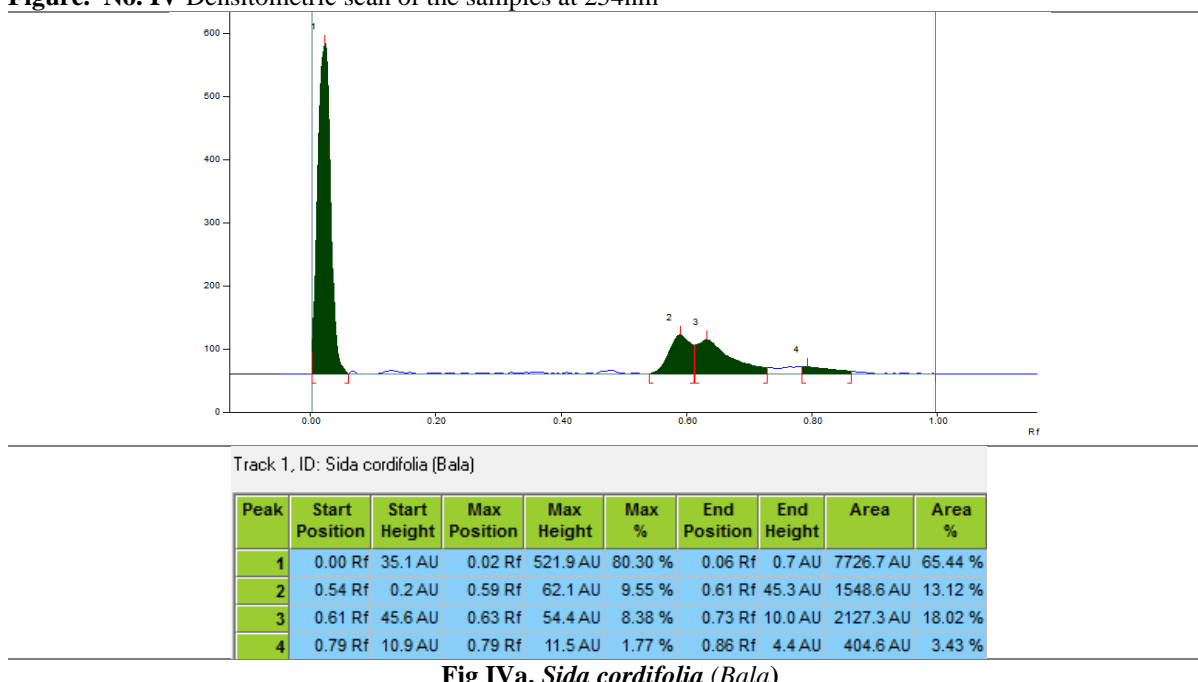
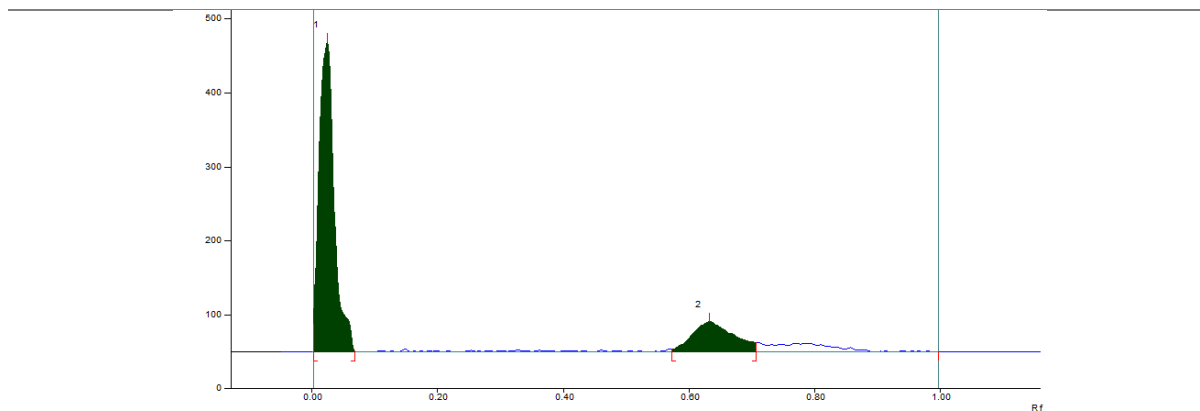


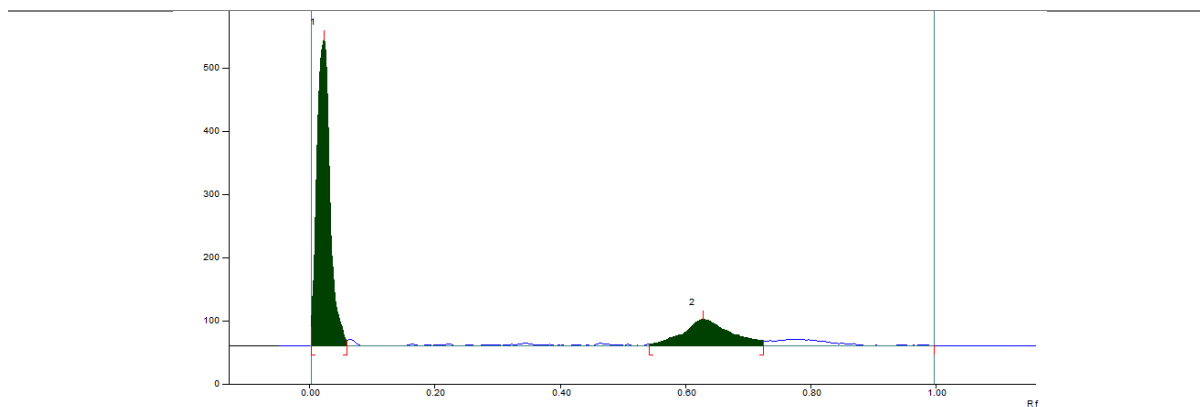
Fig IVa. *Sida cordifolia* (Bala)



Track 2, ID: Sida cordifolia ksheera paka (Bala ksheerapaka)

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	36.8 AU	0.02 Rf	418.5 AU	91.16 %	0.07 Rf	1.0 AU	7292.3 AU	79.06 %
2	0.57 Rf	3.3 AU	0.63 Rf	40.6 AU	8.84 %	0.71 Rf	11.8 AU	1932.0 AU	20.94 %

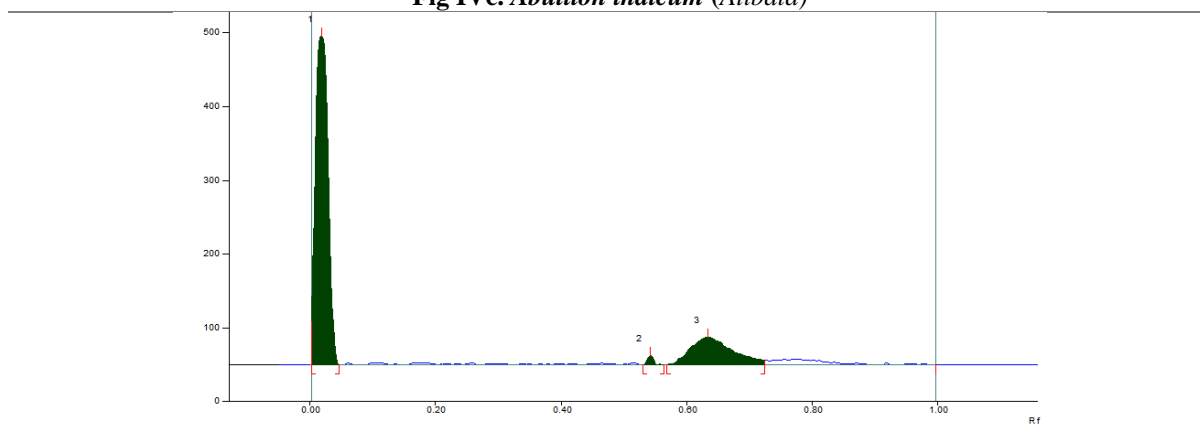
Fig IVb. *Sida cordifolia* (Bala ksheerapaka)



Track 3, ID: Abutilon indicum (Atibala)

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	29.0 AU	0.02 Rf	484.0 AU	92.04 %	0.06 Rf	9.2 AU	7265.5 AU	76.05 %
2	0.54 Rf	2.6 AU	0.63 Rf	41.9 AU	7.96 %	0.73 Rf	8.1 AU	2288.1 AU	23.95 %

Fig IVc. *Abutilon indicum* (Atibala)



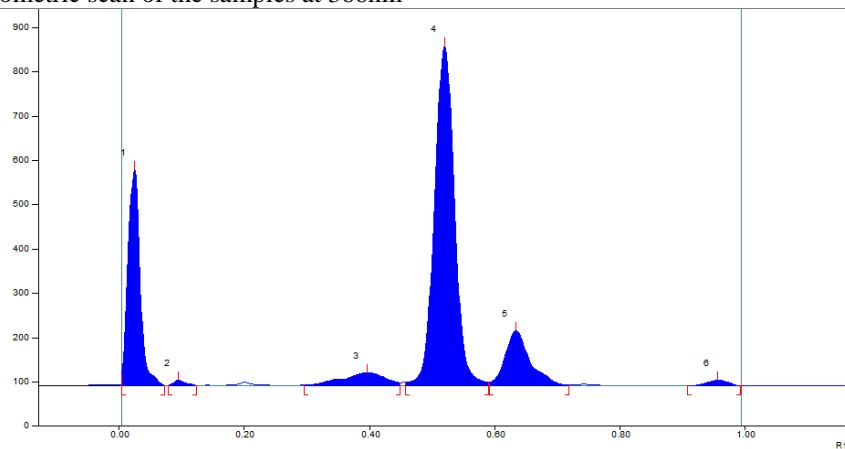
Track 4, ID: Abutilon indicum ksheera paka (Atibala ksheerapaka)

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	58.8 AU	0.02 Rf	445.3 AU	89.97 %	0.05 Rf	0.0 AU	6583.9 AU	77.54 %
2	0.53 Rf	0.1 AU	0.54 Rf	12.3 AU	2.48 %	0.56 Rf	0.0 AU	88.1 AU	1.04 %
3	0.57 Rf	0.4 AU	0.64 Rf	37.4 AU	7.55 %	0.73 Rf	5.7 AU	1818.8 AU	21.42 %



Fig IVd. *Abutilon indicum* (Atibala ksheerapaka)

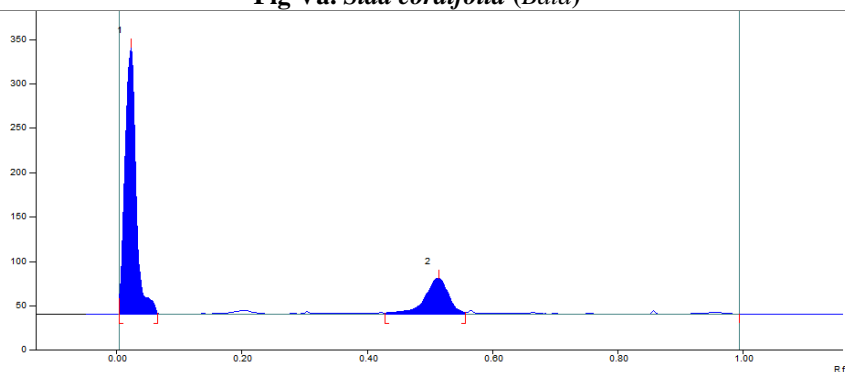
Figure V Densitometric scan of the samples at 366nm



Track 1, ID: Sida cordifolia (Bala)

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	25.2 AU	0.02 Rf	487.5 AU	34.05 %	0.07 Rf	0.3 AU	6834.5 AU	22.80 %
2	0.08 Rf	0.4 AU	0.10 Rf	12.1 AU	0.85 %	0.12 Rf	0.2 AU	169.9 AU	0.57 %
3	0.30 Rf	1.2 AU	0.40 Rf	29.4 AU	2.05 %	0.45 Rf	7.2 AU	1459.7 AU	4.87 %
4	0.46 Rf	7.4 AU	0.52 Rf	766.0 AU	53.52 %	0.59 Rf	8.0 AU	17645.3 AU	58.87 %
5	0.59 Rf	8.0 AU	0.64 Rf	123.9 AU	8.65 %	0.72 Rf	2.5 AU	3562.7 AU	11.89 %
6	0.91 Rf	0.1 AU	0.96 Rf	12.6 AU	0.88 %	0.99 Rf	0.0 AU	300.4 AU	1.00 %

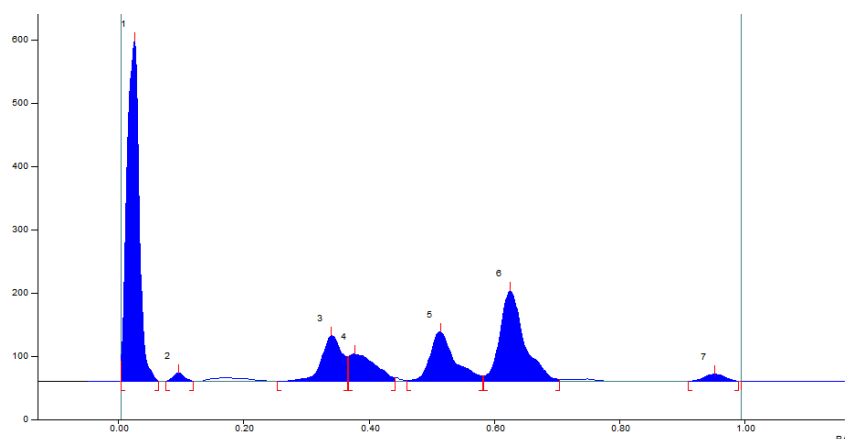
Fig Va. *Sida cordifolia* (Bala)



Track 2, ID: Sida cordifolia ksheera paka (Bala ksheerapaka)

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	17.9 AU	0.02 Rf	300.2 AU	88.07 %	0.07 Rf	0.7 AU	3784.6 AU	77.23 %
2	0.43 Rf	1.4 AU	0.51 Rf	40.7 AU	11.93 %	0.56 Rf	2.1 AU	1115.7 AU	22.77 %

Fig Vb. *Sida cordifolia* (Bala ksheerapaka)

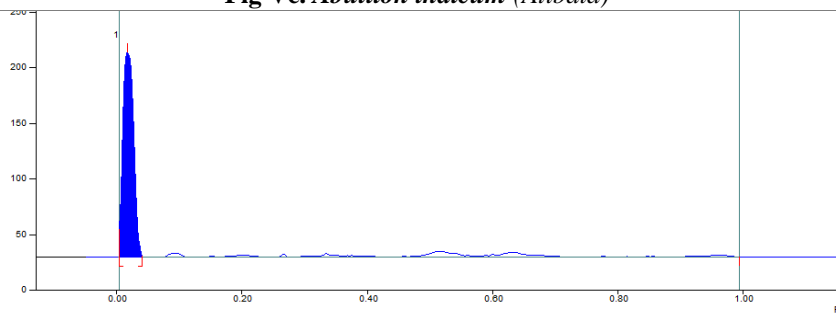




Track 3, ID: Abutilon indicum (Atibala)

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	32.2 AU	0.03 Rf	537.2 AU	59.90 %	0.06 Rf	0.3 AU	7475.8 AU	43.78 %
2	0.08 Rf	0.1 AU	0.10 Rf	13.4 AU	1.50 %	0.12 Rf	0.1 AU	167.4 AU	0.98 %
3	0.25 Rf	0.0 AU	0.34 Rf	71.8 AU	8.00 %	0.37 Rf	39.2 AU	1689.8 AU	9.90 %
4	0.37 Rf	39.5 AU	0.38 Rf	42.8 AU	4.77 %	0.44 Rf	5.5 AU	1307.7 AU	7.66 %
5	0.46 Rf	1.5 AU	0.51 Rf	77.6 AU	8.65 %	0.58 Rf	8.6 AU	2196.3 AU	12.86 %
6	0.58 Rf	8.6 AU	0.63 Rf	142.8 AU	15.92 %	0.70 Rf	3.1 AU	3966.0 AU	23.23 %
7	0.91 Rf	0.0 AU	0.95 Rf	11.3 AU	1.26 %	0.99 Rf	0.4 AU	273.0 AU	1.60 %

Fig Vc. *Abutilon indicum* (Atibala)

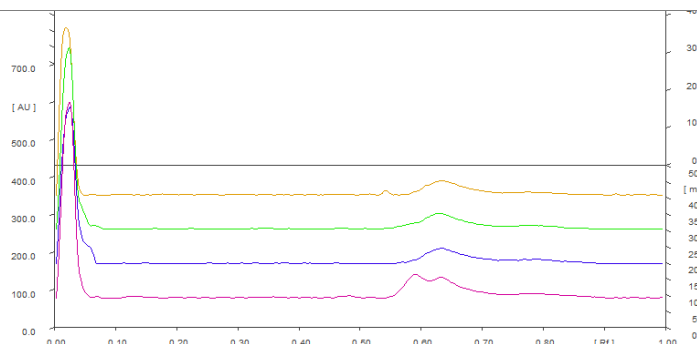


Track 4, ID: Abutilon indicum ksheera paka (Atibala ksheerapaka)

Peak	Start Position	Start Height	Max Position	Max Height	Max %	End Position	End Height	Area	Area %
1	0.00 Rf	24.9 AU	0.02 Rf	184.1 AU	100.00 %	0.04 Rf	1.0 AU	2329.0 AU	100.00 %

Fig. Vd. *Abutilon indicum* (Atibala ksheerapaka)

Figure. No.VI 3-D Chromatogram



Sample ID	Color
Sida cordifolia (Bala)	Magenta
Sida cordifolia ksheera paka (Bala ksheerapaka)	Blue
Abutilon indicum (Atibala)	Green
Abutilon indicum ksheera paka (Atibala ksheerapaka)	Orange

Fig. VIa. At 254nm

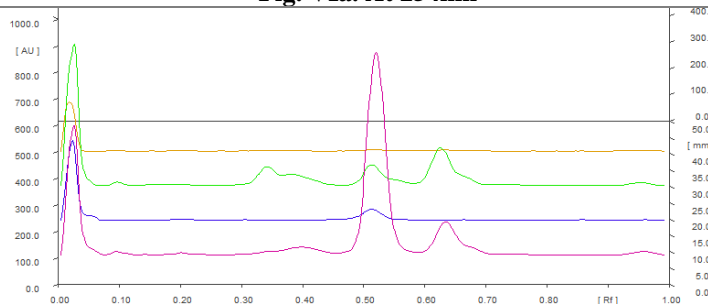


Fig. VIb. At 366nm



Post derivatisation (after treating the plate with Vanillin sulphuric acid) *Sida cordifolia* (Bala) showed one band at R_f 0.32 (Purple) and *Sida cordifolia* (Bala *ksheerapaka*) showed two bands at R_f 0.11, 0.32 (Purple) with *Abutilon indicum* (*Atibala*) there were 5 bands identified at R_f 0.16, 0.24, 0.32, 0.47, 0.97 (all purple) and *Abutilon indicum* (*Atibala* *ksheerapaka*) two bands were seen at R_f 0.11, 0.32 (All purple) as shown in Figure III - HPTLC Photodocumentation of sample of *Sida cordifolia*, *Abutilon indicum*.

Densitometric scan – Figure IV, of *Sida cordifolia* (Bala) at 254nm showed 4 peaks, at R_f 0.63 (18.02%) was prominent. *Sida cordifolia* (Bala *ksheerapaka*) at 254nm showed 2 peaks but at R_f 0.63 (20.94%) was prominent. *Abutilon indicum* (*Atibala*) and *Abutilon indicum* (*Atibala* *ksheerapaka*) each were identified with 2 and 3 peaks respectively among which both at R_f 0.63 (23.95%) and 0.64 (21.42%) was major one.

Densitometric scan at 366nm – Figure V, *Sida cordifolia* (Bala) identified with total number of 6 peaks among which 0.52 was major one, *Sida cordifolia* (Bala *ksheerapaka*) at R_f 0.51 (22.77%) was major peak. *Abutilon indicum* (*Atibala*) at 366nm showed 7 peaks of all these 0.63(23.23%) was the major one, *Abutilon indicum* (*Atibala* *ksheerapaka*) showed one peak which cannot be counted because its at R_f 0.02.

CONCLUSION

In allopathic system of medicine osteoarthritis condition is routinely managed by Analgesic, NSAIDS, steroids which may have untoward

effects in a long run. The medicinal herbs used here ie. *Bala moola* and *Atibala moola* are having anti inflammatory, anti arthritic activity and having the potential to scavenge the free radicals. Both these drugs are commonly and popularly used in various ailments in Ayurveda. *Ksheera* is described under *Ajasrika Rasayana* and hence is considered as *Ajanma satmya* having *jeevaniya* and *brimhaniya* qualities. It is also considered to be *pathyatama* and hence it can be easily prescribed in chronic disorders.

This detailed chemical profile may be useful in the identification and determination of quality of drugs. The phytochemical tests carried out reveal that it is safe for clinical trials.

Acknowledgement

We are thankful to the management and staff of S.D.M. Centre for Research in Ayurveda and Allied Sciences, Udupi - Karnataka, for providing best facilities and valuable guidance in this study.



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