Research Article

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GANDHAKA RASAYANA PREPARATION AND ANALYSIS OF PHYSICOCHEMICAL PROPERTIES

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ABSTRACT

The aims and objectives are to prepare Gandhaka Rasayana by the classical method mentioned in Ayurved Prakash and to evaluate parameters for process standardisation of Gandhaka Rasayana. Shuddha Gandhaka obtained by Shodhan procedure was powdered. In the preparation of Gandhaka Rasayana Bhavana Sanskar is the key element. Gandhaka Rasayana is prepared by 67 bhavanas made by nine different Bhavya dravya and their Upkalpana. The powder of Shuddha Gandhaka, Kwath, Swarasa and Phanta were prepared by the classical method. Physicochemical analysis was performed keeping in view of standardisation aspects of formulation. Final product standardisation is a part of thorough process standardisation. There is change in organoleptic properties in the process of Gandhaka Rasayana formulation. Ash value increased and % sulphur decreased as number of Bhavana increases. There was a rightward shift in pH in the formulation of Gandhaka Rasayana. Gandhaka Rasayana is the abundant source of Potassium. Gandhaka Rasayana is a nine step chain reaction resulting in the final product. Fingerprint of every step of Gandhaka Rasayana can be measured or quantified with the help of total Ash value, % Sulphur and Spectrophotometric analysis. Thus these parameters help us in the process Standardisation of Gandhaka Rasayana. Parameters for final product standardisations of Gandhaka Rasayana are pH value and evaluation of minerals from Flame photometry.

Keywords: Gandhaka Rasayana, Shuddha Gandhaka, Upkalpana

INTRODUCTION

Gandhaka Rasayana is a Khalvi Rasayana dominated by Bhavana Sanskar. It is not only detoxicating but also a rejuvenating Kalpa. Commercially Gandhaka Rasayana is available but does not show its efficacy (Phalashruti) mentioned in classic texts. It may be primarily because commercial Gandhaka Rasayana is available in the form of Gandhaka powder or Gandhaka powder mixed with herbal powders or Gandhaka powder mixed with herbal extracts.

The central dogma of Gandhaka Rasayana formulation is not its constituents but the process through which it is formed. The efficacy of Gandhaka Rasayana i.e. Guna is achieved through Mardanam of Bhavana dravyas in a successive and stepwise manner.[1] Each step in the Gandhaka Rasayana formulation adds Gunas (efficacy) into the Shuddha Gandhaka and ultimately it acts as a Rasayana. Omission or purposeful deletion of any step in formulation of final product will lead to reduction and/ or loss of efficacy and will not serve the purpose of medicine.[2]

Many projects were conducted for the standardisation of the final product; but through this project an attempt was done to evaluate the process standardisation of Gandhaka Rasayana. Gandhaka Rasayana was prepared by the method described in Ayurveda Prakash.[3] and analysed each step on specific parameters and tried to find methodology for process standardisation of Gandhaka Rasayana.

MATERIAL AND METHODS

Aims and Objectives

- To prepare Gandhaka Rasayana by the classical method mentioned in Ayurved Prakash.
- To evaluate parameters for process standardisation of Gandhaka Rasayana

Raw materials with quantity

Raw material	Quantity
Ashuddha (impure) Gandhaka	350 gm
Go ghrita	350 gm
Godugdha	1500 ml
Hot water	As required

Preparation of Gandhaka Rasayana

Bhavana Dravya	Quantity
Godugdha	500 ml
Chaturajata	256 gm (8 gm*4*8)
Guduchi (*Tinospora cordifolia)*	- 400 gm
Haritaki (*Terminalia chebula*)	800 gm
Bibhitaki (*Terminalia bellirica*)	800 gm
Amalaki (*Phyllanthus emblica*)	800 gm
Shunthi (*Zingiber officinale*)	800 gm
Bhringraja (*Eclipta Alba*)	2000 gm
Aadraka (*Zingiber officinale*)	1280 gm
Shuddha Gandhaka	300 gm

For Gandhaka Shuddhi

Wet grinder: ½ HP electric motor capacities 2 lit

Materials for analysis of Gandhaka Rasayana

- pH meter
- Crucibles for ash value
- UV spectrophotometer- Systronics F119 computer based
- Flame photometer for mineral assessment.
- Titration apparatus for %sulphur

This experiment was performed at Department of Ras Shastra in Government Ayurved College Osmanabad and procured the raw material from department, local market and periphery.

Formulation of Gandhaka Rasayana

Gandhaka Shuddhi

350 gm of Go ghrita was taken in an iron pan. In a vessel, 500 ml Godugdha was taken and a piece of cloth was tied to its mouth. When Goghrita melted, 350 gm of Ashuddha (impure) Gandhaka was added to it and continuously stirred till the Gandhaka melted completely. A homogenous yellow coloured mixture was obtained. This mixture was poured through a cotton cloth tied to the vessel containing Godugdha. Yellow coloured thick sheet of Shuddha Gandhaka was floating in the Godugdha. Separated sheets of floating Gandhaka washed with hot water for 3 times. The complete procedure was repeated for 3 times with fresh and new cow milk for each Shodhana procedure. It was dried well in sunlight.[4]

Preparation of Gandhaka Rasayana

Shuddha Gandhaka obtained by above procedure was taken in Khalva Yantra and powdered.

Bhavana

In the preparation of Gandhaka Rasayana Bhavana Sanskar is the key element. Gandhaka Rasayana was prepared by 67 bhavanas made by nine different Bhavya dravya and their Upkalpana. The powder of Shuddha Gandhaka and Kwath/Swarasa/Phanta prepared by the classical method was mixed thoroughly till the powder sinks completely and was allowed to dry till a dry mixture was formed again.

Electrical wet grinder was used for the sake of Mardana Prakriya. Here the same classical Gharshana principal was maintained by triturating Shuddha Gandhaka powder between two stone surfaces.

Bhavana Dravya

Classical text Ayurved Prakash is the basis of this project. There is no any change in the sequence mentioned in the text. This project was commenced in February and completed in May. At the begging of the Bhavana process quantity of Bhavana Dravya was decided. After very first Bhavana we fixed this amount to 100 ml – 120 ml for every Bhavana. Total Bhavana for the Gandhaka Rasayana was 67.

Upkalpana Nirmana

There are three Upkalpana in this project.

Phanta Upkalpana

Ayurved Prakash has mentioned a specific term i.e. Chaturajata .Here Twak Ela Tamal patra and Nagkesara was in equal quantity. For Phanta, water was heated up to 60-800C, so that water and volatile oil will not evaporate.[5]

Kwath Upkalpana

For Bhavana dravya Haritaki, Bibhitaki, Amalaki and Shunthi we made the Kwatha upkalpana.6 Every time we prepared the fresh Kwath by taking the above mentioned Dravya.

Kwath preparation was done by classical text in which 8 times water of the Bhavana bharad dravya is taken. It was reduced to 1/8th and this Kwath is used for every Bhavana.[8]

Swarasa Upkalpana

Swarasa was made from Bhringraja and Aadraka. Both dravyas were taken fresh, thoroughly washed and then produced Swarasa in a classical way.[7]

In Gandhaka Rasayana, Guduchi Bhavana is in the form of Swarasa but the Guduchi procured from the local area was not able to produce sufficient quantity of Swarasa. Hence the alternative method described in Sharangadhara Samhita was adopted.[8]

Up to this 51 bhavanas were completed and 300 gm Shuddha Gandhaka now converted to more than 500 gm of Bhavita Gandhaka. Because of this Bhavana dravya quantity needs to be increased. There was increase in Swarasa Bhavana Dravya quantity to 120 ml.

Sampling

After completion of all Bhavana of a specific drug, 10 gm sample was collected and it was labelled as GR-1 to GR-9e.g. GR-1 is the sample after completion of all three Bhavana of Godugdha and GR-9 is the sample after completion of all the eight Bhavana of Aadraka Swarasa also it is a final product –Gandhaka Rasayana.

Analysis of Physicochemical properties

Physicochemical analysis keeping view of standardisation aspects of formulation was performed. Final product standardisation is a parts of thorough process standardisation.

Process standardisation

This was achieved by Chemical properties of Gandhaka Rasayana

Total Ash value Gandhaka Rasayana

2 gm of each sample is burnt in crucibles and total Ash value calculated with respect to the initial dry sample.

% sulphur

2 gm of each sample is burnt and the fumes of sulphur are condensed and then titrated to calculate the % sulphur in the said sample. After each dravya Bhavana (Godugdha 3 Bhavana, Guduchi kwatha 8 Bhavana and so on) there was estimation % sulphur present in sample.

Spectrophotometric analysis

After each dravya Bhavana, there was an analysis of spectrum graph of samples with the help of CS_2 (carbon disulphide) and ethanol. Computer based Spectrophotometer Systronics F119 is instrument here used. Solvent for Gandhaka Rasayana was Carbon Disulphide and Ethanol. Spectrum for analysis is in visible range i.e. wavelength of 400-800 nm. Sulphur is totally soluble in CS_2, while Bhavana dravya is soluble in ethanol.[9]

Final product standardisation

Final product standardisation was carried out by physical properties such as

pH of Gandhaka Rasayana

It is done by glass electrode. In the glass-electrode method, the known pH of a reference solution is determined by using two electrodes, a glass electrode and a reference electrode, and measuring the voltage (difference in potential) generated between the two electrodes. The difference in pH between solutions inside and outside the thin glass membrane creates electromotive force in proportion to this difference in pH.

Flame photometry

Photoelectric flame photometry, a branch of atomic spectroscopy is used for inorganic chemical analysis for determining the concentrations of certain metal ions such as sodium, potassium, lithium, calcium, Cesium, etc. In flame photometry the species (metal ions) used in the spectrum are in the form of atoms. The basis of flame photometric working is that, the species of alkali metals (Group 1) and alkaline earth metals (Group II) metals are dissociated due to the thermal energy provided by the flame source. Due to this thermal excitation, some of the atoms are excited to a higher energy level where they are not stable. The absorbance of light due to the electrons excitation can be measured by using the direct absorption techniques. The subsequent loss of energy will result in the movement of excited atoms to the low energy ground state with emission of some radiations, which can be visualized in the visible region of the spectrum. The absorbance of light due to the electrons excitation can be measured by using the direct absorption techniques while the emitting radiation intensity is measured using the emission techniques. The wavelength of emitted light is specific for specific elements.[10,11]

Table 1: Summary of Gandhaka Rasayana materials and methods

Bhavana dravya	kalpana	Quantity of raw drug required for each Bhavana	Total Bhavana dravya for each Bhavana (average)	Total Bhavana (67)	Total Days for Bhavana (98)
Godugdha	Sterilised	150 ml	150 ml	3	5 days
Chaturajata	Phanta	8 gm each = 32 gm	95 ml	8	12 days
Guduchi (*Tinospora cordifolia)*	Swarasa	50 gm	100 ml	8	10 days
Haritaki (*Terminalia chebula*)	Kwath	100 gm	100 ml	8	12 days
Bibhitaki (*Terminalia bellirica*)	Kwath	100 gm	100 ml	8	10 days
Amalaki (*Phyllanthus emblica*)	Kwath	100 gm	100 ml	8	11 days
Shunthi (Dried *Zingiber officinale*)	Kwath	100 gm	100 ml	8	13 days
Bhringraja (*Eclipta alba*)	Swarasa	250 gm	120 ml	8	14 days
Aadraka (*Zingiber officinale*)	Swarasa	160 gm	120 ml	8	11 days

RESULTS

Table 2: Organoleptic properties changes from Ashuddha Gandhaka to Gandhaka Rasayana

S. No.	Sample	Sample derived at	Rup	Rasa	Gandha	Sparsha	Shabda
1	Ashuddha Gandhaka	Initial raw drug	Yellow	Slightly bitter	Strong odour like garlic	Rough	Feeble
2	Shuddha Gandhaka	After Shodhan	Yellowish	Slightly bitter	Like ghee	Smooth	Nil
3	GR 1	After Bhavana of Godugdha	Light yellow	Slightly bitter	Like butter	Smooth	Nil
4	GR 2	After Bhavana of Chaturajata	Yellowish with black tinge	Bitter	Like ela	Smooth	Nil
5	GR 3	After Bhavana of Guduchi	Greenish black	Bitter, astringent	Indifferent	Less smooth	Nil
6	GR 4	After Bhavana of Haritaki	Blackish	Bitter astringent	Indifferent	Smooth	Nil
7	GR 5	After Bhavana of Bibhitaki	Grey, black	Bitter astringent	Indifferent	Dry	Nil
8	GR 6	After Bhavana of Amalaki	Grey, black	Bitter, Slightly sour	Indifferent	Dry	Nil
9	GR 7	After Bhavana of Shunthi	Grey, black	Bitter, slightly spicy	Indifferent	Slightly smooth	Nil
10	GR 8	After Bhavana of Bhringraja	Grey, black	Bitter, Spicy	Indifferent	Dry	Nil
11	GR 9	After Bhavana of Aadraka	Grey, black	Slight spicy	Like Ginger	Slightly smooth	Nil

Table 3: Total Ash Value

Sample	Total Ash Value
GR-1	1.9984
GR-2	2.9006
GR-3	3.9673
GR-4	4.726
GR-5	5.0151
GR-6	5.3917
GR-7	5.4894
GR-8	7.7118
GR-9	8.8791

Table 4: % Sulphur

Sample	% Sulphur
GR-1	57.6028
GR-2	40.2209
GR-3	39.782
GR-4	35.4097
GR-5	26.8265
GR-6	18.945
GR-7	11.8823
GR-8	11.651
GR-9	3.7345

Table 5: Na, K and Fe in GR-9 in ppm by flame photometer

Na	1981
K	30120
Fe	1603.4

Table 6: pH from Ashuddha Gandhaka to Gandhaka Rasayana

Sample	pH
Ashuddha Gandhaka	3.46
Shuddha Gandhaka	4.96
GR-9 (Gandhaka Rasayana)	6.61

Table 7: Absorbance using cs2 as solvent in visible range and peak pick of GR1 to GR 9 samples

Sample	Point Pick nm	Peak Pick nm
GR1 (Figure 1)	400 nm = 0	400 nm
GR2 (Figure 2)	400 nm = 0	433.6 nm - 438.4 nm = .301
GR3 (Figure 3)	400 nm = 0	428 nm - 431.2 nm =. 301
GR4 (Figure 4)	490 nm = .125	502 nm - 516.4 nm = .176
GR5 (Figure 5)	400 nm = 0	426.4 nm - 431.2 nm = .301 457.6 nm - 473.6 nm = .176
GR6 (Figure 6)	400 nm = 2.5	448 nm - 452.8 nm = .477
GR7 (Figure 7)	400 nm = 0	428 nm - 429.6 nm = .301 489.6 nm - 559.2 nm = .125
GR8 (Figure 8)	450 nm = 2.5	531.6 nm = .699 571.6 nm = .398
GR9 (Figure 9) (Gandhaka Rasayana)	400 nm = 0	679.2 nm = .740 655.2 nm = .301 514.4 nm = .301 465.6 nm = .301 428 nm = .301

Table 8: Absorbance using ethanol as a solvent in visible range of GR-9 sample

Sample GR -9 (Figure 10)	**Ethanol as a solvent**
Point Pick	500 nm = 0.398
Peak Pick	543.8 nm - 564.8 nm = 0.602 669.2 nm = 1.079

Table 9: **Transmittance using cs2 as solvent in visible range and peak pick of GR9 sample**

Sample GR 9 (Figure 11)	**CS_2 as solvent**
Point Pick	400 nm = 100
Peak Pick	679.2 = 18.2 428 to 655.2 =50

Gandhaka Rasayana spectrophotometric graph of absorbance and transmittance

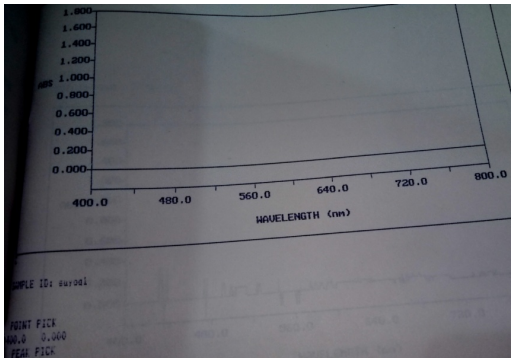

Figure 1: Absorbance using cs2 as solvent in visible range and peak pick of GR1 sample

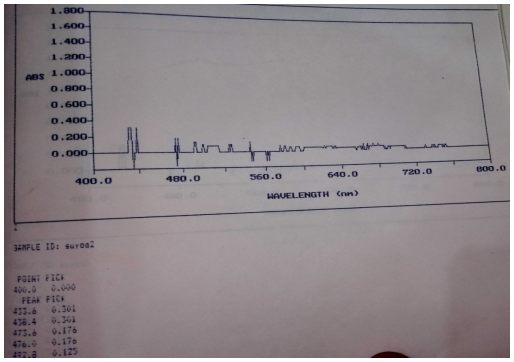

Figure 2: Absorbance using cs2 as solvent in visible range and peak pick of GR2 sample

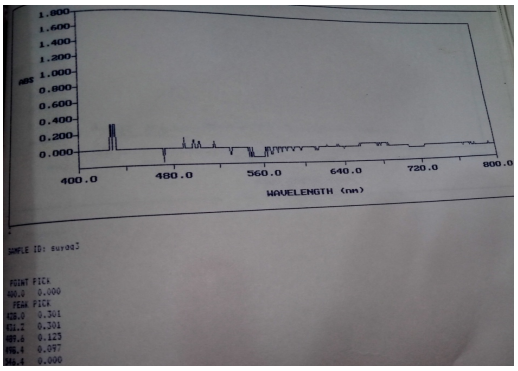

Figure 3: Absorbance using cs2 as solvent in visible range and peak pick of GR3 sample

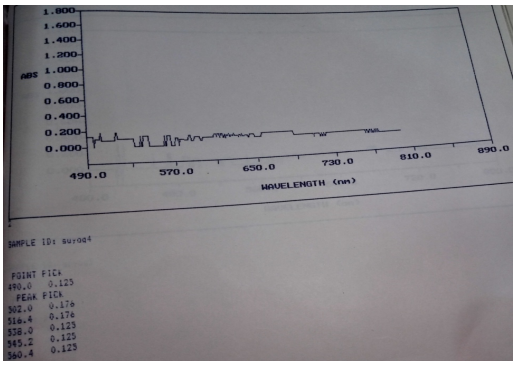

Figure 4: Absorbance using cs2 as solvent in visible range and peak pick of GR4 sample

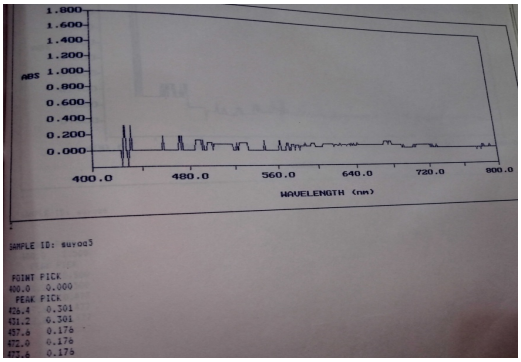

Figure 5: Absorbance using cs2 as solvent in visible range and peak pick of GR5 sample

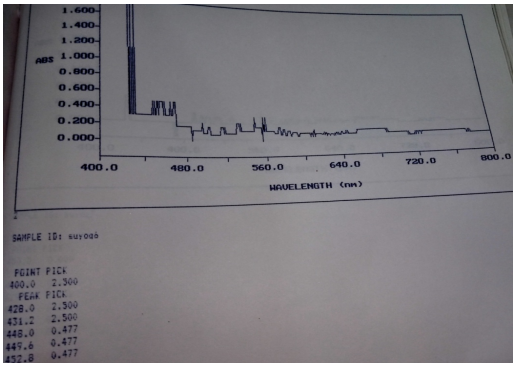

Figure 6: Absorbance using cs2 as solvent in visible range and peak pick of GR6 sample

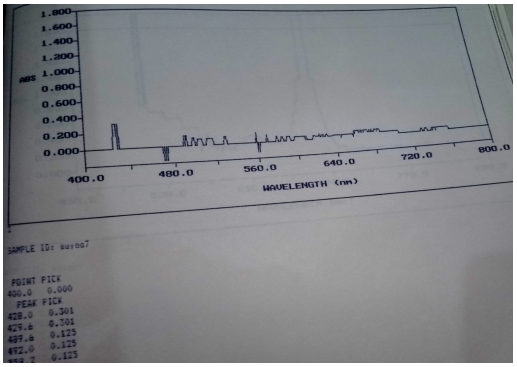

Figure 7: Absorbance using cs2 as solvent in visible range and peak pick of GR7 sample

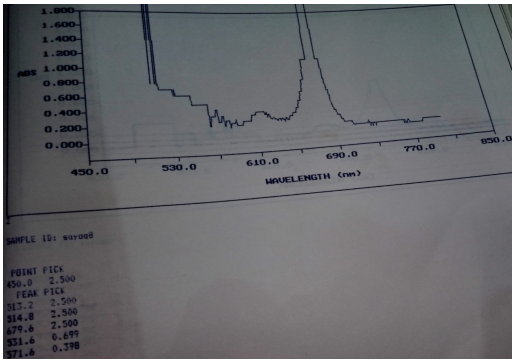

Figure 8: Absorbance using cs2 as solvent in visible range and peak pick of GR8 sample

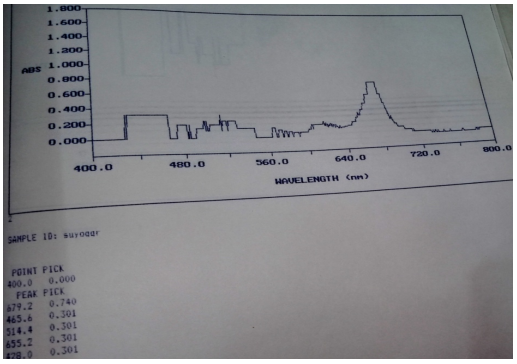

Figure 9: Absorbance is using cs2 as solvent in visible range and peak pick of GR 9 samples

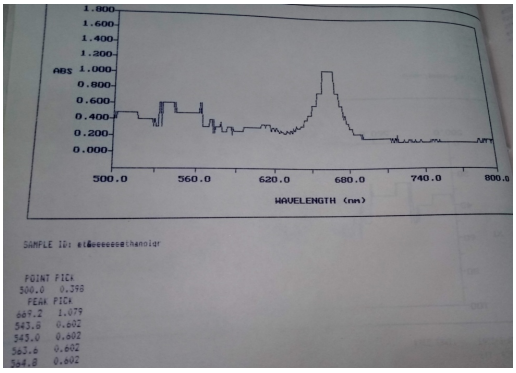

Figure 10: Absorbance using ethanol as a solvent in visible range of GR-9 sample

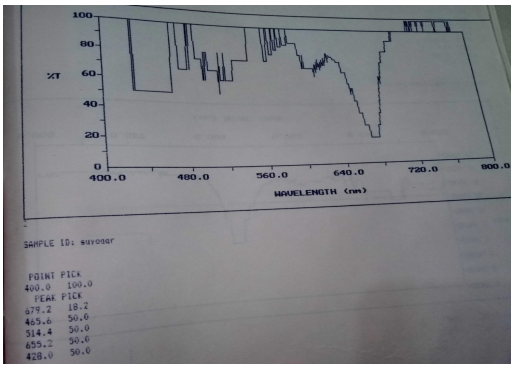

Figure 11: Transmittance using cs2 as solvent in visible range and peak pick of GR9 sample

DISCUSSION

Formulation of Gandhaka Rasayana

Analysis of Gandhaka Rasayana

Formulation of Gandhaka Rasayana

Gandhaka Shodhana

There was 9% weight reduction in Shodhan process. This reduction can be minimised by making a fine powder of Ashuddha Gandhaka, by using a hot water for washing of Gandhaka sheets floating on Godugdha.

Panchabhoutika Parikshana- Organoleptic properties (Table 2)

Gandhaka Rasayana i.e. final product was different from the raw material. The analysis of Panchabhoutika Parikshana observed during the various stages of preparation of Gandhaka Rasayana.

Analysis of Gandhaka Rasayana

Total Ash Value

Total ash is inclusive of physiological ash derived from plant tissue and non-physiological ash consists of residue of the extraneous matter such as sand, soil etc. adhering to the herb itself.[12] From Table 3 Total Ash value was consistently increased from Gr-1 to GR-9 as no. of Bhavana increases simultaneously. Total Ash value of GR-1 is 1.9984 while that of GR-9 is 8.8791 that was 4.5 times increase in total Ash value.

% Sulphur

From Table 4 it is observed that as every Bhavana of specific dravya was completed, % sulphur of the Sample was reduced consequentially. % sulphur after Godugdha Bhavana; GR-1 is 57.6028 while % Sulphur of GR-9 /Gandhaka Rasayana is 3.7345.

Flame photometry

Presence of Sodium, Potassium and Iron minerals are assessed by flame photometry. Table 5 shows that in the final product, Sodium was present 1981 ppm, Potassium was present 30120 ppm and Iron was present 1603.4 ppm. The higher amount of mineral- Potassium is because all the Bhavana dravyas are of plant origin.[10,11] Here it can be speculated that the Rasayana effect of Gandhaka is because of this mineral Potassium which helps Gandhaka to perform its therapeutic activity. This can be a scope for further study.

pH of Gandhaka Rasayana

From Table 6, it can be concluded that there is a shift from acidic Ashuddha Gandhaka to basic Gandhaka Rasayana. pH of blood is alkaline (7.3) and Gandhaka Rasayana pH 6.61 which is nearer to the internal environment of body that is Homeostasis.

Spectrophotometric analysis

Spectrophotometer measured absorbance from spectrum run with every sample. The measured absorbance is the difference between the total absorbance of the solution in the sample cell and that of the solution in reference cell i.e. carbon disulphide.[13] For GR1 peak pick is 0.0000 at 400 nm while for GR 9 peak pick is 0.740 at 679.2 nm. Please refer the Table 7 for every sample absorbance and its peak pick. For this experiment solvent was carbon disulphide.

Table 8 Shows GR-9 dissolved in Ethanol and run visible range absorbance spectrum. Table 9 shows Transmittance spectrum of GR9 sample with CS_2 as solvent.

All these analytical properties become fingerprint (final product and process) of Gandhaka Rasayana standardisation if method of preparation remains universal. (SOP)

CONCLUSION

Most of the research projects are on the standardisation of the final product but this research project is aimed to focus on process Standardisation.

Gandhaka Rasayana is a nine step chain reaction resulting in the final product. If any step is missed or omitted for the commercial purpose, it will show its negative impact on quality and efficacy of the final product.

Fingerprint of every step of Gandhaka Rasayana can be measured or quantified with the help of total Ash value, % Sulphur and Spectrophotometric analysis. Thus these parameters help us in the Process Standardisation of Gandhaka Rasayana.

Parameters for final product standardisations of Gandhaka Rasayana are pH value and evaluation of minerals from i.e. Flame photometry or flame atomic emission spectrometry.

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