Research Article

Qualitative and Quantitative Analysis of Iron Purification - An Observational Study

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ABSTRACT

Siddha system of medicine is practiced in south part of Indian constituency.It is one of the ancient traditional systems of India, mostly followed by tamil peoples. *Siddha* system utilizes the several metals and minerals in the form of nanoparticle preparation for various kinds of disease from the ancient period. Higher order medicines that are unique germ stones of *siddha* system are Chendooram, Parpam, etc., act as novel drug delivery system. *Siddha* system recommends the administration of *Ayam* only after *suddhi* (purification) in different medias. The word "*suddhi*" means to get rid of impurities. *Suddhi* is a unique process of detoxification which is employed to purify/detoxify and to potentiate the effect of various kinds of raw drugs used in *siddha* formulations with a view to reduce their toxic contents effects as well as to enhance their therapeutic properties. To evaluate the quantitative and qualitative analysis of *AYAM* (FERRUM-IRON) purification. The study is focused to observe and analyze the purification process of *Ayam*. This study that the purification value of Iron according to their wavelength that observed through UV analysis and ICP-OES analysis. After purification indicating that the purification process reduces the concentration of elements. The following inferences are drawn based on the qualitative and quantitative analysis of before and after purification of *Ayam* with the juice of *Syzygium cumini*.

Keywords: Siddha, Ayam, *Syzygium cumini*, Purification, UV analysis, ICP-OES.

INTRODUCTION

Siddha system of medicine is practiced in south part of Indian constituency. It is one of the ancient traditional systems of India, mostly followed by tamil peoples. *Siddha* system utilizes the several metals and minerals in the form of nanoparticle preparation for various kinds of disease from the ancient period. Higher order medicines that are unique germ stones of *siddha* system are Chendooram, Parpam, etc., act as novel drug delivery system.[1]

Medicines are divided into internal and external medicines. forms of internal and 32 forms of external medicine.[2]

Siddha system recommends the administration of *Ayam* only after *suddhi* (purification) in different medias. The word "*suddhi*" means to get rid of impurities. *Suddhi* is a unique process of detoxification which is employed to purify/detoxify and to potentiate the effect of various kinds of raw drugs used in *siddha* formulations with a view to reduce their toxic contents effects as well as to enhance their therapeutic properties.[3]

To evaluate the quantitative and qualitative analysis of *AYAM* (FERRUM-IRON) purification.

MATERIALS AND METHODS

Ayam was collected from reputed raw drug store in Chennai and naval pazham (*Syzygium cumini*) is collected from fresh plant in Chennai, identified and authenticated by botanist, Government siddha medical college, Chennai.[4]

Method of purification:

The raw iron is submerged in the *Syzygium cumini* (Naval pazham) juice & is kept in the sunlight till the juice gets fully dried up. The above process is repeated for 6 times.[5]

Drug Storage:

The trial drug iron was stored in clean dry wide mouthed glass bottles.

(A) **(B)**

Figure 1: (A) Raw Ayam(starting stage)**.** (B) Naval pazham juice(*Syzygium cumini)*

PROCESS OF IRON PURIFICATION:

According to *siddha* literature, process of Iron purification as follows,

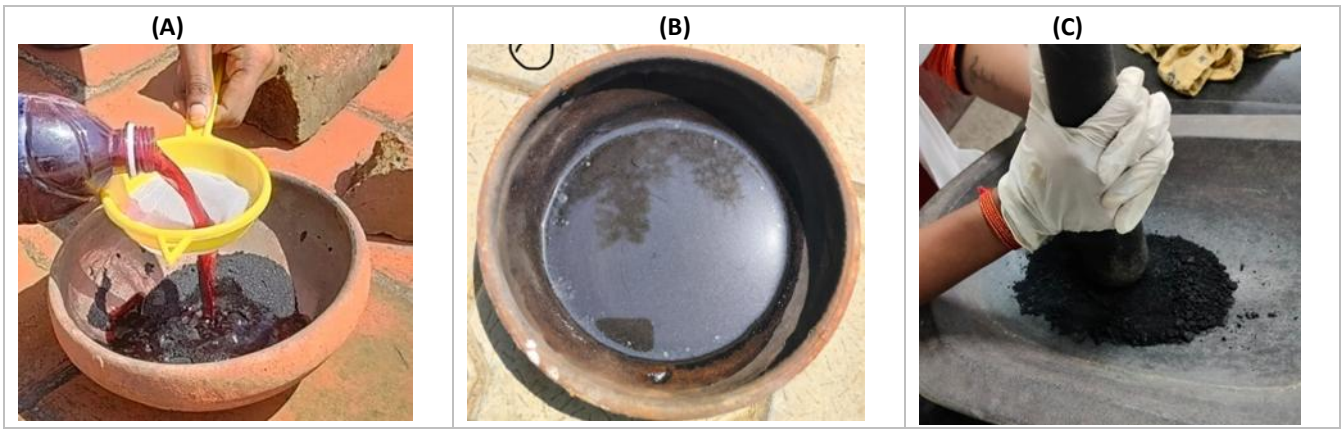


Figure 2: (A) The drug is submersed in naval pazha juice. (B) Dry it under sunlight. (C) The dried drug further ground into fine powder with stone mortar & pestle after washing

Repeated the same process for 6 times. Finally, comparative analysis of purified iron on each time was done to identify the changes obtained on each consequent purification procedure.

AFTER SOAKING WITH NAVAL PAZHAM JUICE – CHANGES OBSERVED

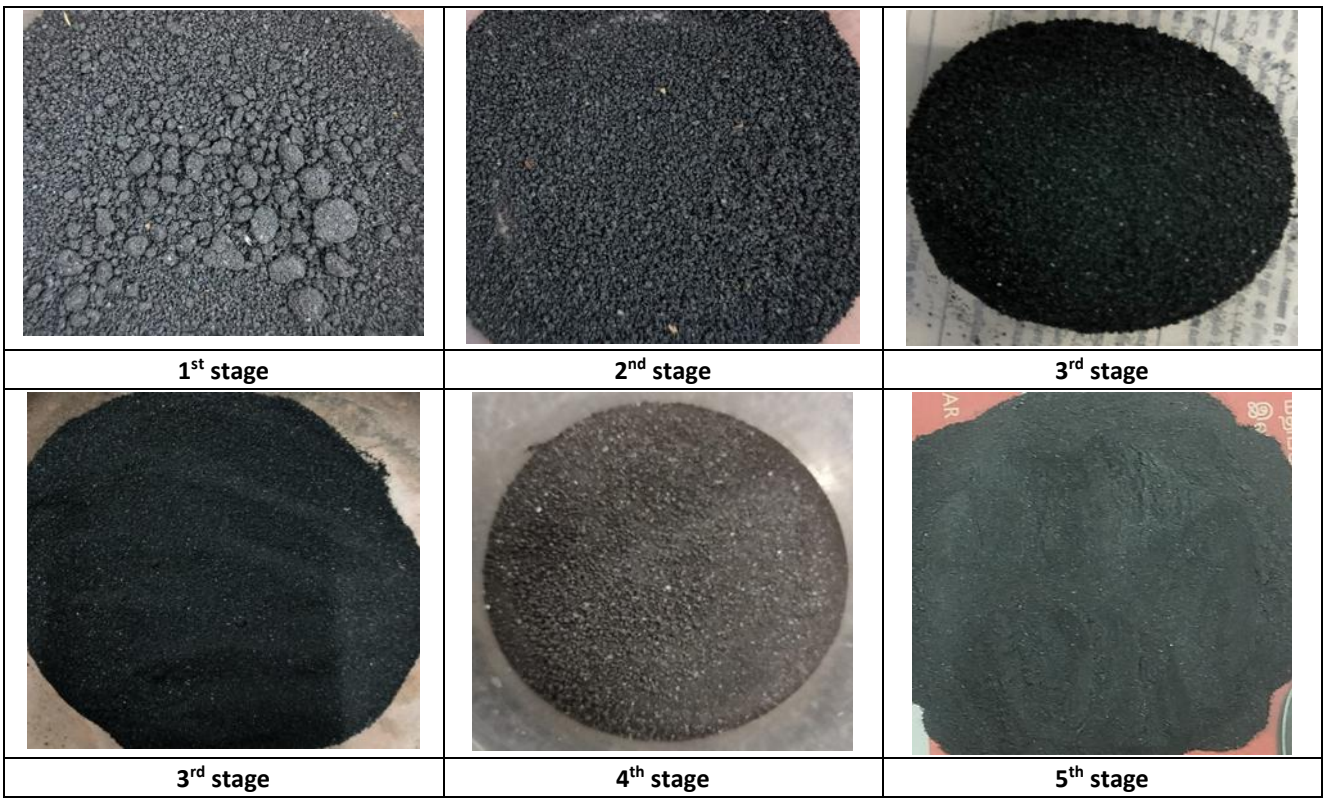


Figure 3: After it was soaked in naval pazha juice during the 1st,2nd,3rd,4th,5th and 6th stages

RESULTS AND DISCUSSION

- Many studies have been carried out to bring the efficacy and potency of the drug Iron. Traditional remedies are advantageous; it does suffer some limitations.
- The main limitation is the lack of standardization of raw materials, processing methods, the final products, dosage formulation and the non-existence of criteria for quality control.
- Standardization of the drug is more essential to derive the efficacy, potency of the drug by analyzing it through various studies.
- Following tables and charts are the results of Physical characterization, UV analysis and Physical characterization and estimation of basic and acidic radicals have been done and tabulated. Its result has been tabulated below.

Table 1: Physical Analysis

Physical Value	Before Purification	After Purification
P^H	8.26	5.38

Organoleptic Characters

Table 2: Organoleptic characters of Iron purification

Organoleptic character	Before purification	After purification
Color	Silver grey	Black color
Odour	Metallic odour	Metallic odour
Texture	Crystals present	Fine powder

Procedure

0.1g of given sample (*Ayam*) is taken and added to 10 ml of conc.Hcl in a 100 ml std/graduated flask with lid. This solution is kept in overnight. Then, the above solution is made up into 100 ml using distilled water and filtered in 4 size filter paper. Then, 5 ml from the filtrate solution is taken and made up into 50 ml using distilled water and another 5ml from the filtrate is taken and added 10ml bipydiyl & 15ml acetate to buffer. The above solution is kept in water bath for 15 mins. Then a pinch of ascorbic acid is added and kept in water bath for 45 minutes & allowed to cool. Then the above solution is made into 50 ml using distilled water. Using this solution the UV analysis of iron is done by the following formula:

$$\frac{\text{Absorbance value}}{\text{Std.absorbance}} \times \frac{\text{std.wt}}{100} \times \frac{5}{50} \times \frac{5}{50} \times \frac{100}{\text{sample.wt}} \times \frac{50}{5} \times \frac{50}{5} \times 100 = \text{ } \%$$

Table 3: UV analysis

Samples	Before purification value	Six stages of purification value					
	Unpurified	1st stage	2nd stage	3rd stage	4th stage	5th stage	6th stage
Absorbance value	0.913	0.875	0.803	0.720	0.684	0.637	0.592
Percentage	9.80%	9.30%	8.71%	7.89%	7.20%	6.84%	6.42%

Elemental Analysis

Table 4: Analytical report of trace elements by ICP-OES

Samples	Elements				
	As	Cd	Fe	Hg	Pb
Unpurified	BDL	BDL	59.89 %	BDL	BDL
1st stage	BDL	BDL	58.66 %	BDL	BDL
2nd stage	BDL	BDL	57.67 %	BDL	BDL
3rd stage	BDL	BDL	53.54 %	BDL	BDL
4th stage	BDL	BDL	58.54 %	BDL	BDL
5th stage	BDL	BDL	56.86 %	BDL	BDL
6th stage	BDL	BDL	56.75 %	BDL	BDL

Sample Names: Unpurified, 1, 2, 3, 4, 5, and 6

Note: BDL – Below Detection Limit; (µg/ml) – microgram /millilitre

Encl:

(i) Calibration curves of standard and sample for each element

(ii) Linearity graph of each element

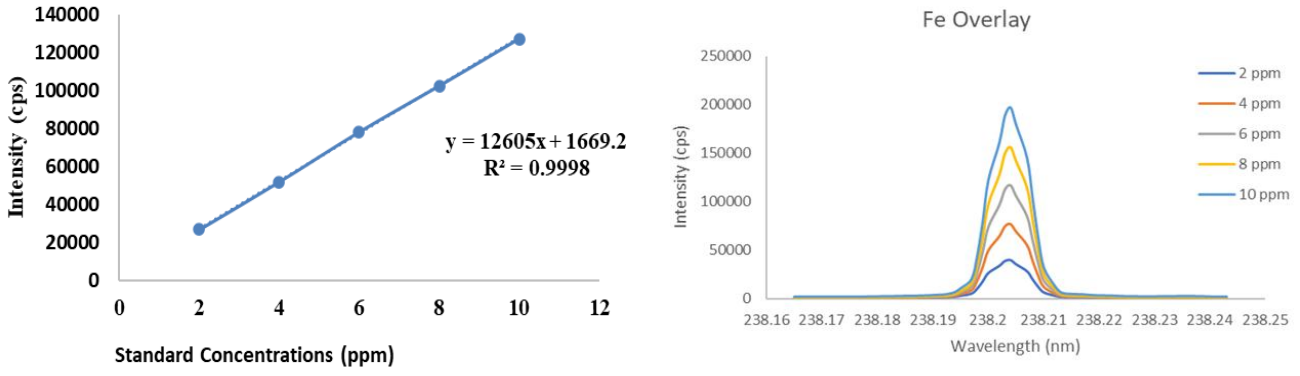
(iii) Procedure for the analysis

Procedure:

Take about 20-50 mg of sample into the Teflon microwave digestion vessel and add 1mL of ultrapure nitric acid to digest about 45 minutes using Anton Paar microwave digestion unit. After that the sample is made up to a 50mL standard measuring flask. The calibration standard solution is prepared for 0.2 µg/ml to 1.25 µg/ml by using ultrapure nitric acid and blank also. Agilent ICP-OES 5100 VDV instrument used with the following operation conditions: a RF power 1.2 kW, a plasma gas flow rate 12 L min^{-1}, and a nebulizer gas flow rate 0.70 L min^{-1}. The samples are introduced into the plasma using nebulizer and spray chamber for the analysis.

Table 5: Standard Linearity

Element	Wavelength	R^2 value
Iron [Fe] (µg/ml)	238.204 nm	0.9998



(A) Iron (B) Standard overlaid graphs

Figure 4: (A)Standard concentration of iron (B) Standard overlaid graph of iron

Samples ICP-OES Graph:

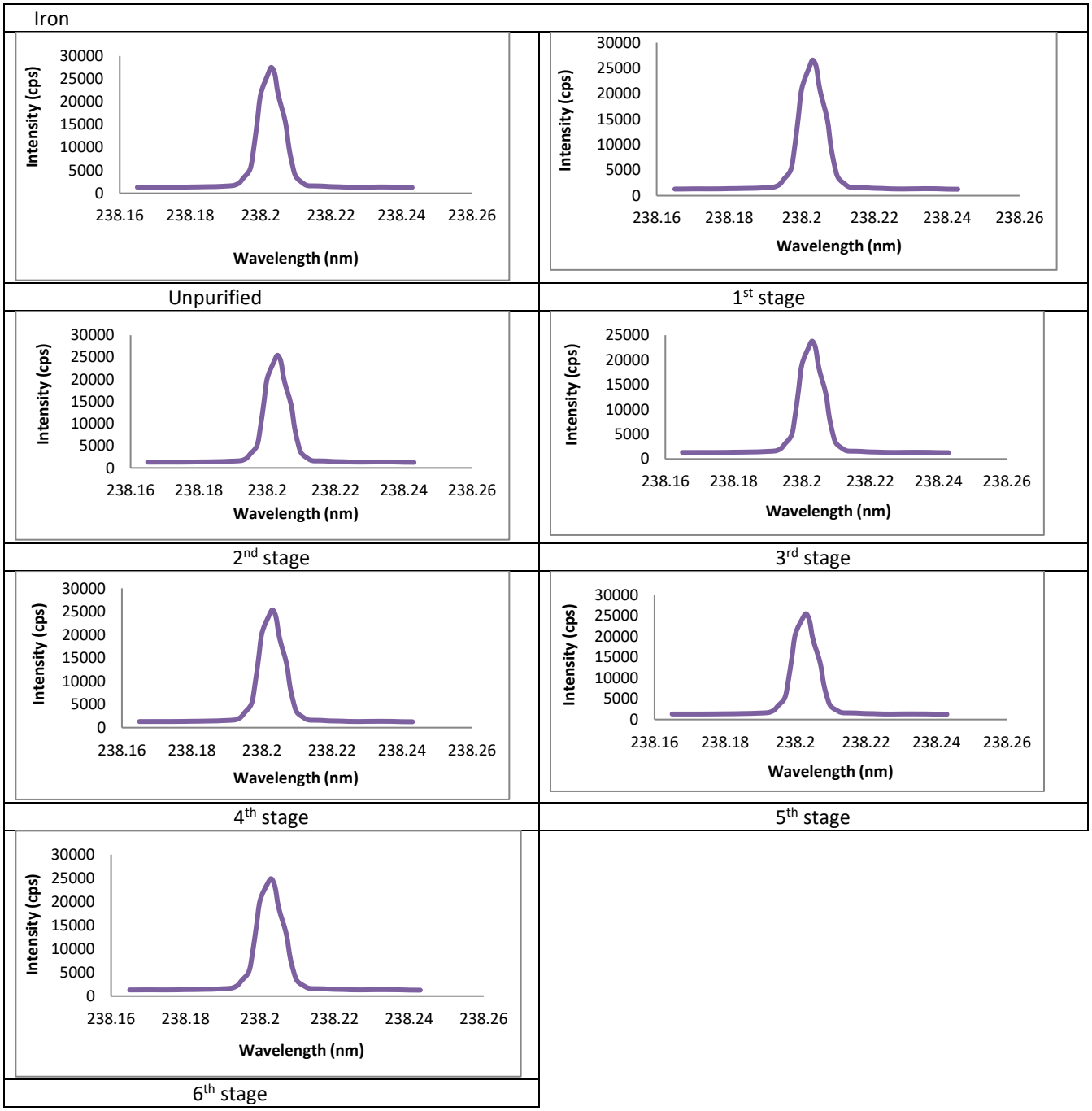


Figure 5: Wavelength of iron at each stages in nm (Unpurified,1st,2nd,3rd,4th,5th&6th)

Interpretation

he heavy metals (except iron) were found to be within below detection limit. The presence of Iron (Fe) shows the therapeutic value.

DISCUSSION

- The drug **Ayam** purification process was selected from the *Siddha* literature ***Gunapadam thathu-jeevam*** (page no:91) for standardization.
- The ingredients of the drug were Identified and authenticated.
- The samples were analyzed in two samples (Before and After purification process). The samples are mentioned as unpurified and sample 6.
- The drug was prepared as per the procedure and subjected to various studies such as qualitative and quantitative analysis.
- Qualitative analysis includes organoleptic characters (color, odour, texture and p^H) of Iron. Quantitative analysis includes UV analysis and ICP-OES instrumental analysis.
- The organoleptic characters are color, odour, texture and p^H value of the sample is changed.
- The UV analysis results showed that the absorbance values and percentages are reduced in each stage of Iron purification.
- The ICP-OES results showed heavy metals like As, Pb, Cd and Hg were found below detection limit in this purification of Iron. Hence, it may be safe for human consumption. The presence of ***Ayam*** was observed in major quantities. The drug Iron is rich in this purification that explains this drug may help in the treatment of Iron deficiencies.
- Thus, by scrutinizing all the above-mentioned factors it was concluded that the test drug Iron purification has been scientifically validated, and it was a safe and a potent drug.

CONCLUSION

- The present study is an attempt to establish the scientific basis of the purification of ***Ayam***. The following inferences are drawn based on the qualitative and quantitative analysis of before and after purification of ***Ayam*** with the juice of *Syzygium cumini*.
- Quality of a drug can be defined by the status of the raw material which is determined by the identity, purity and other chemical and physical properties and by the manufacturing processes.
- The selected purification method is found to be time consuming and easy to carry out.
- The results show that organoleptic characters include color, odour and texture of unpurified and purified (6) sample were changed in all the samples and p^H value was changed alkaline (8.26) to acidic (5.38) in nature.
- UV analysis, the sample of unpurified irons absorbance values of 0.913 which is reduced to 0.592 and percentage also reduced from 9.80% to 6.42%.
- In ICP-OES, sample unpurified shows the presence element of Iron concentration of 59.89 % which is reduced to 56.75%. Also, the amount of Arsenic, lead, cadmium and mercury is increased (BDL) after purification indicating that the purification process reduces the concentration of elements.
- From the observed results and interpretation, it is concluded that the raw drug *Ayam* was purified and analyzed. There were remarkable changes was found between unpurified and purified form of ***Ayam*.**
- If the purification is carried as per the *siddha* literature, it should take for medicinal preparations and that will fulfill the therapeutic purposes.
- Hence the concept of purification procedure as mentioned in *siddha* text provide contemporary evidence with a good scientific background.
- These explorations will definitely help to set a standard procedure for purification of ***Ayam*** in future.

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