Calcination of *Abrak Safaid* in Muffle Furnace following Different Methods of Detoxification

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Abstract

Kushta Abrak Safaid is a unani formulation used in the treatment of Sual(chronic cough/Bronchitis) and Zeequn Nafas (Asthma), (Anonymous 2006). *Kushtajaat (calcines)* are organo-mineral fine particles prepared by treating mineral with several herbs and subjected to precise heat treatment. The present study aims at comparing physico-chemical evaluation of *Kushta Abrak Safaid* prepared by two different methods of detoxification. *Abrak* was detoxified by two methods as mentioned in Unani literature and their *kushtas (calcines)* were prepared. Finished products were compared for physico-chemical characteristics. Results suggest that physico-chemical constant of both *kushtas* were similar without any significant difference.

Keywords: Abrak (Mica), Bronchitis, Detoxification, *Kushta (calcine)*, Physico-chemical Properties,

Introduction

The process of calcination enhances the absorption of drug in the body and increases its efficacy manifold. In the past it was believed that minerals are incompatible with human system but research shows that their moderate presence in the body is essential for human health (Dandiya, et al, 1989). In Unani Medicine and other alternative systems of Medicine, these metals and minerals are mostly used in calcined form and called as *kushta. Kushta* is known by various vernacular names like *Rasayana*, Elixir, *Kimiya* and *Ikseer* (Mahdi Hassan, 1979; Bajaj, et al., 2000). It is an organo-metallic substance treated with a quantum of heat to induce thermal decomposition in drug which produces rapid remedial effect after entering into the body. In Unani system of Medicine, Abrak (Mica) has been used effectively since long for the treatment of various disorders. Internally, it is used in the form of *kushta*. But before making its *kushta*, it is always subjected to detoxification in order to enhance its therapeutic actions and remove the unwanted or toxic properties (Khaleefatullah, et al., 2009). Various detoxification procedures of *Abrak* are mentioned in classical texts which are still in practice. Unani scholars claim that different detoxification methods do not necessarily affect physico-chemical properties of the end products. However, this claim has not been scientifically tested. Therefore, the present study aims to prepare *Kushta Abrak Safaid* by detoxifying it in two different ways as well as to compare the physico-chemical properties of both the products to find out whether the two *kushtas* significantly differ from each other or not.

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Methodology

Abrak safaid and milk were purchased from the local market in Bangalore. *Gheekwar* (*Aloe barbadensis* Mill.) was procured from the herbal garden of National Institute of Unani Medicine, Bangalore. *Shora Qalmi* (Potassium nitrate) of analytical grade was purchased from Shrinivasa chemical shop, Rajaji Nagar, Bangalore.

Methods of Detoxification *(Tasfiya)* of *Abrak Safaid*

Before subjecting to *kushtasazi (calcination process)*, *Abrak Safaid* was purified as per classical literature. Generally, all raw drugs are sourced from the mines so there are always chances of impurities, toxicity and heterogeneous qualities. *Tasfiya* (detoxification) is a time tested method to eliminate all such impurities as well as to induce certain good qualities to enhance its pharmaco-therapeutic properties (Neeralagi, 2010).This process results in the conversion of impure mineral into pure or organo-mineral form, ready to be calcined (Tariq, 2013). If purification (*tasfiya*) is not performed, their use is said to be harmful to the individual (Chopra, et al., 1982).

First Method of Detoxification

The layers of *Abrak* were first separated by pounding with mortar and pestle (Fig. 1). The small pieces of *Abrak* were tied loosely in a bag of thick cotton cloth along with date (*Phoenix dactylifera*) seeds. The bag was then dipped in lukewarm water and rubbed vigorously (Fig. 2). Small particles of *Abrak* were then squeezed out of the bag. The process of dipping the bag in hot water and rubbing was repeated till all the particles of *Abrak* were squeezed out of the bag. The particles were allowed to settle down at the bottom of the vessel and the water was decanted. *Abrak* particles were then collected and allowed to dry. The dry particles are called *Abrak Mahloob* (Fig. 3) (Anonymous, 2007).

Fig. 1: Raw *abrak*

Fig. 2: *Dhanab* process

Fig. 3: *Abrak mahloob*

Second Method of Detoxification

Abrak was heated on fire (Fig. 4) until it became red (Fig. 5) and then dipped into 100 ml of milk (Fig. 6). The procedure was repeated seven times (Hafeez, Sanat'ut Taklees 2005).

Fig. 4: Raw *Abrak* during heating

Fig. 5: *Abrak* after red hot stage

Fig. 6: *Abrak safaid* after dipping in milk

Method of Preparation of *Kushta Abrak Safaid* (KAS)

KAS was prepared as per the method mentioned in *Kitabut Taklees* with a slight modification,ie; instead of using the cow dung cakes method it was prepared in furnace because being a closed chamber, furnace gives better temperature control (Tariq, 2013, Chaturvedi, et al., 2011), isolation of material being heated and saves time and labour (Chaturvedi, et al., 2011). Twelve gram of *Abrak Safaid purified* (*musaffa*) was dipped in *Luab-e- Gheekwar* (*mucilage of Aloe barbadensis*) (Fig. 7) and placed inside Muffle Furnace and heated (Fig. 8). For the operation of heat, thermo gram of 12 kg of cow dung cakes cited by Kumar et al. 2012 was followed as same quantity of cow dung cakes was used for the preparation of KAS. After self cooling, 18g *Shora Qalmi* dissolved in 20 ml of water was added (Fig. 9) and again heated (Fig. 10) by following the same heat pattern. After self cooling, *kushta* was removed and dipped in one liter of water (Fig. 11) and kept undisturbed for 2-3 hours so as to remove *Shora Qalmi*. Afterwards, water was removed and *kushta* was dried on heater. After complete drying, KAS (Fig. 12) was stored in an air tight bottle.

Fig. 7: *Abrak* flakes dipped

Fig. 8: After 1st puta (Heating)

Fig. 9: After addition of *shora*

Fig. 10: After 2^{nd} puta

Fig.11: *Kushta* dipped in water

Fig. 12: Final *Kushta Abrak Safaid*

Observations

The prepared *kushtas* were evaluated for classical parameters like organoleptic properties, classical parameters of *kamil kushta* (perfect calcine) like floating test (Tariq, et al., 2013), grain floating test (Mohaptra, et al., 2010), fineness test (Tariq, 2013) as well as modern scientific parameters like bulk density, tapped density (Ahmed, et al., 2013), Hausner's ratio (Qui, et al., 2006), Carr's compressibility index (Ghosh, et al., 2008) in density tester by LABINDIA model no. 1025. pH in 1% and 10% solution (Anonymous, 2006) by digital pH meter by Eutech instruments model no. 1544421, loss of weight on drying (Anonymous, 2006) in hot air oven by LABLINE, Anmatrix instrument technologies. Total ash (Anonymous, 2007), acid insoluble ash, water soluble ash (Anonymous, 2007) and extractive values (Anonymous, 2011) were also evaluated.

Results and Discussion

Ideally, *Kushta* should be tasteless, odorless and lusterless. Both KAS were tasteless, odorless, smooth to touch and lusterless (Table 3). KAS-1 was yellowish white and KAS-2 was complete white. Floating, grain floating, finger and wall stick test were positive for both *kushtas* (Fig.13-18). These findings imply that both the *kushtas* were perfect (*kamil*) as per classical Unani literature.

Fig.13: Floating test KAS-1

Fig.14: Rice floating on KAS-1

Fig. 15: Finger test KAS-1

Fig. 16: Floating test KAS-2

Fig. 17: Rice floating on KAS-2

Fig. 18: Finger test KAS-2

The mean value of bulk and tapped density of KAS-1 and KAS-2 were 0.50± 0.00 gm/ml, 0.83± 0.00 gm/ml and 0.49±0.00, 0.83± 0.03 gm/ml respectively (Table 4). Bulk density is the mass per unit volume of a loose powder bed. It is an essential parameter for process development of solid dosage manufacturing. It indicates the amount of powder that can fit in a space. The tapped density represents the random dense packing of the material and is generally higher for regularly shaped particles (i.e. spheres) as compared to irregularly shaped particles such as needles (Qui, et al., 2006). The mean value of Hausner's ratio and compressibility Index of KAS-1 and KAS-2 were 1.69± 0.00,40.23± 0.24% and 1.78± 0.00, 40.39±0.25 % respectively (Table 4).Compressibility index is a measure of relative importance of inter-particle interactions. In a free flowing particle, these interactions are generally less significant; so bulk density and tapped density values are closer. For poorly flowing materials, there are frequently greater inter particle interaction which results in lower bulk density and a greater difference between bulk and tapped densities. These differences in particle interactions are reflected as compressibility index (Qui, et al., 2006). Compressibility index of kushtas were more than 37 and indicated that both *kushtas* have very, very poor flow properties (Aulton, 2009). However, the compressibility index of KAS-1 was less than that of KAS-2 indicating that KAS-2 was more compressible than KAS-1.

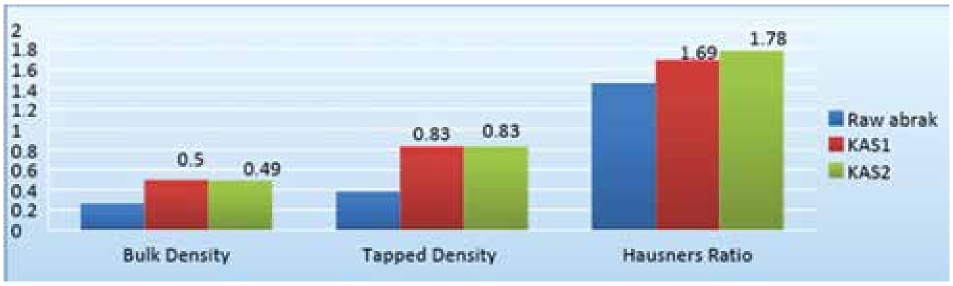

Fig.19: Comparative Bulk density, tapped density and Hausner's ratio of raw *abrak*, KAS-1 and KAS-2

pH values of both *kushtas* were alkaline. The pH value of KAS-1 and KAS-2 was 9.96± 0.01 and 9.60± 0.01 respectively in 1% and 10.87± 0.00 and 10.30± 0.01

respectively in 10% aqueous solution (Table 4). These results are in accordance with the fact that the pH value of water solutions of metallic oxides is basic (Qasmi, 2003). The percentage of loss of weight on drying at 105°C was found to be 0.095± 0.00 and 0.094± 0.00 in KAS-1 and KAS-2 respectively (Table 4). Shelf life of *kushta* as mentioned in classical literature is infinite and they become more and more potent with the advent of time. This negligible amount of moisture might be the factor responsible for high shelf life as it would not provide any medium for the growth of the microbes and restricts the chemical reactions. The mean percentage values of the total ash, acid insoluble ash, water soluble ash and water insoluble ash in KAS-1 were 93.04± 0.05%, 5.98± 0.01 %, 6.59± 0.07% and 86.45± 0.07 % respectively and 97.26± 0.03 %, 6.84± 0.01 %, 7.48± 0.00 % and 89.77± 0.04% respectively in KAS-2 (Table 4). High ash value in both *kushtas* showed the presence of very high inorganic content.

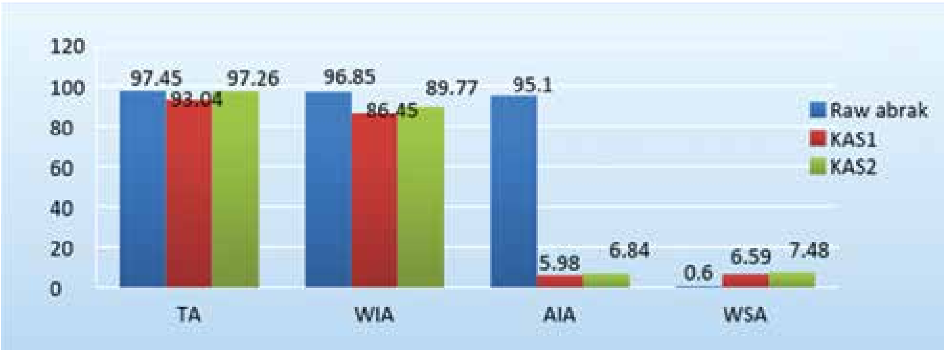

Fig. 20: Comparative total ash (TA), water insoluble ash (WIA), acid insoluble ash (AIA) and water soluble ash (WSA) of raw *Abrak*, KAS-1 and KA-S2

The mean percentage of the extractive value of KAS1 in petroleum ether, acetone, ethanol and water were 0.00± 0.00, 0.46± 0.03, 1.43± 0.03 and 5.23± 0.03 respectively and KAS 2 were 0.00± 0.00, 0.6± 0.00, 1.73± 0.03 and 5.73± 0.03 respectively (Table 4). Extractive values help in the determination of adulteration. *Kushta* extractive value is performed to extract out organic matter (Rasheed, et al., 2011). Low extractive values were indicative of very low organic matter and maximum quantity of inorganic substance in both *kushtas*.

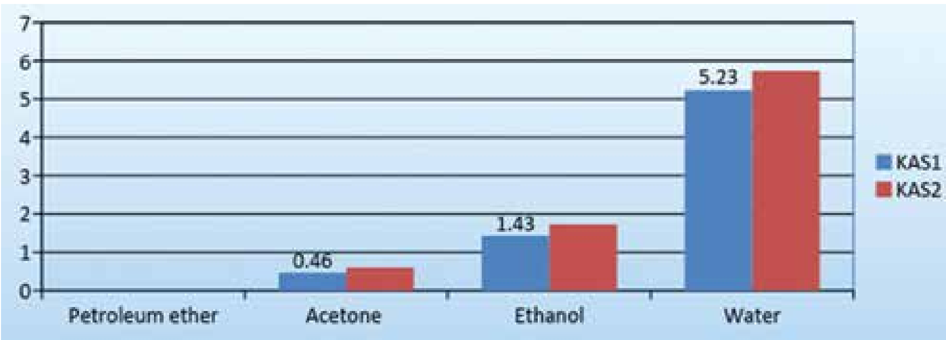

Fig. 21: Comparative extractive values of KAS-1 and KAS-2 in petroleum ether, acetone, ethanol and water

***LOD- Loss of weight on drying, AIA-Acid insoluble ash, WIA- Water insoluble ash, WSA-Water soluble ash**

Conclusion

The data generated from the present study suggest that the physico-chemical characteristics of KAS-1 and KAS-2 were similar without any significant difference before and after calcination. However, these kushtas(calcines) may be analyzed using more advanced and sophisticated analytical instruments like XRD, Particle size distribution, SEM, TEM, Energy Dispersive X Ray and AFM methods. Furthermore, work needs to be done using various animal models to evaluate the extent and scope of absorption and their elemental effect at tissue level.

Table 1: Observations while Detoxification of *Abrak*

S. No	Method	Weight Before detoxification (g)	Weight After detoxification (g)
1.	Method 1	50	48.62
2.	Method 2	50	49.70

Table 2: Physical Constants of Raw *Abrak*

S. No	Properties	Raw abrak
1.	Nature	Flaky (separable in thin layers)
2.	Colour	Greyish yellow
3.	Fracture	Uneven
4.	Luster	Splendent
5.	Cleavage	Absent
6.	Tenacity	Flexible
7.	Transparency	Translucent
8.	Hardness	2.5
9.	Specific gravity	2.6

Table 3: Preliminary Tests of Raw *Abrak*, KAS-1 and KAS-2

Properties	Raw *Abrak*	KAS-1	KAS-2
Colour	Greyish yellow	Yellowish white	White
Odour	Odourless	Odourless	Odourless
Taste	Tasteless	Tasteless	Tasteless
Touch	Smooth	Very Smooth	Very Smooth
Floating test	Absent	Present	Present
Fineness test	Fine	Very fine	Very fine
Wall stick test	Absent	Present	Present
Finger test	Negative	Positive	Positive
Lusture	Present	Absent	Absent

Table 4: Physico-chemical Parameters of Raw abrak, KAS1 and KAS2

	Raw Abrak	KAS Method 1				KAS Method 2			
Parameters	**Mean ± SEM**	**1**	**2**	**3**	**Mean ±SEM**	**1**	**2**	**3**	**Mean ±SEM**
Bulk Density	0.26± 0.00	0.50	0.50	0.50	0.50± 0.00	0.50	0.49	0.50	0.49± 0.00
Tapped Density	0.38± 0.00	0.84	0.83	0.84	0.83± 0.00	0.83	0.83	0.84	0.83± 0.03
Hausner's Ratio	1.46± 0.00	1.69	1.69	1.69	1.69± 0.00	1.78	1.787	1.78	1.78± 0.00
Carr's Index	31.57± 0.22	40.47	39.75	40.47	40.23± 0.24	39.75	40.96	40.47	40.39± 0.25
pH (1%)	7.92± 0.01	9.94	9.97	9.98	9.96± 0.01	9.59	9.63	9.60	9.60± 0.01
pH (10%)	7.78± 0.01	10.86	10.89	10.87	10.87± 0.00	10.28	10.33	10.29	10.30± 0.01
LOD* (%)	0.2± 0.00	0.095	0.095	0.095	0.095± 0.00	0.094	0.094	0.094	0.094± 0.00
Total ash (%)	97.45± 0.02	92.97	93.16	93.01	93.04± 0.05	97.20	97.31	97.27	97.26± 0.03
AIA* (%)	95.10± 0.01	5.97	6.01	5.98	5.98± 0.01	6.85	6.81	6.87	6.84± 0.01
WIA* (%)	96.85± 0.06	86.32	86.47	86.56	86.45± 0.07	89.70	89.84	89.79	89.77± 0.04
WSA* (%)	0.6± 0.07	6.65	6.69	6.45	6.59± 0.07	7.5	7.47	7.48	7.48± 0.00
Extractive values									
Petroleum ether	-	0.00	0.00	0.00	0.00± 0.00	0.00	0.00	0.00	0.00± 0.00
Acetone	-	0.5	0.5	0.4	0.46± 0.03	0.6	0.6	0.6	0.6± 0.00
Ethanol	-	1.4	1.5	1.4	1.43± 0.03	1.7	1.7	1.8	1.73± 0.03
Water	-	5.2	5.2	5.3	5.23± 0.03	5.7	5.8	5.7	5.73± 0.03

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सारांश

डिटॉक्सिफीकेशन की विभिन्न विधियों द्वारा अब्रक सफ़ेद का मफल फर्नेस में निस्तापन

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कुश्ता अब्रक सफेद एक यूनानी मिश्रण है जो सुआल (स्थायी खांसी/श्वसनीशोथ) और ज़ीकुन नफ़स (अस्थमा), के उपचार में उपयोग की जाती है। कुश्ताजात (कैल्सीन) ऑग्रेनो–खनिज महीन कण होते हैं जो खनिज के कई जड़ी–बुटियों से उपचार द्वारा तैयार किये जाते हैं और उचित ताप–उपचार के अधीन होते हैं। वर्तमान अध्ययन का उद्देश्य कुश्ता अब्रक सफेद के भौतिक–रासायनिक मूल्यांकन की तुलना करना है जो डिटॉक्सिफीकेशन की दो विभिन्न विधियों से तैयार की गई है। अब्रक का यूनानी साहित्य में वर्णित दो विधियों से डिटॉक्सिफीकेशन किया गया और उनके कुश्तास (कैल्सीन) को तैयार किया गया। संपूर्ण उत्पादों की भौतिक–रासायनिक विशेषताओं के लिए तुलना की गई। परिणाम बताते हैं कि दोनों कुश्तास की भौतिक–रसायनिक स्थिरता समान थी।

शब्द कुंजीः अब्रक, श्वसनीशोथ, डिटॉक्सिफीकेशन, कुश्ता (कैल्सीन), भौतिक रसायन, गुण