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PHYSICOCHEMICAL ASSESSMENT OF KUSHTA NUQRA: A UNANI FORMULATION

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ABSTRACT

Background and objective: Silver is a metal frequently used as a therapeutic agent in Unani system of medicine. It is mostly used in kushta form however, before using the metals or metallic compounds they are always subjected to processes called 'tasfiya' (detoxification). In present study, kushta nuqra was prepared by detoxifying Silver with method mentioned in the classical literature using quenching technique and physicochemical standardization data of the Kushta was recorded which can be used for future studies as a reference for Kushta Nuqra (KN). Methods: Detoxification of silver was done by quenching in aab leemun (Citrus Lemon) seven times. Detoxified silver was subjected to furnace for preparation of kushta (Calx). Temperature in furnace was regulated according to the thermogram prepared previously, by recording the temperature using pyrometer by means of preparing the kushta as mentioned in the classical text. Finished product was evaluated for physicochemical characteristics including preliminary and physicochemical parameters. Results: Bulk density 0.79±0.005, tapped density 1.18 ± 0.001, Hausner's ratio 1.48±0.008, compressibility index 32.79 ± 0.31, loss of weight on drying 0.003±0.00, pH of 1 % solution, 10 % solution (8.26±0.00, 8.39±0.003, total ash, acid insoluble ash, water soluble 99.70±0.005, 92.32±0.12, 3.55±0.13, water, alcohol soluble extractive value 0.039±0.00, 0.07±0.00 successive extractive values of petroleum ether, chloroform, alcohol (0.06±0.001, 0.016±0.001, 0.04±0.003 were reported in KN. Conclusion: This study was first of its kind where Kushta nuqra was prepared by classical detoxification process and observed on scientific parameters. Kushta was prepared in electric muffle furnace, which helped to achieve a better temperature control. The method of preparation and the results obtained can be taken as standard for future studies.

KEYWORDS: Unani system of medicine Physicochemical standardization; *Kushta Nuqra*; Calcination; Detoxification.

INTRODUCTION

There are four principal alternative systems of medicine practiced in India: Unani-Tibb, Ayurveda, Siddha and Homeopathy. These systems utilize drugs of natural origin constituting plants, animals and mineral preparations.[1] Unani system have ample description of useful metals and minerals such as gold, silver, copper, arsenic, gems and salts which are used successful in the management of various diseases. Earlier there was a perception that minerals are not compatible to human body at all, but now it has been reported that numbers of metallic compounds are essential for body and some are in the category of possibly essential elements.[2]

Before using the metals or metallic compounds, they are always subjected to processes called '*tasfiya'* or '*shodhana'* or purification. This is an idea to get rid of the impurities and their deleterious qualities. If '*tasfiya'* is not performed, their use is said to be injurious to the individual.[3] The physicians believe that the unique and repeated purification processes employed during preparation reduces the toxicity.[4] Further drugs are finely grounded in pestle and mortar with specified juice of known drugs for given time. Then mixture is sealed in an earthen pot using special process and calcinated in closed crucible in pits of different sizes having varying number of cow dung cakes. This provides different intensity of heat. The process is repeated till *kushta* is obtained.[5]

The advantages of these preparations over plant preparation is their stability, lesser dose and easy availability.[6] Silver is one of the metals known to ancient civilizations.[7] The first recorded use of silver for medicinal purposes dates back to eighth century. *Kushta nuqra* is cephalic tonic, cardiac stimulant, liver tonic, aphrodisiac and is useful in spermatorrhoea and nocturnal emission.[8] These detoxification process claims to purify the metal but very little is known

regarding the scientific validation and standardization of Kushta Nuqra.

Hence, the present study was carried out to detoxify *Nuqra* with C*itrus lemon* juice using quenching technique mentioned in the classics and scientifically validate the standards of Kushta Nuqra. Detoxified silver was subjected to the Muffle furnace for calcination instead of conventional *puta* as furnace allows better temperature control, temperature uniformity, and isolation of material being heated. Thus, standardize the finished product, modern analytical techniques of quality control were also employed along with classical techniques.

MATERIALS AND METHOD

Procurement of raw materials

I. Procurement of silver

7 biscuits of silver weighting 20 gm and 1 biscuit weighting 10 gm were purchased from Vega zeal marketing pvt. Limited, KR market, Bangalore with BRPL hallmark Ag 999. The 999 is the standard of purity.

II. Procurement of chemicals

All chemicals were purchased from Nice chemical pvt. Limited, Manimala road, Edapally, Kerela) and were of analytical grade.

Methods of Detoxification of Silver[9]

Silver was detoxified by method mentioned in classical literature.

1. Quenching with *aab leemun* (*Citrus limon* (Linn.)[9]

Preparation of *aab*

Leemun, imli and *angoor* were purchased from the local market of Bangalore.

a. Preparation of *aab leemun*: *Aab leemun* was collected by slicing *leemun* into two pieces and squeezing out the *aab*; then *aab* was filtered through cloth.

Procedure

20 gm of raw silver (Fig.1) was weighed and washed with plain water. In a vessel, 60 ml of liquid (aab leemun) was taken with the help of measuring cylinder. The sheet of silver was heated on gas stove and frequently turned upside down with the help of ladle to ensure uniform exposure to heat. When silver turned completely red hot, it was immersed quickly into the liquid. In the process of detoxification, quenching was repeated seven times with *aab leemun*.

Fig. 1: Raw silver.

Kushta Nuqra preparation

For the operation of heat in the furnace, a thermogram was prepared with the help of method prescribed for preparation of *kushta nuqra* in classical text. A 2×2×2 feet pit was dug and one cow dung cake weighing 2.5 kg was placed at the bottom. Then triturated *nuqra* sealed in a crucible was placed over it and again one cow dung cake weighing 2.5 kg was kept over it. Cakes were ignited from all sides,[9] and heat pattern was recorded at every 5 min with the help of pyrometer. Chatruvedi and Jha in their study emphasized the use of Muffle furnace (M.F) and opined that it helps to achieve a better temperature control.[10] The recorded heat pattern obtained from above mentioned process was applied in M.F (manufactured by Optics technology, Delhi, ISO 9001-2008) for the preparation of *Kushta Nuqra* by furnace method. (Fig.2).

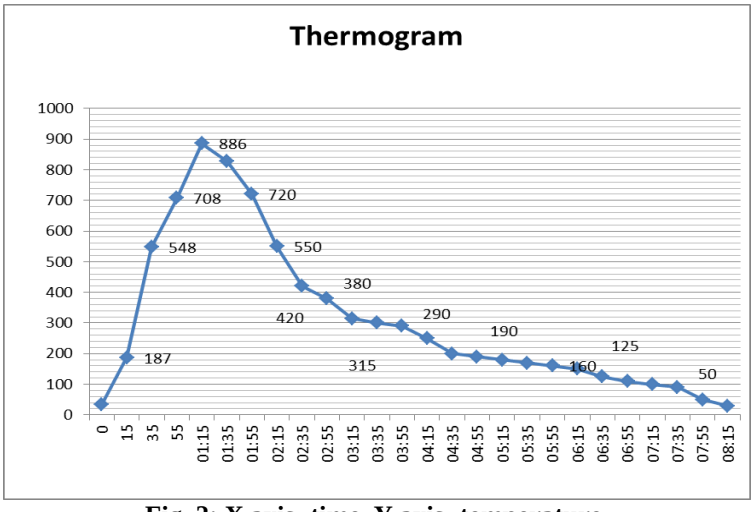


Fig. 2: X axis- time, Y axis- temperature.

Preparation of Kushta by furnace method

Quenched silver sheets were reduced to *buradah* (powder) with the help of *reeti.* Twelve grams of *buradah nuqra* (powdered silver) was taken and grinded in mortar and pestle with sufficient quantity of rose water for 3-4 hrs (Fig. 3). Then small pellets were made and dried (Fig. 3). For pelletisation a plastic tray was taken and a small amount of paste was placed over it and the surface of pellet was pressed with spoon so as to make the upper surface smooth. This was kept for drying under shade. After drying, the pellets were put in crucible (Fig. 4) in M.F wrapped in 30 gm of paste made from rose petals and placed in silica crucible, capped and placed in the furnace. Furnace temperature was maintained according to thermogram obtained from the classical method. After cooling, *kushta* was removed from furnace and powdered in a mortar (Fig.5) and the finished product was preserved in an air tight bottle.

Fig. 3: Silver powder being triturated in rose water.

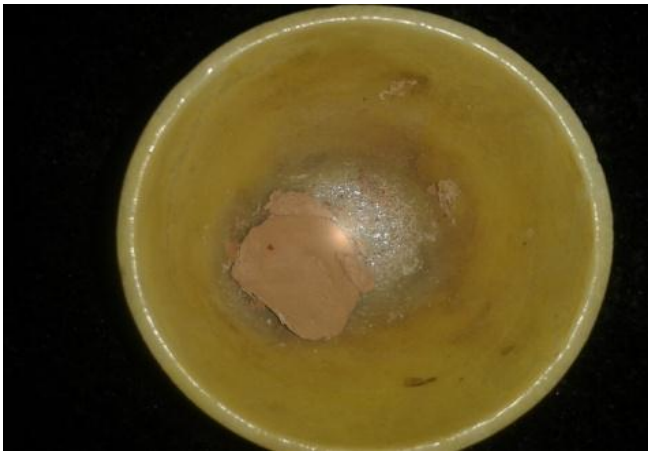


Fig. 4: Dried pellet of triturated silver.

Fig. 5: *Kushta Nuqra* triturated in mortar.

A) Physico-chemical Constants

The prepared *kushta nuqra* was evaluated for organoleptic properties like taste, odour, colour etc and classical parameters of *kamil Kushta* (ideal *kushta*) like floating test, grain floating test, wall stick test and finger test. Modern scientific parameters like bulk density, tapped density, Hausner's ratio, Carr's compressibility index was performed in density tester by LABINDIA model no. 1025. pH in 1% and 10% solution was observed by digital pH meter manufactured by Eutech instruments model no. 1544421. Loss of weight on drying was measured in hot air oven manufactured by LABLINE, Anmatrix instrument technologies. Loss of weight on ignition, total ash, acid insoluble ash, water soluble ash, water insoluble ash was done with the help of M.F (Manufactured by Optics technology, Delhi, ISO 9001-2008). Successive and non- successive extractive value were also assessed.

1. Organoleptic characters of *Kushta Nuqra*

Prepared *kushta* was evaluated for its colour, odour, taste and lusture.

2. Preliminary testing's

(i)Floating test[11]

Small quantity of *kushta* was sprinkled on water and observed if it floats on the surface or not.

(ii) Fineness test[11]

Fineness and smoothness were recorded by rubbing a small quantity of *kushta* between the index finger and thumb and noted whether it deposit into crease and lines on ventral aspect of finger.

(iii) Loss of metallic lusture[11]

Kushta was examined for metallic lusture, with naked eye in sun light.

(iv) Wall stick test

Kushta was also examined by throwing on the wall to check whether it stick to the wall or not.[12]

3. Physicochemical tests

a. Bulk density and tapped density[13]
b. Hausner's ratio[14]
c. Compressibility index[15]
d. Loss of weight on drying[16]

Determination of moisture content using toluene distillation apparatus,[17]

e. Determination of Loss on Ignition (LOI),[18]
f. pH value of 1% and 10 % solution
g. Total ash,[19]
h. Acid insoluble ash
i. Water soluble ash
j. Determination of extractive values
A) Successive extractive value[20]
B) Non-successive extractive value

Table 1: Organoleptic Description.

Character	KN
Colour	Reddish
Taste	Tasteless
Smell	Odourless
Appearance	Lusterless

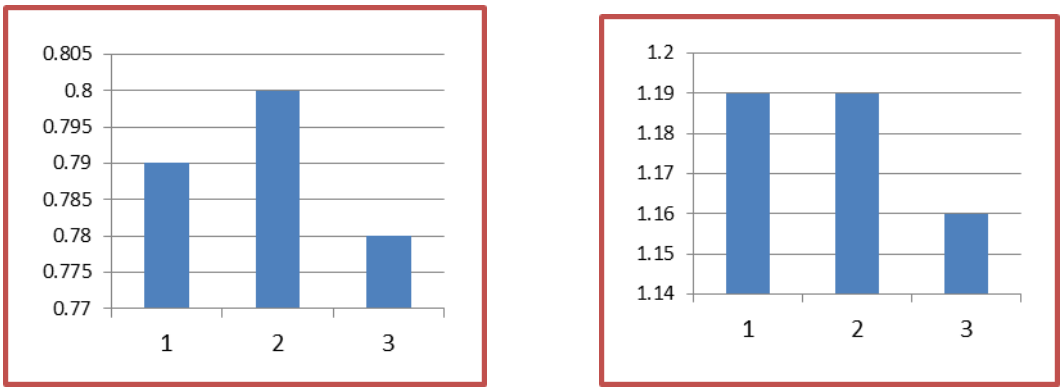
Table 2: Preliminary Tests of KN.

Preliminary tests	KN
Floating test	Positive
Fineness test	Very fine
Loss of metallic luster	Yes
Wall stick test	Positive

Table 3: Physicochemical test of *Kushta Nuqra.*

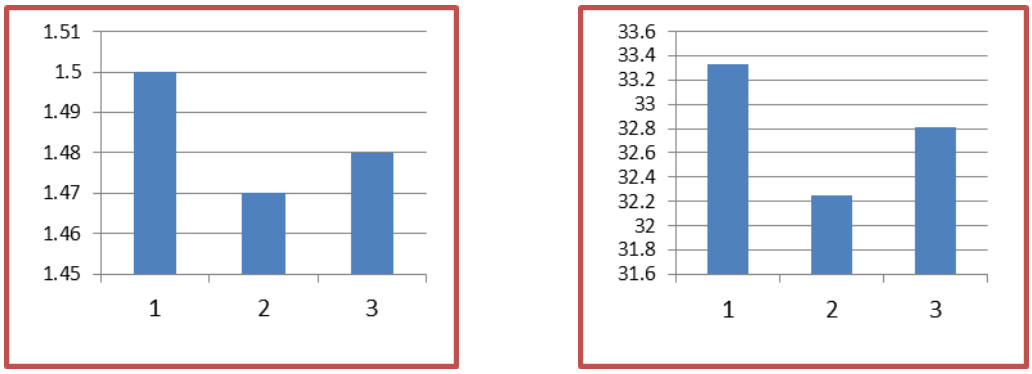
Parameters	1	2	3	Mean ±SEM
Bulk Density	0.79	0.80	0.78	0.79±0.005
Tapped Density	1.19	1.19	1.16	1.18±0.001
Hausner's Ratio	1.5	1.47	1.48	1.48±0.008
Carr's Index	33.33	32.25	32.81	32.79±0.31
pH (1%)	8.26	8.26	8.26	8.26±0.00
pH (10%)	8.51	8.52	8.52	8.51±0.003
Loss of weight on drying (%)	0.003	0.004	0.003	0.003±0.00
Loss of weight on ignition (%)	0.06	0.07	0.06	0.06±0.003
Total ash (%)	99.71	99.70	99.71	99.70±0.005
Acid insoluble ash (%)	92.54	92.11	92.32	92.32±0.12
Water insoluble ash (%)	96.01	96.26	96.18	96.15±0.07

Water soluble ash (%)	**3.7**	**3.44**	**3.53**	**3.55±0.13**
Water soluble Extractive value (%)	**0.038**	**0.040**	**0.041**	**0.039 ± 0.00**
Alcohol soluble Extractive value (%)	**0.07**	**0.07**	**0.07**	**0.07± 0.00**
Petroleum ether soluble Successive Extractive value (%)	**0.064**	**0.070**	**0.069**	**0.06±0.001**
Chloroform soluble Successive Extractive value (%)	**0.015**	**0.019**	**0.014**	**0.016±0.001**
Alcohol soluble Successive Extractive value (%)	**0.05**	**0.05**	**0.04**	**0.04±0.003**



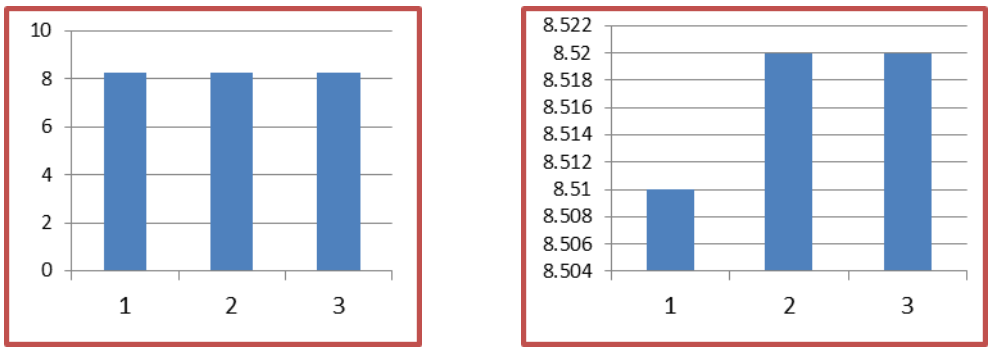
(a) **(b)**

Fig: (a) Bulk and (b) Tapped Density of KN.



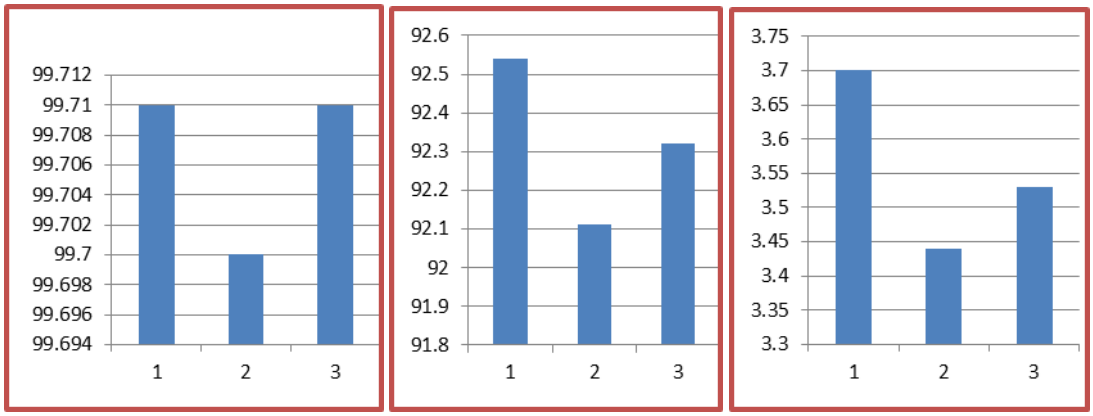
(a) **(b)**

Fig: (a) Hausner's Ratio and (b) Compressibility Index.



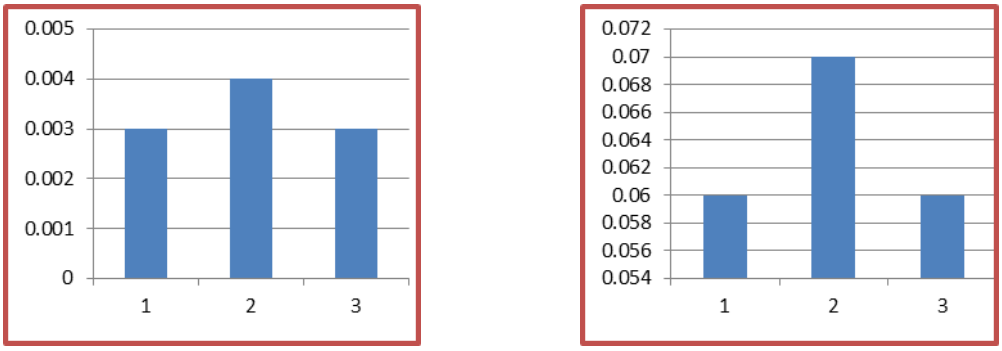
(a) **(b)**

Fig : (a) 1% pH values and (b) 10 % pH Values of KN.



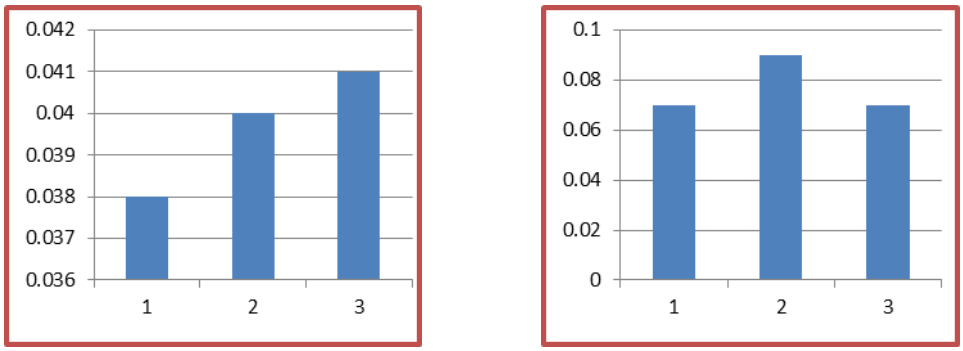
(a) (b) (c)

Fig. 5: (a) Total Ash (b) Acid Insoluble and (c) Water Soluble Ash of KN.



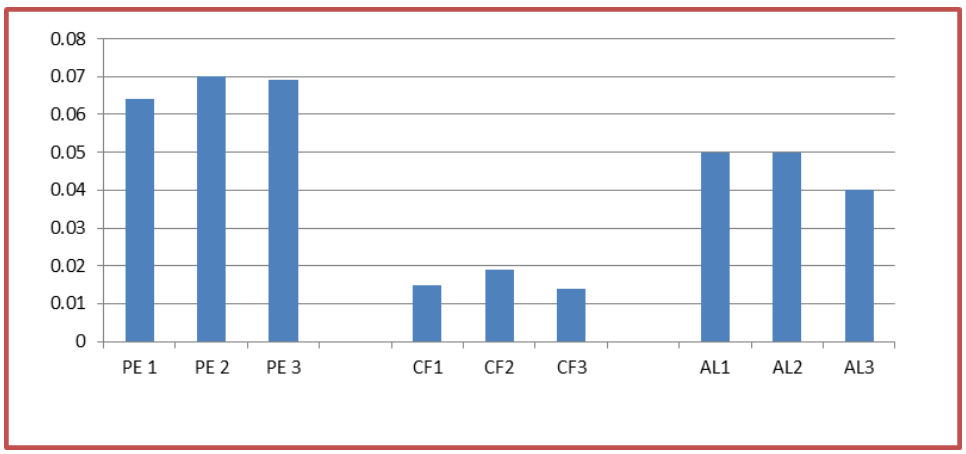
(a) (b)

Fig. 6: Loss of Weight on (a) drying and (b) Ignition of KN.



(a) (b)

Fig. 7: Non successive Extractive Values of KN in (a) Water (b) Alcohol.



***PE: Petroleum Ether; CF: Chloroform; AL: Alcohol**

DISCUSSION

In this study, the mean value of bulk density of KN was 0.79±0.005 gm/ml. The mean value of tapped density of KN was 1.18±0.001 gm/ml. Determination of bulk and tapped densities is a method to determine the bulk densities of powder under loose and packed conditions respectively. It is one of the measures of packing, compressibility and flow properties. The mean value of Hausner ratio of the powder of KN was 1.48±0. The mean value of Compressibility Index the powder of KN was 32.79±0.31%. Hausner's ratio and compressibility index of *kushta* was greater than 1.2 and 23 respectively hence indicating poor flowability.[21] The pH value of KN was 8.26± 0.00 in 1% aqueous solution. The pH value of KN was 8.51±0.003 in 10% aqueous solution. This study is in accordance to the fact the pH value of water solutions of metal oxides are basic.[22] e.g.

$$MgO + H_2O \longrightarrow Mg(OH)_2$$
$$CaO + H_2O \longrightarrow Ca(OH)_2$$

Moreover it is mentioned that most of the *kushtajat* are alkaline.[23] pH of the drug is also an important parameter to assess the quality of drugs. The percentage of loss of weight on drying at 105°C was found to be 0.003±0.00. The percentage of loss of weight on ignition of KN was 0.06±0.003. Loss of weight on drying and ignition are methods for measuring the loss in mass of the sample during drying and ignition respectively. These are done to determine the amount of water, all or a part of the water of crystallization or volatile matter in the sample which is removed during drying and ignition.[16] Shelf life of *kushta* is infinite and they become more and more potent with the advent of time. This very low or absent moisture content and negligible loss of weight on drying might be the factor responsible for this high shelf life as low moisture control would not provide any medium for the growth of the microbes. The mean percentage values of the total ash, acid insoluble ash, water soluble ash and water insoluble ash in KN were 99.70±0.005%, 92.32±0.12 %, 3.55±0.13% and 96.13±0.10% respectively. High ash value shows the presence of very high inorganic content. The mean percentage of the water and alcohol soluble extractive value of KN was 0.039 ± 0.00% and 0.07±0.00% respectively. Extractive values help in the determination of the adulteration and is an index of the purity of the drug. In case of *kushta* extractive value is performed to extract out organic matter if present.[24] In this study very low extractive values in non successive and successive extraction were indicative of very low content of organic matter and maximum quantity of inorganic substance in KN. It also shows that *kushta* was prepared over 360^{o}C temperature, which is high enough to burn all organic matter. It confirm the purity of the finished product.

CONCLUSION

In this study the quality of the prepared *kushta* was established using traditional and modern standardization techniques. The strength of the study, this study was first of its kind where *Kushta nuqra* was prepared by following detoxification method and observed on scientific parameters. *Kushta* was prepared in electric muffle furnace, which helped to achieve a better temperature control and ease of access. Further it is recommended, that the therapeutic efficacy of both *kushtajat* should be evaluated by animal and clinical trials.

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