



Concept of Kshara Nirmana Out of Kanji with Reference to Rasayansara- A Pharmaceutico-Analytical Study

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

Kanji (sour rice gruel) is an acidic fermented preparation mentioned in many of the Ayurveda classics for various purpose like therapeutic use, pharmaceutical processes etc. A special method of *kanji* preparation is mentioned in *Rasaratnasamuchchaya* commentary by Acharya Dattatreya Anant Kulkarni and similar preparation is also mentioned in *Rasayansara* book recommended for the *Parada samskara* (mercurial processes) with some difference in ingredients. *Kshara* (alkaline preparation/ alkali) is an important preparation mentioned in classics. In *Rasayansara* text, Acharya Shyamsundar Vaishyaji has described a unique method of *Kshara nirmana* out of the leftover material of the *Kanji*. This kind of innovative methods should be adopted to recycle the leftover

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waste matters. It will help in regenerate the new pharmaceutical product. Here an attempt has been done by preparing the *kanji* and the *kshara* out of its residue material as mentioned in *Rasayansara*. First *Kanji* was prepared as per the reference of *Rasayansara* book and the leftover after filtration was dried. The *kshara* was prepared out of this dried leftover. Organoleptic and physicochemical analysis of the prepared *kshara* was done. The average yield of obtained *kshara* was 4.88%. The moisture content of the final product found very less while total ash value found on higher side. The pH value suggests its alkaline nature. It shows good solubility in various solvents and good water-soluble extractive value. Exploration of such innovative procedures where waste stuff is been recycled should be increased in present time.

Keywords: *Kanji; Kshara; Rasayansara; Ayurveda.*

1. INTRODUCTION

In the present era, *Ayurveda* (science of life) is witnessing a global acceptance and demand of the *Ayurveda* medicines and therapies are drastically increased in recent time. Ultimately, a great boom has been noticed in the *Ayurved* pharma industries within last few years. With the increased production of the medicines, resulting the growth in the pharmaceutical waste matter. They are generating large volume of solid waste, oil waste, plant extract waste, residue of many filtrates used in various processes like *kwatha* (decoction), *swarasa* (juice) etc. Pharmaceutical waste management is also an important task to be done in this industry. This management needs numerous processes like treatment, deep burring, incineration etc. As mentioned in *Rasayansara* book [1], there is no waste matter of *Rasayanshala* (*Ayurveda* pharmacy) which cannot be reused by reprocessing it. All the leftover material can be recycled and another useful secondary drug or product can be prepared out of these waste materials. In this classical book many procedures has been introduced suggesting the reuse of the residue of pharmacy like preparation of *Sangraha Sindura rasa* [2], *Bhasmani kosha* etc. In the preparation of *Sangraha Sindura rasa* method, it is mentioned that it can be made out of the broken glass bottles obtained during the preparation and collection of *Chandrodaya rasa*, *Sindura rasa* etc where the sublimation process carried out by *kupipakwa* method (special method of drug preparation using glass bottle). *Bhasmani kosha* [3] is also mentioned where preparation of *Rasasindura* (a mercurial preparation) is advocated out of the debris of the *Hingulottha Parada* (extraction of mercury from cinnabar by sublimation process). Nowadays recycling and re-use of various *ayurvedic* pharmaceutical wastes are growing steadily. Various cost-effective methods are developed and are being coming in force these days. In the procedure of *kanji nirmana*, the leftover is usually thrown away

as waste product. But it can be recycled and another useful product can be prepared by processing the leftover of *Kanji*. *Kshara* preparation out of the left-over materials of the *kanji* is one of the procedures elaborated in this classic. *Kanji* is a type of *Shukta kalpa* (Acidic preparation/vinegar) which comes under the *Sandhana Kalpana* (Fermentative products). It is generally prepared by using incompletely boiled *Masha dhania* (*Phaseolus mungo* Linn) with gruel prepared out of *Rakta Shali* (*Oryza sativum*) by employing fermentation process. The properties of the *kanji* are *Jeevaniya* (nourishing), *Daha nashan* (relieves burning sensation), *Vata Kaphahara* (alleviate vata and kapha-bodily humour), *Trushnahara* (pacify thirst) and *Laghu* (lightness) [4]. *Kshara* is defined as the one which destroys or removes the unhealthy tissue from the body [5]; or removes the vitiated *dosas* (bodily humour). It is widely used and recommended because it can be used safely on the patients who are afraid of surgery. *Kshara* is an alkaline substance obtained from the ash of herbal, mineral or animal source of origin drugs [6]. According to the *Ayurvedic* Formulary of India, *Kshara* are alkaline substance obtained from the ash of drugs [7]. The process of *Kshara* preparation is done by extraction from the ash of dried drugs which are rich in alkali. *Ksharas* are supposed to be helpful and used in the diseases which are difficult to cure [8]. The properties of the *kshara* are *tikshna* (sharp), *maha ushna* (very hot), *dahak* (burns), *pachak* (digestant), *mutral* (diuretic), *kruminashak* (anthelmintic) and *Vrana shodhak*, *ropak* (Cleansing and healing of wounds) [9]. The main *kshara* prepared and used in *Ayurveda* are *Apamarga* (*Achyranthes aspera*) *kshara*, *Tilnal* (*Sesamum indicum*) *kshara*, *Chincha* (*Tamarindus indica*) *kshara* etc. The *kanji vidhi* (procedure) explained in this treatise, is used for *dhatu shodhana* (purification of metals) and *Parada swedana samsaka* (sudation process of mercury). A special method of the preparation of *kanji* for *Parada samskara* is also

mentioned in commentary of *Rasaratna samuchhaya* [10] by Acharya Dattatreya Anant Kulkarni. But there is little variation in the ingredients like *mulika* (radish) not used in the *Rasayansara* method.

2. MATERIALS AND METHODS

For the current study, the *kanji nirmana* and *kshara nirmana* was done as per the method mentioned in *Rasayansara* text. This *kanji* was obtained from herbo-mineral source of origin drugs and the *kshara* obtained from left out of these drugs mainly containing the herbal drugs. They were carried out in the GMP certified Parul Ayurved Pharmacy and puta section of the pharmacy, analysis of the finished drug was carried out at central QC lab. Parul institute of Ayurved, Parul university, Vadodara Gujarat. This part of the study includes two main segments. First the preparation of the drug and second analysis of the final product. The preparation of the product can be divided into two parts viz. *kanji* preparation and *kshara* preparation.

A. Kanji preparation [11]

All the ingredients (Image 1) were taken in the mentioned proportion. Powdering of the dried raw drugs were carried out like *rajika*, *saindhava*, *haridra*, *shunthi* and *jiraka*. *Hingu* was taken in *shodhita* (purified) form and powdered it. All the powders were filtered through cloth. *Vamsha patra* (Bamboo leaves) were cut down into small pieces. All the ingredients, their English/ Latin name and their classical weights, metric weights are compiled in Table 1.

First rice cooked by adding 14 times potable water. It was filtered and *Manda* [12] (supernatant rice gruel after cooking) was collected. The *Kulattha* was taken in another

vessel and 8 times of water added to it and boiled over mild fire until the liquid reduced to 1/4th part [13]. It was then filtered through cloth and collected as *Kulattha kashaya* (decoction). Thereafter one big container taken and smeared with mustard oil from inside. The powdered drugs put into this container and liquids like *Manda*, *Kulattha kashaya* added to it. Potable water in 20 *ser* (18.660 litre) quantity was added to the container, pieces of bamboo leaves added to it and mixed the mixture well. Then *vataka* (fritters) of *masha* flour made and fried into *sarshap taila*. These fritters cut down into pieces and added to the container (Image 2). All the mixture mixed well again and closed with airtight closure, *sandhibandhana* (sealing with mud smeared cloth) was done. After one week the sealing was opened and *kanji* was filtered through clean cloth (Image 4). The residue remained above the cloth was collected and dried into hot air oven. This residue mainly contains bamboo leaves, *masha vataka*, parts of *rajika*, *haridra*, *shunthi*, *jiraka* etc. This dried material was used for the next procedure of *kshara nirmana*.

B. Kshara preparation: [14,15 & 16]

The dried residue of *kanji* was taken in a *loha katahi* (iron dripping pan) of suitable size. It was subjected to the fire and burning continued till the whole content burnt and turns to the ash. This procedure was done in an open vessel. It was then left for self-cooling. On next day, the ash was collected and 6 times of water added to it. It was mixed and macerated well with the hands. It was then kept overnight undisturbed. On next day, the supernatant water was siphoned out in a vessel and this obtained liquid was filtered through single folded cloth for twenty-one times. The final filtrate was placed over the moderate fire until the whole water content gets evaporated to obtain the final product of *kshara*.

Table 1. Ingredients with quantity used for *Kanji* preparation

Ingredient name	English/ Latin name	Classical quantity	Weight in Metric unit
<i>Rajika</i>	<i>Brassica juncea</i> L	1 <i>ser</i> (<i>setmana</i>)	933 gm
<i>Saidhava</i>	Rock salt	2 <i>ser</i>	1866 gm
<i>Kulattha</i>	<i>Dolichos biflorus</i>	2 <i>ser</i>	1866 gm
<i>Tandula</i>	<i>Oryza sativa</i>	2 <i>ser</i>	1866 gm
<i>Haridra churna</i>	<i>Curcuma longa</i> L.	½ <i>ser</i>	467 gm
<i>Vamsha patra</i>	<i>Bambusa bambos</i>	½ <i>ser</i>	467 gm
<i>Shunthi</i>	<i>Zingiber officinale roscoe</i>	¼ <i>ser</i>	233 gm
<i>Jiraka</i>	<i>Cumin cyminum</i> L	¼ <i>ser</i>	233 gm
<i>Hingu</i>	<i>Ferula asafoetida</i>	½ <i>pala</i>	24 gm
<i>Masha</i>	<i>Vigna mungo</i>	½ <i>ser</i>	467 gm
<i>Sarshap taila</i>	Mustard oil	Q.S.	-

Analysis of the final product [17,18,19]

The analysis of the prepared *kshara* was carried out for organoleptic characteristics and physicochemical analysis. The colour, odour, taste and consistency was noted. Analysis tests like Loss on drying, Total ash, Acid-insoluble ash, water-soluble extractive value, alcohol-soluble extractive value, pH and solubility in various solvents were carried out as per standards of The Ayurvedic Pharmacopoeia of India (API) and results were recorded.

1. pH(18)- Determination of pH was done with the help of pH meter to test the acidity or alkalinity of the drug. The drug taken was in 10 % aqueous solution. Before testing the drug, pH meter was calibrated with standard buffer solution of 4, 7 and 9.2 pH.

2. Loss on drying: Loss on drying or moisture content determined by taking accurately measured 2 gm of sample in an tared evaporating dish and place it into hot air oven at 105°C for 5 hrs and weight. Drying was continued till constant weight in two consecutive readings obtained. The percentage of loss on drying is calculated by formula

% Moisture content = (Initial weight of sample - weight of sample after drying/Initial weight of sample) X 100

3. Water-soluble extractive value: Accurately weighed 2.5 gm air dried sample taken in a closed conical flask containing 50 ml of water and kept for 24 hrs. For first six hrs it is shaken intermittently and kept undisturbed for next 18 hrs. Then filtered rapidly and pipette out 25 ml filtrate in an evaporating dish. This dish placed on hot water bath and the residue dry at 105°C to constant weight. The percentage of water soluble extractive was calculated by formula

% Water-soluble extractive = (weight of residue/ weight of the drug) X 100.

It is expressed as percent w/w of the air dried drug.

4. Alcohol-soluble extractive value: Accurately weighed 2.5 gm air dried sample taken in a closed conical flask containing 50 ml of methanol and kept for 24 hrs. It is kept shaking frequently for first six hrs and allowed stand still for next 18 hrs. Then filtered rapidly and pipette out 25 ml filtrate in an evaporating dish. This dish

placed on hot water bath and the residue dry at 105°C to constant weight. The percentage of alcohol soluble extractive was calculated by formula

% Alcohol-soluble extractive = weight of residue / weight of the drug X 100. It is expressed as percent w/w of the air dried drug.

5. Total Ash: Accurately weighed 2 gm of sample taken in a crucible and placed in electric muffle furnace at a temperature not exceeding 450°C to obtain ash free from carbon. It is then allowed for self-cooling and weighed. The percentage of total ash calculated with reference to the air dried drug. Percentage of total ash is calculated by using formula

% Total Ash = (Weight of crucible with ash - Weight of empty crucible/ Initial weight of sample) X 100

6. Acid insoluble ash: The ash obtained by total ash method, is collected and taken in a beaker containing 25 ml 0.5 N Hydrochloric acid. It is then boiled over hot water bath for 5 minutes and filtered through whatman ash-less paper. The insoluble matter on ash-less filter paper washed with one litre of hot water. The ash-less filter paper then dried and placed in electric muffle furnace for burning. The weight of acid insoluble ash obtained calculated after self-cooling. The percentage of acid insoluble ash calculated with reference to the air dried drug. The percentage of the acid insoluble ash is calculated by formula

% of acid insoluble ash = (Weight of acid insoluble ash / weight of air dried drug) X 100

7. Solubility in various solvents: The solubility is the ability of a solute to dissolve in solvent to form a solution. It is measured by the concentration of the saturated solution.

3. RESULTS AND DISCUSSION

Pharmaceutical results: There are more than 30 *ksharas* mentioned in Brihatrayi [20] but the *kshara* mentioned here is different in terms of the ingredients used for the *kshara* preparation. Also, there are numerous procedures mentioned for the *kshara nirmana* with different proportion of water need to be added with ash, different number of filtrations through cloth with cloth folds used for filtration and the different time used for soaking the Ash. In present study, the method

adopted was that recommended by Acharya Yadavaji Trikamji. This procedure is commonly followed. Overnight soaking was done to extract the *kshara* and filtration was done 21 times for complete the ash-less, clear filtrate. Hence this method was adopted. When the *kanji* was filtered and the residue taken out, dried in hot air oven; the weight of this dried residue (Image 5) was 1230 gms. It was then burnt in the puta section of the Parul Auryved pharmacy using gas burner. The weight of ash (Image 7) obtained after burning and self-cooling was 780 gms. This ash was then mixed with six times of water i.e. 4680 ml w/v and kept overnight for soaking. Next day morning, the supernatant clear liquid was siphoned out (Image 9) with the help of rubber pipe and collected in a suitable sized vessel. The obtained clear liquid which was 3820 ml, then filtered through single folded clean cotton cloth for twenty-one times. After 21st time filtration, the liquid obtained was 3160ml. It was then subjected for heat on moderate fire until all the liquid part evaporates leaving white coloured salty solid substance at the bottom of the vessel.

It was then scrapped, collected and triturated to make fine powder. It was stored in a glass container. As the final product is hygroscopic in nature hence, it should be stored in an airtight container only.

The weight of final product (Image 11) was 38.1 gms. The percentage of yield (4.88% w/w of ash) was less than the average percentage of usual *kshara* like *Apamarga*, *Chincha* etc. This could be due to the percentage of *kshariya* properties may more in the routine *kshara* drugs than the ingredients used in the present *kanji kshara*. Entire pharmaceutical process of *kshara nirmana* is tabulated weight wise or volumes wise as per the Table 2.

Analytical results: The obtained *kshara* was then tested for the organoleptic characteristics, physicochemical parameters and solubility in specified solvents.

The taste of final product was salty as it is an alkaline preparation.

Table 2. Process wise weight of product

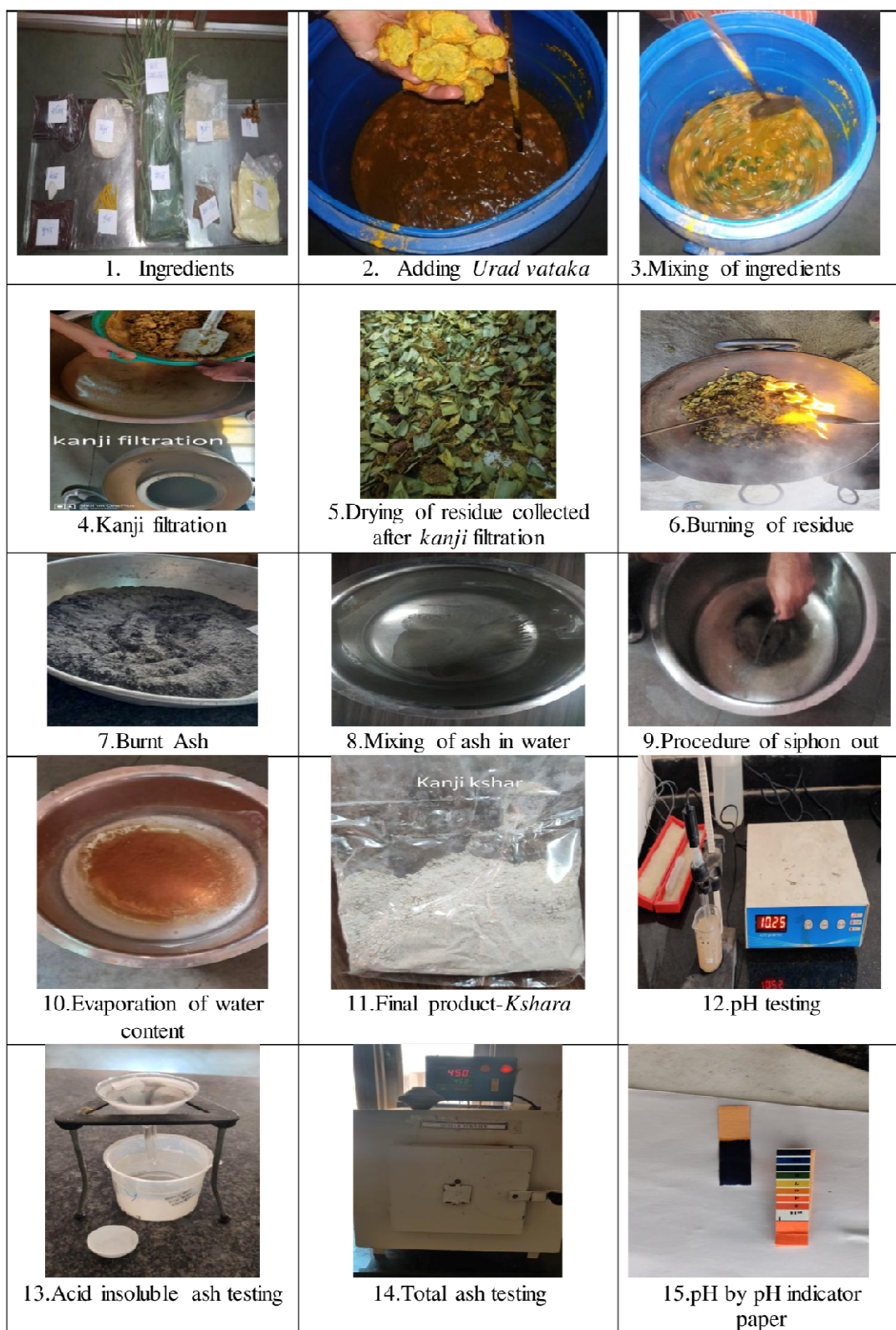
Sr No	Name of process	Weight / Volume/ yield
1	Dried Kanji residue	1230 gms
2	Ash (After burning residue)	780 gms
3	Water added to Ash (w/v of Ash)	4680 ml
4	Liquid after siphoned out	3820 ml
5	After 21 times filtration	3160 ml
6	Final <i>Kshara</i>	38.1 gms
7	Final yield percent (w/w of Ash)	4.88%

Table 3. Organoleptic characteristics of Kanji Kshara

S NO	Parameters	Observations
1	Color	Grey
2	Odor	None
3	Taste	Salty
4	Touch	Rough
5	Consistency	Solid (Granular form) powder

Table 4. Physico-chemical characteristics of Kanji Kshara

S No	Parameters	Results
1	Loss on Drying at 105°C (% w/w)	0.2
2	Total Ash Value (% w/w)	98.45
3	Acid Insoluble Ash (% w/w)	0.95
4	Water Soluble Extractive Value (% w/w)	40.44
5	Alcohol Soluble Extractive Value (% w/w)	9.41
6	pH (Using pH meter) (10 % aq. Solution)	10.25



Images 1-15.

Table 4. Solubility in different solvents of Kanji Kshara

Sr No	Solvents	Results*
1	Water	+++
2	0.5 N HCl	+++
3	Ethanol	+++
4	Chloroform	+
5	Diethyl ether	+++

*(++++) Very soluble, (+++) Freely soluble, (++) Soluble, (+) Sparingly soluble and (-) Insoluble

The percentage of loss on drying found very less as there was nearly no moisture content. The total Ash value was higher as the final product is outcome of completely burnt substance. The pH done by pH indicator paper also shows the pH 10.5 (Image 15). pH value was suggestive of alkaline and so corrosive nature of the product. The pH obtained is more suitable for the internal use. For the external use more alkalinity than obtained is required [20]. The water soluble extractive value found was less as compared to the *kshara* prepared by other classical method like *Apamarga kshara*. It may be because of the residue was in contact with water for seven days during kanji process and some part of water soluble extractive may have been lost during that process.

The final product was freely soluble in water, HCl, Ethanol and Diethyl ether while it was sparingly soluble in Chloroform. It shows a good solubility nature of the drug except in chloroform. This suggests the possible good absorption rate of the drug.

The *kshara* prepared by this method out of residue of *kanji*; can be used as appetizer. Also, if used in the formulations like *Vajrakshar*, *Gandhak vati*, *Lavanbhaskar churna*, *Vadvanala churna* etc., then it will be beneficial in the patients suffering from loss of appetite [21]. Images of the entire process are attached below. The process of *Kanji* preparation is shown from Images 1 to 4. Process of *kshara* preparation is shown from Images 5 to 11. Analytical study was done and shown from Images 12 to 15.

4. CONCLUSION

As per *Rasayansara* text, any remained material of the ayurvedic pharmacy should not be thrown away. They can be processed again to obtain the secondary preparation which can be used in various formulations as well as for therapeutic purpose. Such procedures should be validated

and promoted for recycling of the pharmaceutical left-over materials which may be useful in another way. The method of *kshara* preparation mentioned in *Rasayansara* book can be adopted as the present pharmaceutical and analytical study shows acceptable results. *Kshara* can be used both internally and externally. Usually the *kshara* has the utility of making *Ksharsutra* (medicated caustic thread) and use externally or for *Paniya kshara* preparation and use internally. But, here a different aspect of *kshara* can be seen in terms of its ingredients and its use. Other processes mentioned in the *Rasayansara* book should also be revalidated and bring in light where recycling of the residual matter of the pharmacy is advocated. An exploration of such innovative methods is need of the hour and should be focused to support more use and recycling of pharmaceutical industrial waste stuff.

CONSENT

It is not applicable.

ETHICAL APPROVAL

As per international standard or university standard written ethical approval has been collected and preserved by the authors.

DISCLAIMER

The products used for this research are commonly and predominantly use products in our area of research and country. There is absolutely no conflict of interest between the authors and producers of the products because we do not intend to use these products as an avenue for any litigation but for the advancement of knowledge. Also, the research was not funded by the producing company rather it was funded by personal efforts of the authors.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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