

Organoleptic Properties of Chocolate Coated Chinese Chestnut

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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

Chinese chestnuts native to countries like Taiwan, China, Korea shows a great tool as to deal with several body ails. The main objective of this experimental study was to standardize and develop the value product from Chinese chestnut to alleviate ails in all age groups.

Not only to add value to the product but also to introduce the nut to the people residing in different parts of but also to people all over the world. As there are limited number of studies focusing on the presence of vitamins in *Castanea crenata*, *C. dentata* and *C. mollissima*.

The study was carried out to use Chinese chestnut with three different chocolates and flaxseeds for production of the confection- chocolate coated chestnut and flaxseed mix.

The raw material was obtained from Uttarakhand and was processed later using methods like roasting, sun drying etc.

For the packaging of the products, colorful foils were used as primary packaging material and then attractive cardboard boxes as the secondary packaging, which protects the confection against

biological, chemical, physical factors. These confections were prepared from Chinese chestnut and are evaluated for their sensory properties. In sensory evaluation all three confection samples T1, T2, T3 were accepted.

Keywords: Chinese chestnut; chocolate; sensory evaluation; alleviating ails; packaging.

1. INTRODUCTION

Chestnuts are ruck of Northern Hemisphere temperate and native, have eight to nine species of deciduous trees and shrubs in the genus *Castanea*, in the beech family Fagaceae. These chestnuts have been most important edible fruit in China, having history of around 2000 years. There is heterogeneity in this genus- *Castanea sativa*, *C. dentata*, *C. mollissima* etc [1-9].

The Chinese Chestnut, also known as *Castanea mollissima*, where *mollissima* means “soft” in Latin, and is in reference to the fuzzy leaf undersides and downy twigs and is cultivated in East Asia but is also native to countries like China, Taiwan and Korea. And owes its name due to the thick pubescence on the buds and the abaxial sides of its leaves.

It is a packet full of good source of health promoting compounds like vitamins and minerals i.e., vitamin E, Vitamin A, Vitamin B, Calcium, Magnesium, Zinc, Iron, Copper, Manganese etc [8-14].

28.35 grams of raw Chinese chestnuts covers 12.46 grams of water with 64 calories, 1.19 grams of protein, and 0.31 grams of total fat with 0.47 grams of ash and 13.91 grams of carbohydrate. The same amount offers 19.74% of manganese, 11.44% of copper, 11.33% of Vitamin C, 10.70% of carbohydrate, 8.92% of Vitamin B6, 5.71% of magnesium and 5% of iron.

Chestnuts can be processed at home and also undergo industrial processes in order to improve its organoleptic properties (aroma, flavour, texture) and digestibility. Also amylose and amylopectin are the main types of starch in these nuts and are a critical part of the functional and physico-chemical properties of starch [15].

The high tannin content in the nut is responsible for the astringent bitterness and its lower palatability making it highly suitable for processing and an array of novel uses (Wani et al., 2017).

The chestnuts are low in fat and but are high in vitamin C, which makes them more fruit than true nuts. They are dark brown shells, shiny spiral husk, which is to be broken before consuming it. The vitamin C is lost while it is boiled therefore roasting at lower temperature is preferred over boiling. As boiling reduces the amount of reducing sugars, sucrose, glucose and fructose, also a fact attributed to the solubilization of those carbohydrates. Starch is also markedly affected by cooking and decreases upon roasting and boiling as recorded in *C. mollissima* [16].

The community with least reach with the different commodities like wheat flour relied on chestnuts for carbohydrates. When compared with other staple starch foods such as potatoes, the starch content is approximately double or triple in chestnuts, making them a very popular an appreciated nut with potential health benefits like it can prove to be healthy source of energy.

Moreover, the chestnut starch content exhibits lower gelatinization (56.1°C) and peak viscosity (79.5°C) temperatures, which compare favorably with corn starch, especially in applications where lower processing temperatures are needed [17].

Flaxseed with Latin name *Linum usitatissimum* which means “useful” and is also known as *Alsi*, *Jawas* in different Indian languages and possesses crispy texture and nutty taste.

There are two types of flaxseeds-brown & golden or yellow.

It is nutritionally rich in fiber, and is used for its medicinal uses. The whole flaxseed is said to be chemically stable though the grounded flaxseeds goes rancid under room temperature in around a week.

It's defined as a functional food for what functions it plays in aiding/curing different diseases like cardio-vascular diseases etc as it has presence of alpha-linolenic acid, lignans and dietary fiber.

The main functional component in flaxseeds was found to be Alpha-linolenic acid. It has been serving as an excellent source of omega-3 fatty

acid in the vegetarian diets [18]. These have quite a nutty taste with the crispy texture [19,20].

It is also known as linseed and the term is used interchangeably. The term 'flaxseed' is used to define flax when consumed by human beings while 'linseed' denotes utilization specifically for industrial applications [19].

All the parts of linseed plant are used for different purposes. The seed contains good proportion of oil which is used for edible purpose after refining (Singh et al. 2011).

A specific yellow flax strain called solin, was developed by agricultural scientists, which was further utilized, processed and sold as cooking oil. This oil can be substitute for oils like sunflower seed oil. Food and Drug Administration (FDA) approved solin as a GRAS list food, and it is sometimes being produced under the trademarked name "Linola" (TM) (Flax Council of India). As solin only contains about 1/10th of the α -linolenic (ALA) content of other brown and golden flax varieties of linseeds, it should definitely not be considered equivalent from a nutritional standpoint (Flax Council of India).

Chocolate is one of the products of the cocoa. It is usually sweet, brown, roasted & grounded and often flavored with the vanilla. It is prepared in the form of block, paste or liquid and also added to other products for the flavor purpose. But contains high fat and high calories.

Though one of its type i.e., dark chocolate is considered to be beneficial for the consumption. But like over-consumption of anything can prove to be harmful, so does chocolate's.

Dark chocolates alias black chocolate is consumed as it is, or even utilized in cooking for which thicker packed bars are available in the market. It is usually semisweet and bitter depending on the quantity of the cocoa butter added to its preparation.

Cocoa contains gallic acid and epicatechin equivalents for around 611mg/serve and 564mg/serve respectively. (Lee et al, 2005).

As per the tests conducted on 215 participants, there has been no evidence of a dose-effect relationship, of any effect in healthy subjects, or of any change in HDL-cholesterol. The authors also concluded that cocoa's short-term consumption significantly reduces blood

cholesterol, but it can also change depending on the amount of cocoa consumed and the health status of participants. Therefore, there was no response to dose and no healthy participants were effected.

Similar studies related to enhancement of nutritive values utilizing different commodities to increase variety for consumers by transforming mango into different forms of breakfast cereals, yoghurt etc were observed by Deeksha.K, Sunita. M [21].

1.1 Objective

- To standardize and develop the product from Chinese chestnut
- To study the packaging and sensory acceptability of the developed product.

2. METHODOLOGY

2.1 Preparation of the Chinese Chestnut Products

2.1.1 Tools

Dryer, mixer, weighing machine, measuring spoons, wok (kadhai), strainer, chocolate molds, turner, stainless steel pots (patila/ bhagona), gas stove, freezer, turner (kalchi).



Fig 1. Chinese chestnut

2.1.2 Collection of ingredients

Chinese chestnut, flaxseeds, chocolates, molds for the shape, fats, chocolate powders were procured from local market in Nainital city, super market and also local market of Aminabad, and Eldeco Spencers, Lucknow respectively. The procuring was done in single lot to prevent the variations in the composition so that quality differences could be ruled out.

2.1.3 Preparation of the mix

Sundry the procured Chinese chestnut at 32°C for one week. Later peel of the cover and grind them in the grinder and sieve the grounded chestnut using strainer and later roast the obtained powder. Also roast the flaxseeds and grind them too using grinder.

Once roasted, mix both the powders thoroughly maintaining ratio of 80:20. The 80% of the mix was composed of the roasted chestnut and flaxseed whereas rest 20% was the chocolate powders used for all three sample types.

2.2 Preparation of the 'Drinking Chestnut Chocolate Shells'

The required sample for the experiment is roasted and grounded Chinese chestnut (250gm), roasted and grounded flaxseeds (50gm), Ghee (2 tablespoon, to roast the ingredients and also to chocolate for the glossy appearance), Drinking Chocolate powder (50gm), Chocolate compound (150gm). No sugar was added to the product during preparation or later. The product was later wrapped in glossy RED wrapping foils coded as T1 (SAMPLE-1) (Fig. 3).



Fig. 2. Flaxseeds

2.3 Preparation of the 'Hershey's Chestnut Chocolate Shells'

The required sample for the experiment is roasted and grounded Chinese chestnut (250gm), roasted and grounded flaxseeds (50gm), Ghee (2 tablespoon, to roast the ingredients and also to chocolate for the glossy appearance), Hershey's Chocolate Syrup

(50gm), Chocolate compound (150gm). No sugar was added to the product during preparation or later. The product was later wrapped in glossy YELLOW wrapping foils coded as T2 (SAMPLE-2) (Fig. 4)



Fig. 3. Drinking chestnut chocolate shells



Fig. 4. Hershey's chestnut chocolate shells

2.4 Preparation of the 'Dark Chestnut Chocolate Shells'

The required sample for the experiment is roasted and grounded Chinese chestnut (250gm), roasted and grounded flaxseeds 50gm), Ghee (2 tablespoon, to roast the ingredients and also to chocolate for the glossy appearance), Cocoa Powder (50gm), Dark Chocolate compound (150gm). No sugar was added to the product during preparation or later.. The product was later wrapped in glossy BLUE wrapping foils coded as T3 (SAMPLE-3) (Fig. 5).



Fig. 5. Dark chestnut chocolate shells

2.5 Packaging

Food packaging is one of the most reliable and trusted method for food containment. It not only helps in food containment but also helps in protection against physical, chemical and biological damages.

Being educated and responsible consumers today, it's our responsibility to check whether the product we spend our money on is safe and properly packed and sealed before being used.

2.5.1 Tools

Aluminium colorful foils, cardboard secondary packaging boxes.

2.5.2 Procedure

The chocolates were wrapped with the dry and clean hands in the primary packaging material i.e., colorful foils allotted according to their sample codes i.e., T1 – red foil, T2 – yellow foil, T3 – blue foil keeping hygiene in mind. And later packed in the secondary packaging material i.e., cardboard boxes and were weighed approx. 100gm/box.

The sensory evaluation for this study was done in our Department of Food and Nutrition, Food Science and Technology by the efficiently trained faculty and Hedonic Scale was the technique used for the sensory evaluation.

3. RESULT AND DISCUSSION

The result and discussion chapter is based on the Sensory Evaluation and the acceptability of the Chinese chestnut chocolates.

Sensory evaluation of packed and processed Chinese Chestnut Shells by expert panel of members on hedonic scale and marking was done on the four parameters-

- Body and Texture
- Color and Appearance
- Flavor and Taste
- Overall Acceptability

Note- all the tested attributes will be presented separately.

3.1 Parameter 1- Body and Texture

From Fig. 6 it can be depicted that the most accepted sample by the panelist members was T3 and got highest scoring for body and texture. Then after sample T1 and sample T2 respectively.

3.2 Parameter 2: Color and Appearance

From Fig.7, it can be depicted that the most accepted sample by the panelist members was T3 and got highest scoring for color and appearance. Then after sample T2 and sample T1 respectively.

3.3 Parameter 3- Flavor and Aroma

From Fig. 8, it can be depicted that the most accepted sample by the panelist members was T3 and got highest scoring for flavor and aroma. Then after sample T1 and sample T2 altogether.

3.4 Parameter 4: Overall Acceptability

From Fig. 9, it can be depicted that the most accepted sample by the panelist members was T3 and got highest scoring for overall acceptability. Then after sample T1 and sample T2 respectively.

3.4.1 Overall calculation

Overall calculation was done to know most acceptability of the product in all terms of quality by sensory evaluation scores given by the panelist members, in which all scoring of texture, aroma, color, flavor and taste were calculated in the table, by which we were able to do statistical analysis and obtain standard deviation, average and other calculations like the body and texture, flavor etc parameters mentioned above. (Fig. 10).

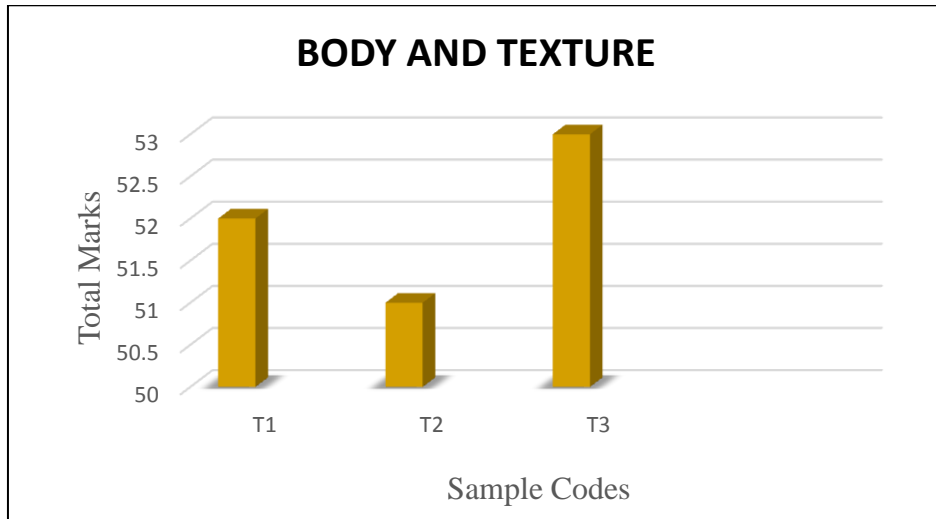


Fig. 6. Graphical representation of body and texture for table: 2

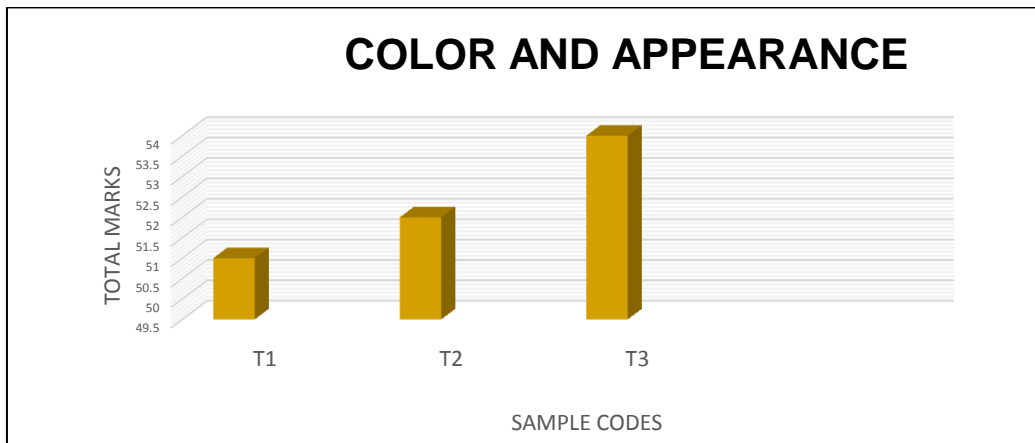


Fig. 7. Graphical representation of color and appearance for table: 3

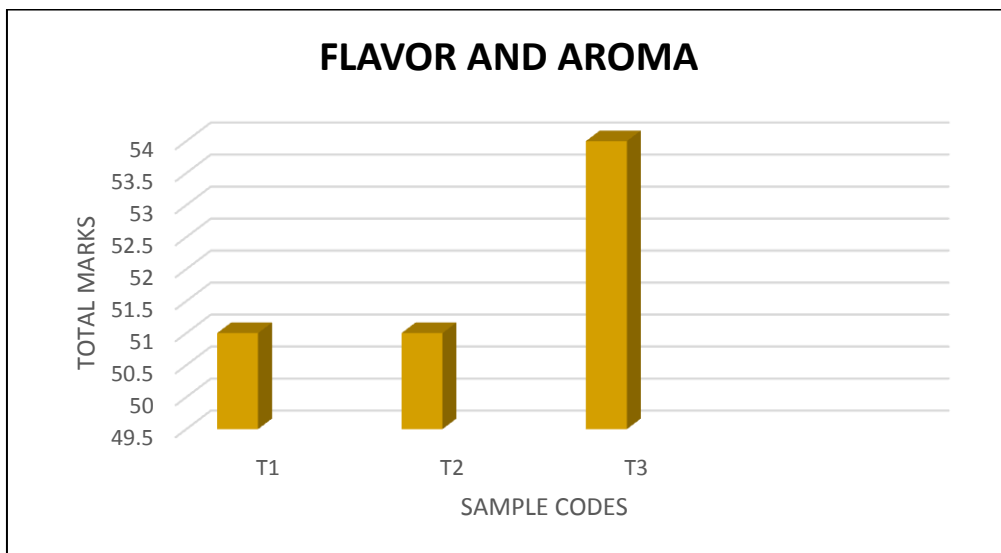


Fig. 8. Graphical representation of flavor and aroma for table: 4

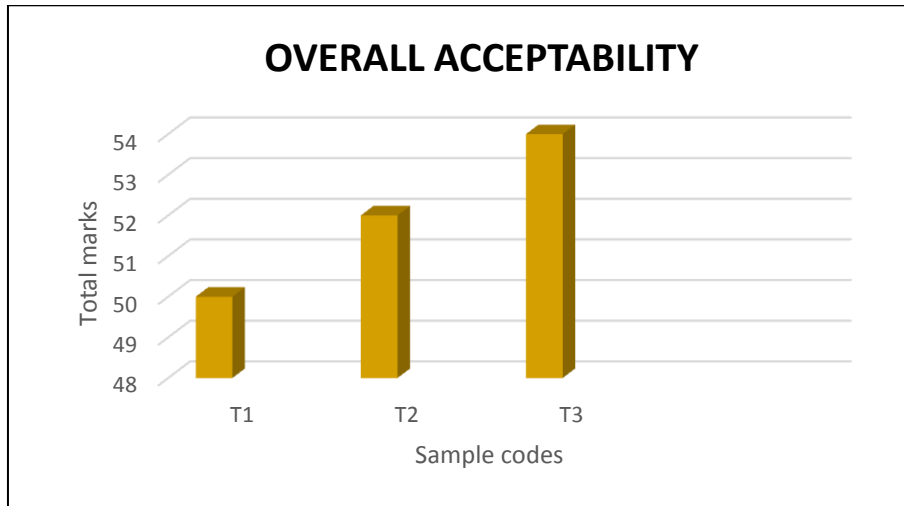


Fig. 9. Graphical representation of overall acceptability for table: 5

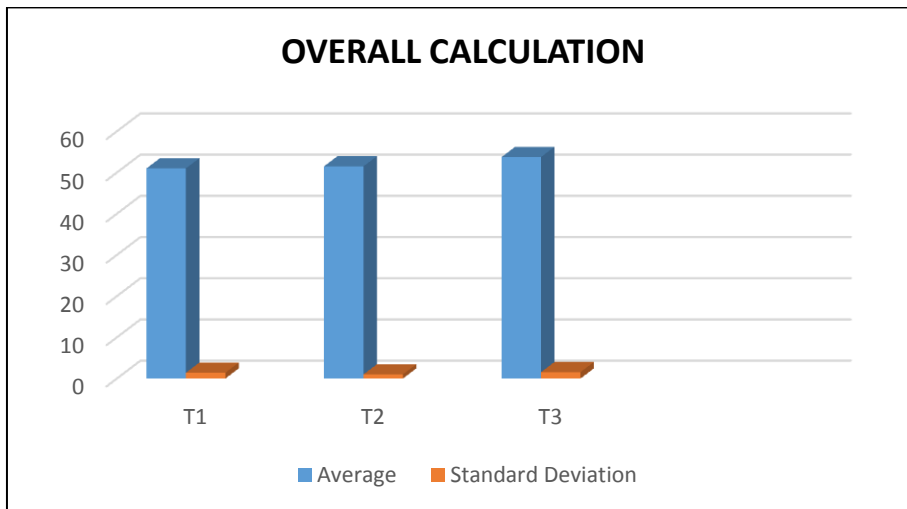


Fig. 10. Graphical representation of average and standard deviation for table: 6

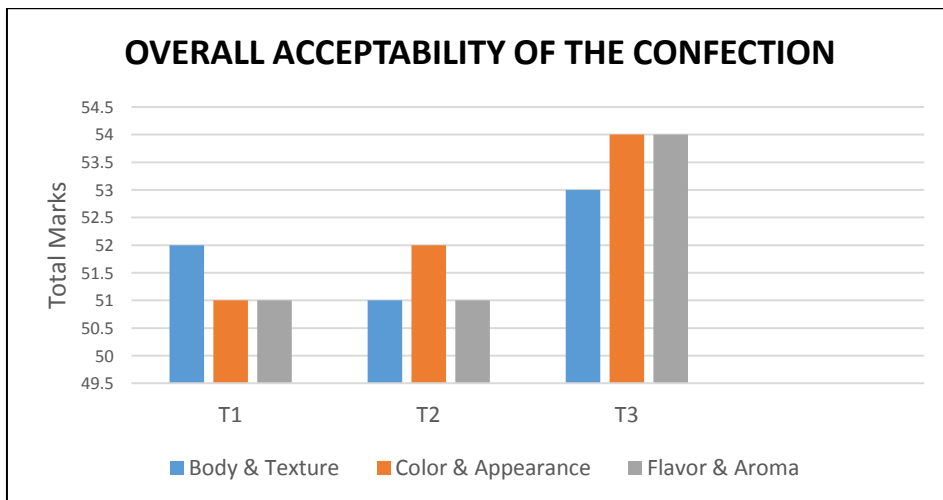


Fig. 11. Graphical representation of hedonic scale rating for overall acceptability of the confection for all the criterion

Table 1. Distribution of the sample

T1	DRINKING CHOCOLATE CHESTNUT SHELLS
T2	HERSHEY'S CHESTNUT SHELLS
T3	DARK CHOCOLATE CHESTNUT SHELLS

Parameter1- body and texture**Table 2. Individual markings for the body and texture**

	T1	T2	T3
Member 1	9	9	9
Member 2	8	8	8
Member 3	9	8	9
Member 4	9	8	9
Member 5	9	9	9
Member 6	8	9	9
Total	52	51	53

Parameter2- color and appearance**Table 3. Individual markings for color and appearance**

	T1	T2	T3
Member 1	9	9	9
Member 2	9	9	9
Member 3	8	8	9
Member 4	8	8	9
Member 5	8	9	9
Member 6	9	9	9
Total	51	52	54

Parameter3- flavor and aroma**Table 4. Individual markings for flavor and aroma**

	T1	T2	T3
Member 1	8	8	9
Member 2	9	9	9
Member 3	9	8	9
Member 4	9	9	9
Member 5	8	9	9
Member 6	8	8	9
Total	51	51	54

3.4.2 Overall acceptability

The confection was alluring to the panelists and was approved with good rankings at all the criterion / parameter – appearance, taste, aroma/smell, flavor, color, body and texture (Fig. 11).

Parameter4- overall acceptability**Table 5. Individual markings for overall acceptability**

	T1	T2	T3
Member 1	8	9	9
Member 2	8	9	9
Member 3	8	8	9
Member 4	8	8	9
Member 5	9	9	9
Member 6	9	9	9
Total	50	52	54

Table 6. Overall calculations

Parameters	T1	T2	T3
z1	52	51	53
2	51	52	54
3	51	51	54
4	50	52	54
Total	204	206	215
Average	51	51.5	53.75
Standard deviation	1.41	1	1.55

4. SUMMARY AND CONCLUSION

Chinese chestnut being packet full of nutritious ailing compounds, can be utilized and recommended for ails like arthritis and many more. Also flaxseeds being cure for diseases like CVD (cardio-vascular disease) is full of fibre and several other nutritive compounds.

Both when brought and merged together can prove to be useful and a healthy option. Therefore, the developed confection product – Chocolate Chessy Balls is a way to introduce the nut and also its nutritious advantages before people.

The idea behind this development was also to introduce the exotic nut- Chinese Chestnut to the people and also to aware them about the goods of the same. For the insurance of the quality, organoleptical indicator is good to determine the quality, taste and acceptance.

All the chocolates were well accepted by the panelists and not only appreciated but suggested

for further recommendation to spread awareness about the miraculous nut, native to country like China, Japan, Korea to the people of India's states like Uttar Pradesh. But amongst all T3 was preferred more than other two T1 and T2.

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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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