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GINGER-BASED LOTIONS: SAFETY AND QUALITY DETERMINATION THROUGH SCIENTIFIC ASSESSMENT AND *HALALAN THOYYIBAN* CONCEPT

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Abstract

For ages, Zingiber officinale, or ginger, has been utilised as a culinary spice and medicinal purposes. Previous research has shown that ginger has anti-inflammatory, anti-bacterial, anti-cancer, anti-fungal, and other pharmacological properties. Ginger has recently been included in natural product formulations such as cosmetics and personal care products due to its health benefits. In Al- Qur'an, ginger is mentioned in the term zanjabil as recorded in Surah Al-Insan verse 17. This verse explains that people in heaven are served with drinks mixed with ginger. However, the quality of ginger-based product especially personal care product for its microbiological status, heavy metal, and their potential as an anti-inflammatory and anti-microbial agent are unknown. Furthermore, the benefits of ginger to

human health from Islamic properties are not well reported. The current study aims to assess the quality and safety of finished products of four types of ginger-based lotion (Losyen Mustajab Pati Halia) through laboratory experiment and was evaluated in terms of halalan thoyyiban concept through literature review assessment. The results showed that all types of ginger-based lotion tested are safe for consumers since the microbial content and heavy metal concentration are within the recommended guidelines. Remarkably, the lotions also postulated anti-inflammatory properties via the lipoxygenase and hyaluronidase pathways to varying degrees. However, the lotions are not marketed as anti-bacterial agents. From the point of halalan thoyyiban concept and proven by scientific findings, the ingredients used are clean, safe, good quality and no false claim element on the information displayed on the packaging. As conclusion, the result demonstrates the safety and quality of the ginger-based lotion as a daily personal care product, which fulfils consumers' expectations and needs.

***Keywords**: Ginger based lotion, halalan thoyyiban, quality, safety, scientific assessment*

1. INTRODUCTION

Zingiber officinale or commonly known as a ginger has been used for centuries as culinary spices and medicinal purposes. It is herbaceous perennial plant which belongs to family of Zingiberaceae. According to U.S. Food and Drug Administration, ginger has been categorised under "Generally Recognised as Safe" (GRAS) substance. For centuries, ginger has been extensively used in cooking and medicine. In fact, ginger is among the 17 plants mentioned in the Quran (Sumaiyah Mohd Tamizi, 2015). The word ginger in Arabic is *zanjabil*. It is also mentioned in Surah Al-Insan verse 17. Word of Allah SWT:

وَيُسْقَوْنَ فِيهَا كَأْسًا كَانَ مِزَاجُهَا زَنجَبِيلا

And they will be given to drink there of a cup (of wine) mixed with *Zanjabîl* (ginger).

According to Ibn Kathir (1997) and Al- Zuhaili (2004), this verse explains about the drink that was served to the *Abrar* which was wine mixed with ginger. This drink mixture provides a balanced drink for the body as this mixture is hot in nature. It is also mentioned in the previous verse that the *Abrar* drink was being mixed with the cooling lime. According to Al-Sabuni (1981), the Arabs mixed ginger in their drinks to evoke a delicious aroma. Al-Qurthubi (1996) states that the benefits of mixing ginger in drinks as done by the Arabs is to refresh the mouth and to help food digestion. Moreover in making the drink fragrant. A study conducted by Robiatul Adawiyah Mohd and friends (2018) on 13 selected tafsir books have found that all the 13 tafsir books indicate that main feature contained in *zanjabil* was its fragrant aroma and delicious taste as well as being a special drink for the *Abrar* in heaven.

However, Qatadah and Mujahid (Ibn Kathir, 1997; Al-Qurthubi, 1996) interpret the word *zanjabil* as the name of a spring found in paradise.

Previous studies demonstrated that ginger exhibit various pharmacological effect like anti-inflammatory (Funk et. Al., 2016), antibacterial (Nas et. Al., 2018), anti-cancer (Akimoto *et al*., 2015; Park *et al*., 2014), anti-fungal (Tagoe et. Al., 2011) and others. Ginger contains phytochemical compound but mainly known as gingerols which is classified under an aromatic ketone. Gingerols responsible for producing antioxidant activity, treatment for cardiovascular diseases (Han et. Al., 2019; Meng et. Al., 2018), anti-cancer (Kumara et. Al., 2017) and can be also used to treat nausea and vomiting (Ernst and Pittler, 2000).

Recently, ginger has been used in natural product formulations such as cosmetic and personal care due to its health benefits. However, the quality of the products is still in question. There is still no microbiological analysis being conducted properly; infact there is heavy metal found in the products and the potential as an anti-inflammatory and antimicrobiological agent. As a result, a systematic analysis is needed to ensure the product is safe for consumers. Dunia Herbs Sales & Marketing Sdn Bhd has been produced a series of *Losyen Mustajab Pati Halia* that containing ginger extract as a main ingredient in lotion formulation (Figure 1). Therefore, this project aims to assist the company to evaluate the quality and safety of their product through scientific method and review its benefits through Islamic perspective to increase the consumers acceptance.

Figure 1. Series of ginger-based lotion used in this study

2. METHODOLOGY

For this project is to characterize the quality of the four (4) type of ginger-based lotion in terms of heavy metal profile, microbiological status

and anti-inflammatory properties. Al-Quran and hadith were used for Islamic perspectives assessment.

a. Heavy Metal analysis

The analysis of heavy metal of ginger lotions was performed by using Inductive Coupled Plasma Mass Spectrometry (ICP-MS ELAN 6100). Approximately, 2 grams of the samples were mineralised by open vessel acid digestion (hot plate digestion). Two to three drops of nitric acid (HNO_3) were added and make up to 50 ml of water. Multi element calibration standard 3 (10 mg/l in 5% HNO_3) was used as a standard solution and multi-element calibration standard 4 as an internal standard. The concentration of all elements was expressed in milligram per kilogram of ginger lotion (mg/kg).

b. Microbiology analysis

i. Total Plate Count (Pour Plate Method)

10 ml of the products were dissolved in buffered sodium chloride-peptone solution pH 7.0 or in any other suitable liquid. In general a one in ten dilution was prepared. 9 ml of sterile diluents were prepared in required number of universal bottles. Dilutions up to 10^{-4} were prepared accordingly. A 1 ml of the dilution was transferred into a petri dish as required and 20 ml of Soybean Casein Digest Agar Medium that previously has been melted and cooled to approximately 45 °C was added to each petri dish. The plates containing agar were left to solidify at room temperature. Positive control was performed by inoculating with reference culture from 8.0 and was performed as per test procedure. Uninoculated media was treated as negative control. Then, the plates were incubated for 5 days at 30-35 ^{o}C and results were recorded.

ii. Detection of Escherichia coli

10 ml were used to inoculate the corresponding bacterial species in 100 ml of Soybean Casein Digest Broth and was incubated at 35-37 °C for 18 to 48 hours. The container was shaken thoroughly and 100 ml of MacConkey Broth were transferred into the mixture and incubate at 43-45 °C for 18-24 hours. By mean of an inoculating loop, bacterial suspension was subcultured from the MacConkey Broth onto the MacConkey Agar and incubated at 35-37 °C for 18-72 hours. Presence of *E. coli* were spotted when Gram negative rod was observed. Positive control was performed by inoculating with reference culture and proceed as per test procedure. Uninoculated media was treated as negative control.

iii. Detection of Enterobacteria and Gram negative bacteria

Bacterial species was homogenised and incubated at 35- 37° C for 2 to 5 hours. The container was shaken and transferred the quantity of contents (Homogenate A) corresponding to 1 ml of the sample to 100 ml of Enterobacteriaceae Enrichment Broth (Mossel) and incubated at 35-37 °C for 18 to 48 hours. The culture of Enterobacteriaceae Enrichment Broth (Mossel) was subcultured onto the Violet-red Bile Agar (VRBG) with Glucose and Lactose and incubated at 35-37 °C for 18-24 hours. Positive control was performed on VRBG and negative control was the uninoculated media. Gram staining was performed as referred to (SOP/ML115/009/07) The growth of well-colonies is generally red or reddish of colonies hence it shows as positive result with gram-negative bacteria constitutes.

iv. Detection of Pseudomonas aeruginosa

10 ml of sample were taken out to inoculate 100 ml of soybean casein digest medium, homogenised and incubated at 35-37°C for 18 to 48 hours. It was then sub cultured on cetrimide agar plate by using an inoculating loop and incubated at 35-37°C for 18 to 72 hours. Positive control and negative control were prepared accordingly. If there is no growth of microorganism, the sample passes the test. When there is growth of microorganism observed, performs the Gram staining as referred to a standard procedure. If there is presence of gram-negative rod microorganism, transfer the colonies to soya-bean casein digest medium and incubate at 41-43°C for 18 to 24 hours. The sample passes the test when there is no growth occurs at 41-43°C.

v. Detection of Staphylococcus aureus

10 ml of samples to be examined was dissolved in buffered sodium chloride-peptone solution pH 7.0. If the product is known to have antimicrobial activity, an activating agent may be added to the diluent. pH of samples was adjusted to about pH 7 and were diluted to ten-fold. Accordingly, 10 ml of samples were inoculated into 100 ml Casein Soybean Digest Broth, homogenised and incubated at 35-37°C for 18 to 48 hours. The medium was subcultured on the surface of Baird-Parker Agar (BPA) by using an inoculating loop. The agar was then incubated at 37°C for 18 to 72 hours together with its control. Upon examination, if growth of black colonies surrounded by clear zone, performs the Gram staining (refer to SOP/ML115-008/07). Gram-positive cocci were spotted, therefore the assay was proceeded with further confirmation tests. Both positive and negative control was performed as per test procedure.

vi. Detection of Salmonella species

10 mL of samples to be examined was dissolved in buffered sodium chloride-peptone solution pH 7.0. If the product is known to have antimicrobial activity, an activating agent may be added to the diluent. pH of samples was adjusted to about pH 7 and were diluted to ten-fold. Accordingly, 10 ml of samples were inoculated into 100 ml Casein Soybean Digest Broth, homogenised and incubated at 35-37°C for 18 to 48 hours. After incubation, 1 ml of enrichment culture was pipette to 10ml of Tetrathionate Bile Brilliant Green Broth and incubated at 41-43°C for 18 to 24 hours. By means of an inoculating loop, enrichment culture was streaked from Tetrathionate Bile Brilliant Green Broth on at least two different agar media chosen from Deoxycholate Citrate Agar, Xylose Lysine Deoxycholate Agar and Brilliant Green Agar. Both positive and negative control was prepared according to test procedure. The culture plates were then incubated at 35-37°C for 18 to 72 hours.

The probable presence of Salmonella is indicated by the growth of cultures having the following appearance (Table 1):

Table 1. Appearance of Salmonella culture on different types of agars

Types of Agar	Appearance of Colonies
Deoxycholate Citrate Agar	Well-developed, colourless colonies
Xylose Lysine Deoxycholate Agar	Well-developed, red colonies, with or without black centres
Brilliant Green Agar	Small, transparent, colourless or pink or opaque-white colonies often surrounded by pink or red zone.

A few doubt colonies were transferred separately to Triple Sugar Iron Agar in universal bottles, using surface and deep inoculation and then was incubated at 35°C up to 48 hours. The culture plates were observed afterward, and results were recorded.

vii. Total Yeast and Mould Count (Pour Plate Method)

10 mL of samples to be examined was dissolved in buffered sodium chloride-peptone solution pH 7.0. If the product is known to have antimicrobial activity, an activating agent may be added to the diluent. pH of samples was adjusted to about pH 7 and were diluted to ten-fold. Several dilution bottles were prepared as needed, each containing 9 ml of sterile diluent. The solution was thoroughly mixed by shaking the stoppered bottle

using 25 up and down movements of about 300 mm over a period of about 12 seconds. 1 ml of the first dilution was transferred into next dilution blank. Dilutions were prepared up to 10^{-4} and 1 ml was transferred for each dilution into petri dishes with 20 ml of Sabouraud Dextrose Agar Medium at not more than 45°C. The agar was allowed to solidify at room temperature and both positive and negative control was also prepared. The culture plates were then incubated at 20-25°C for 5 days.

c. Anti-inflammatory analysis

i. Lipoxygenase assay

All assays were performed at room temperature (23°C). Initially, the assay conditions were incubated in 50 mM phosphate buffer (pH 6.0) and 0.5 mM linoleic acid (plus Tween 20), then 3-(dimethylamino) benzoic acid (DMAB), 3-methyl-2-benzothiazolinone (MBTH), and haemoglobin were added to determine the amount of sample formed. Solution A was prepared by mixing 10 ml of the 20 mM DMAB, 100 mM phosphate buffer solution (pH 6.0), 0.4 ml of the 25 mM linoleic acid stock, and 9.6 ml of water. While Solution B was prepared by mixing 0.4 ml of 10 mM MBTH, 0.4 ml of 5 mg/ml haemoglobin, and 19.2 ml water. For the standard two-step assay, the sample, in a volume of 2 to 10 µl, was incubated with 0.5 ml of Solution A. After incubation for 5 minutes, 0.5 ml of solution B was added. After an additional 5 minutes, 0.5 ml of 1% (w/v) sodium lauryl sulphate was added to terminate the reaction. Absorbance at 598 nm was determined.

ii. Hyaluronidase Assay

The hyaluronidase assay was conducted according to the method of Tolksdorf et. Al., (1949) and Kass and Seastone (1944). Briefly, 10 mg of Worthington hyaluronic acid (Code: VHHA) was dissolved in 25 ml 0.1 M sodium phosphate buffer: pH 5.3 with 0.15 M sodium chloride. As for the enzyme hyaluronidase, stock solution of enzyme was prepared at 1 mg/ml in 0.1 M sodium phosphate buffer pH 5.3 with 0.15 M sodium chloride. Immediately prior to use dilute further in the same buffer. 0.5 ml of a 0.4 mg/ml hyaluronic acid solution was prepared into a series of test tube and incubated at 37 °C for 4 - 5 minutes to achieve temperature equilibrium. One blank tube was incubated with 1.0 ml of 0.1 M sodium phosphate buffer, pH 5.3 with 0.15 M sodium chloride. At timed intervals, 0.5 ml of appropriately diluted enzyme or standard was added to respective tubes. Each tube was incubated exactly 10 minutes and cool in an ice bath to room temperature. 9.0 ml of albumin reagent was added to each tube and incubated at room temperature for 10 minutes. Absorbance at 540 nm of each tube was read

versus the blank. The amount of hyaluronic acid remaining after digestion was calculated from the standard curve. The amount of hyaluronic acid (HA) digested was calculated as follows (Eq. 1):

Mg HA digested = 0.2 mg - mg HA remaining
(Eq. 1)

d. Halalan Thoyyiban Concept Assessment

The *Halalan Thoyyiban* Concept assessment were conducted according to Al-Quran and Hadith.

3. RESULTS AND DISCUSSION

Consequently, National Pharmaceutical Regulatory Division of Ministry of Health Malaysia has established the acceptance limit permissible for microorganism and heavy metals for public health protection (Table 2 and Table 3).

Table 2. Heavy metal test analysis guideline for finished product based on National Pharmaceutical Regulatory Division of Ministry of Health Malaysia.

Heavy Metal Contamination	Limit
Lead	≤10.0 mg/kg (≤10 ppm)
Arsenic	≤5.0 mg/kg (≤5 ppm)
Mercury	≤0.5 mg/kg (≤0.5 ppm)
Cadmium	≤0.3 mg/kg (≤0.3ppm)

Table 3. Microbial analysis guideline for finished product based on National Pharmaceutical Regulatory Division of Ministry of Health Malaysia.

Microbial contamination test	Specification
Total Aerobic Microbial Count	NMT 2 x 10^4
Total Yeasts & Moulds Count	NMT 2 x 10^2
Test for Specified Microorganisms:	
1. biletolerant gram- negative bacteria in 1g or 1ml	NMT 2 x 10^2
2. Salmonella in 10g or 10ml	CFU
3. Escherichia coli in 1g or 1ml	Absence
4. Staphylococcus	Absence
	Absence

NMT = Not More Than

a. ***Analysis of heavy metal in four different types of ginger-based lotion***

The study was carried out to evaluate the compositional of heavy metals contained in the different types of ginger-based lotion. The determination of heavy metals is an important aspect that need be considered for consumer safety. A high concentration of heavy metals in the product potentially causes toxic and ailment to the consumer even present in small quantities. According to the Malaysian Cosmetic Guidelines (Annex 1, Part 14) which impose on the heavy metal specification of cosmetic with the maximum limit of arsenic 5 mg/kg, cadmium 5 mg/kg, lead 20 mg/kg and mercury 1 mg/kg.

Table 4. The heavy metal concentrations of different types of ginger-based lotion. The results are presented in unit mg/kg.

No.	Products	Arsenic, As	Cadmium, Cd	Lead, Pb	Mercury, Hg
1.	Superhot Lotion with Capsicum	<0.1	<0.1	0.2	<0.05
2.	Extra Hot with Extra Ginger Lotion	0.2	<0.1	<0.1	<0.05
3.	Lime & Ginger Extract Lotion	<0.1	<0.1	<0.1	0.33
4.	Ginger Extract Lotion	<0.1	<0.1	<0.1	<0.05

Table 4 presents the concentration of heavy metal analysis contained in the products of ginger-based lotion. The result show that at all type of ginger-based lotion, the concentration of heavy metals is below the maximum limit allowed under the regulation for As, Cd, Pb and Hg. Moreover, it denoted that for Lime & Ginger extract lotion, it contained high concentration of Hg which was 0.33 mg/kg as compared to other product. However, the value is still under limitation of 1 mg/kg according to National Pharmaceutical Regulatory Agency (NPRA) guideline. Overall, the result has concluded that the products are considered safe and do not have high contain of dangerous heavy metal.

b. Microbiological analysis

The microbiological test was performed to determine microbiological patterns contained in the lotion. This is to ensure that pathogenic (harmful) microorganisms will not be inherited to the consumers which can cause food poisoning. Other than that, it also helps to reduce risk of having bacterial contaminant which can cause infection. During the experiment, a selective

medium was used to detect and identify the presence of different types of microorganisms. A culture medium was supplemented with common nutrients prior to enhances the microbial growth. Hence, a specific type of microbes can be grown in that cultured medium. By using this technique, both qualitative and quantitative results can be obtained.

The microbiological analysis of different type of ginger-based lotion is shown in Table 5. The result demonstrated that there is presence of 1.0×10^1 and 2.0×10^1 of total viable aerobic bacteria in Lime & Ginger Extract Lotion and Superhot Lotion with Capsicum, respectively. Whilst less than 10 colony viable of aerobic bacteria contained in the ginger extract lotion and extra hot with extra ginger extract lotion. Furthermore, less than 10 colony of viable aerobic fungi was observed for all ginger-based lotion with no visible presence of the food borne pathogens (*S. aureus*, *Salmonella sp*, *Pseudomonas sp* and *E.coli)* found in all ginger-based lotion except for Bile-tolerant gram negative bacteria which indicated less than 10 colony.

Table 5. Microbiological analysis of different type of ginger-based lotion

No.	Parameter (unit)	Ginger Extract Lotion	Lime & Ginger Extract Lotion	Superhot Lotion with Capsicum	Extra Hot With Extra Ginger Lotion
1.	Total Viable Aerobic Count: Bacteria (CFU/g)	<10	1.0×10^1	2.0×10^1	<10
2.	Total Viable Aerobic Count: Fungi (CFU/g)	<10	<10	<10	<10
3.	*Staphylococcus aureus* (in 10 ml)	Absent	Absent	Absent	Absent
4.	*Pseudomonas aeruginosa* (in 10 ml)	Absent	Absent	Absent	Absent
5.	*Salmonella sp.* (in 10 ml)	Absent	Absent	Absent	Absent
6.	*Bile-tolerant gram-negative* (MPN/ml)	<10	<10	<10	<10
7.	*Escherichia coli* (in 10 ml)	Absent	Absent	Absent	Absent

< 10: less than 10; MPN: Most Probable Number

The result suggests that all type of ginger-based lotion could not impose any health issues on food poisoning, urinary tract, bloodstream and lung infection

upon its application on the skin as microbial content presence in the product is comply to the recommended microbial limit according to NPRA guideline.

c. Evaluation of antimicrobial activity by Disc Diffusion Assay

Antimicrobial susceptibility testing has been used as drug discovery in pharmacological industry. Since the last four decades of "golden era" where almost all-important antibiotics have been discovered, however, nowadays they are losing their efficiencies associated with multidrug-resistance bacteria. This is due to the bacteria itself which possessed genetic ability to transmit and become resistance towards available antibiotics. Bacteria were classified as Gram-positive and Gram-negative according to structure of the cell walls. Gram-positive bacteria such as *B. subtilis* and *S. aureus* have thicker peptidoglycan layer than those Gram-negative bacteria. Nevertheless, Gram-negative bacteria such as *P. aeruginosa* and *E. coli* has caused thousands of severe contagions each year. However, a variety of laboratory in vitro methods have been developed to evaluate or screen the antimicrobial activity. The most known and basic methods are the disc-diffusion and broth or agar dilution methods. The disc diffusion method has been routinely used in many clinical microbiology laboratories as most of the fastidious bacteria can be tested accurately, low cost and ease of results.

Food-borne pathogens including *S. aureus*, *Pseudomonas sp*, *Salmonella sp*, and *E. coli* are group of microorganisms potentially to cause food-borne diseases. The prevalence of food borne disease caused by food-borne pathogens have increased globally which has also become the main concern especially among individuals with impaired immune systems. Currently, medical antibiotics which are penicillin and macrolides (mycins group) are being widely used. Hence, it would be beneficial if the products are able to exhibit antimicrobial effect towards different types of food-borne pathogens.

In this study, the antimicrobial activity of different type of ginger-based lotion was estimated by using the zone of inhibition and activity index (AI) values against *S. aureus* and *E. coli*. The AI values are helpful in estimating the potential of antimicrobial activity quantitatively compared to the respective standards. During the experiment, Streptomycin 10 µg/ml was serve as positive control and the results are illustrated as below (Table 6).

Table 6. Antimicrobial activity of ginger-based lotion using disc diffusion assay

No.	Parameter	Sample			
		Lotion name	**Inhibition zone of sample (mm)**	**Inhibition zone of standard (mm)**	**Activity Index (AI)***
1.	*Escherichia coli*	Ginger Extract Lotion	-	16	-
		Lime & Ginger Extract Lotion	-	14	-
		Extra Hot with Extra Ginger Lotion	-	17	-
		Superhot Lotion with Capsicum	-	12	-
2.	*Staphylococcus aureus*	Ginger Extract Lotion	-	18	-
		Lime & Ginger Extract Lotion	19	19	1.0
		Extra Hot with Extra Ginger Lotion	-	19	-
		Superhot Lotion with Capsicum	-	-	-

*AI = Inhibition zone of sample/Inhibition zone of standard

Among all the four different types of ginger-based lotion studied, none of them have shown a significant inhibition zone towards Gram negative bacteria *E. coli.* However, the inhibition zone was clearly observed when the media was treated with Lime & Ginger Extract Lotion that exhibited the maximum AI values of 1.0 against Gram positive bacteria *S. aureus*. This indicated that the extract of Lime & ginger is highly provoke a remarkable antibacterial activity with efficiency on zone of inhibition. This might be due to the ingredient of lime itself that has been proved to reduce microbial activity against food-borne pathogen. Furthermore, lime or scientifically called as *Citrus aurantifolia* has been widely reported to exert antimicrobial activity (Jafari et Al., 2011; Al-Farraj et Al., 2018). Overall, the result suggested that all type of ginger-based lotion do not capable to act as antibacterial agent against the tested bacterial species except for Lime &

Ginger Extract Lotion.

d. Anti-inflammatory properties of the ginger-based lotions

The main action of anti-inflammatory activity by substance involves series of event by which the inhibition of arachidonic acid metabolism take place either through enzymatic inhibition of cyclooxygenase (COX) or lipoxygenase (LOX) (Oguntibeju, 2018). COX responsible to convert arachidonic acid to prostaglandin H_2 (PGH2) meanwhile LOX synthesised leukotriens (LTs). LTs are the mediators of allergic reactions because a high level of LTs could be observed in the case of asthma, psoriasis, rheumatoid arthritis and colitis ulcerosa. The production of LTs can be prevented *via* inhibition of the lipoxygenase pathway. Whilst Hyaluronidase is an enzyme that degrades the hyaluronic acid and known to be involved in allergic affects, inflammation and cause an increase in the permeability of the vascular system. Lipoxygenase and or their metabolites are implicated in a wide range of disease states eg; asthma, cancer metastasis, atherosclerosis, and psoriasis hence inhibition of lipoxygenase activity may be of therapeutic benefit. In this study, Nordihydroguaiaretic acid (NDGA) and apigenin were used as positive control. NDGA is an established lipoxygenase inhibitor meanwhile, Apigenin is classified as potent anti-inflammatory compound and has been used as hyaluronidase inhibitor.

In view of the results obtained (Table 7), it revealed that all type of ginger-based lotion exhibits a low degree of anti-inflammatory activity by which the inhibition of enzymes lipoxygenase and hyaluronidase are below 40%. Even though the inhibition is quite low, but all ginger-based lotion is able to induce inhibition against both pathways. Similar finding has been observed in other study on anti-inflammatory effect of ginger extract (Justo et Al., 2015; Kravchenko et Al., 2019).

Table 7. Anti-inflammatory properties of the ginger-based lotion. Determination of anti-inflammatory level was selected based on range; **H**-High (**71-100%**), **M**-Moderate (**41-70%**) **L**-Low (**0-40%**); **NT**-Not tested, **NA**-Not active. Values are expresses as mean Inhibition (%) S.E.M. of triplicate measurements from 3 independent experiments.

No.	Products	Lipoxygenase (%)	Hyaluronidase (%)
1.	Superhot Lotion with Capsicum	13.97 ± 2.58	10.34 ± 2.89
2.	Extra Hot with Extra Ginger Lotion	14.10 ± 2.29	18.48 ± 3.57
3.	Lime & Ginger Extract Lotion	11.61 ± 0.42	3.95 ± 1.97
4.	Ginger Extract Lotion	14.38 ± 2.38	5.53 ± 3.33

5.	Standard: NDGA	96.70 ± 0.53	-
6.	Standard: Apigenin	-	4.96

e. The medicinal value of ginger from Islamic perspective

Although there are contradicting of opinions on the meaning of *zanjabil*, the benefits of *zanjabil* cannot be denied. Consequently, the benefits of drinking mixed with *zanjabil* from a health point of view have been established by Al-Qurthubi, Ibn Kathir and Al-Zuhaili. According to Ibn Qayyim Al-Jauziah (2013), the Prophet Muhammad SAW treated various diseases by using three types of medicine namely, medicines from natural ingredients such as honey and plants, medicine using Quranic verses and prayers and treatments that combined natural ingredients with Quranic verses and prayers. The benefits of treatment using natural ingredients including using ginger has been proven. Some of the benefits of ginger in medicine are to warm the body, helping in digestion, open blockages in the liver, eliminate myopia due to moist air, remove wind in the stomach and large intestine. Treatment using ginger and Quranic verses recommended by Raflis bin Sabirin (2011) who has over 30 years of experience in the field of Islamic medicine are as in Table 8:

Table 8. Treatment using ginger and Quranic verses

No	Diseases	Natural Ingredients	Quranic Verses and Prayers	Procedure
1	Breast cancer	A thumb -sized piece of old ginger is ground with a glass of water. Boil the mixture. Let it cool. The filtered ginger is mixed with 3 tablespoons of honey and 3 tablespoons of sanna decoction.	Recite on the prepared boiled ginger, (1x) surah Al-Fatihah, Al-Ikhlas, Al-Falak, Al-Nas and verses of the Al Kursi. Then verse 21 of Surah Al-Hashr (7x).	Drink the medicine once a day for 21 days
2	Tumor	A thumb -sized piece of old ginger is ground with a glass of water. Boil the mixture. Let it cool. The filtered ginger is mixed with 3 tablespoons of honey	Recite on the prepared boiled ginger (1x) surah Al-Fatihah, Al-Ikhlas, Al-Falak, Al-Nas and verses of the chair. Then verse 31 from surah Al-Ra'du, verse 105 from surah Al-Thoha and verses 21-24 from surah Al-Hashr	Drink the medicine once a day for 40 days
3	Thyroid	A thumb -sized piece of old	Recite on the	Drink the

ginger is ground with a glass of water. Boil the mixture. Then add 7 teaspoon of coarse salt and filter the mixture.	prepared boiled ginger surah Al-Fatihah (1x), Al-Ikhlas (3 x), Al-Falak (1x), Al-Nas (1x) and surah Al-Hashr verse 22 (21x).	medicine 2 times a day, in the morning and evening for 21 days.

According to the practice of traditional and Islamic medicine (Faszly Rahim et. Al., 2018), ginger has many consumptions in cooking and medicine. Ginger is used to treat 51 types of diseases including back pain, worms, chest pain, colds, sprained legs, headaches, coughs and diarrhea. There are also studies showing ginger used to treat liver cancer, breast neoplasms (Rizwan Ahmad et. Al., 2016) and prevent early stage of cervical cancer (Rita Nursuhaila Ridzuan et. Al., 2018). In conclusion, ginger is a special plant in terms of its nutrients and benefits to our health. It has been widely used not only in cooking and drinking but also in treating various diseases.

f. Halalan Thoyyiban Concepts from the perspectives of Al Quran and hadith

Every Muslim must ensure that the intake of food and products has the characteristics of *halalan thoyyiban*. There are several verses of the Qur'an mentioning the word *thoyyib* as in surah Al-Baqarah verse 168, surah Al-A'raf verses 32-33, 160, surah Al-Anfal verse 69, surah Yunus verse 93, surah Al-Nahlu verse 72 and 114, surah Al-Mukminun verse 51, surah Toha verse 81, surah Al-Isra 'verse 70, surah Ghofir verse 64 and surah Al-Jathiah verse 16. Based on the scholars' debate in interpreting the word *thoyyib* in the verses of the Qur'an and hadith, it can be concluded that the characteristics of food and products that are *halalan thoyyiban* (Al-Thobari, 2001; Ibn Kathir, 1997; Al-Qurthubi, 1995; Hamka, 1993; Muhammad Quraish Shihab, 2002; Al-Zuhaili, 1991; Al-Zain, 1994; Al-Nawawi, 1994) as in figure 2:

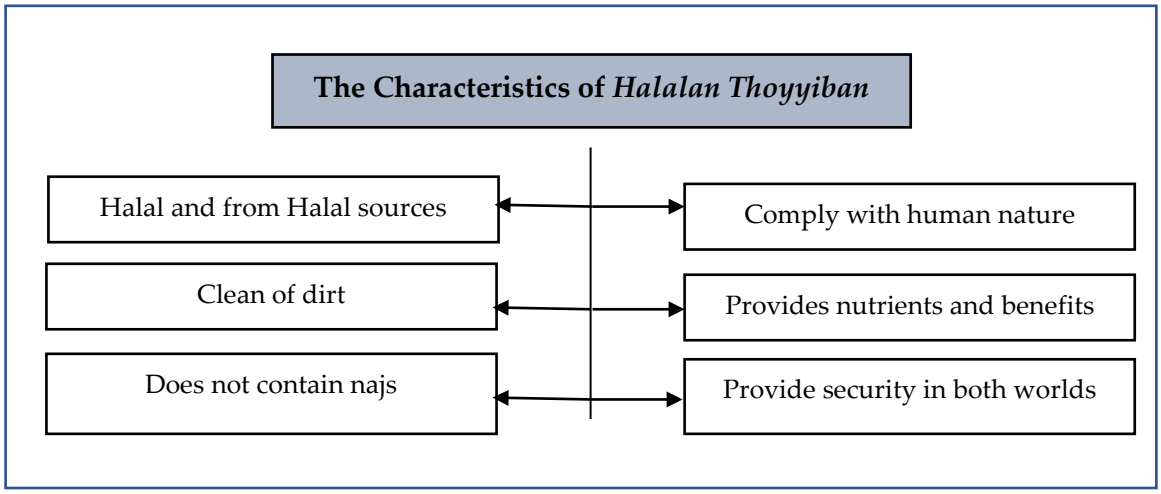

Figure 2. The characteristics of Food and Products of *halalan thoyyiban*

Based on Figure 2, the main characteristics of food and products that are obligation choice for Muslims are halal and from halal sources. Food or products that are halal and from halal sources and have thoyyib characteristics are the best choice. This is because, the characteristics of thoyyib are safe, clean, do not contain najs and conform to the nature of human beings who like something that is good and clean. In addition, the characteristics of thoyyib are good for human health especially in their nutrient's ingredients. There are studies found that among the halal characteristics of thoyyiban is to meet the safety aspects that is clean, not harmful to human health and fresh (Musfirah Syahida et. Al., 2015; Mohd. Farhan et. Al., 2018). In a summary, Allah SWT teaches people to eat, use or benefit from products that are not only halal from the point of view of jurisprudence but also from the point of view of science that is clean, safe, quality and well managed.

4. CONCLUSION

In conclusion, the four different types of ginger-based lotion are considered safe to be applied by consumers on the skin as their microbial content as well as the concentration of heavy metals are compliance with the recommended guideline. Moreover, the lotions also postulate anti-inflammatory activity through lipoxygenase and hyaluronidase pathway at different degree. Unfortunately, the lotions cannot be used as antibacterial agent. On the other hand, the present study has discovered the quality, safety and its medicinal value of ginger as a main ingredient in product formulation through scientific, Islamic assessment and *halalan thoyyiban* concept so thus it meets a good standard to be offered to the consumer.

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