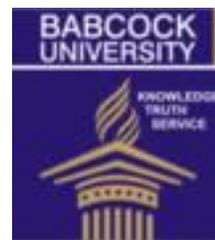




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Research

Consumers' Preferences and Phytochemical Properties of Selected Chewing Sticks in Southwest Nigeria

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Abstract

The paper examines the reasons for Consumer's preferences for chewing sticks and evaluated the phytochemical properties of some chewing stick materials in the study area. The result shows that some of the samples-Vernonia amygdalina Del., Distemonanthus benthamianus Baillon, Anogeissus leiocarpa (DC.)Guill. & Perr., Terminalia schimperiana Hochst, Garcinia kola Heckel, Massularia acuminata (G.Don) Bullock &Hoyle, Pseudocercera kotschyi (Schweinf.) Harms, Altonia boonie can exhibit anti-microbial activities as a result of their phyto-chemical constituents. The perennial reasons for the preference of chewing sticks in the study area is its medicinal/therapeutic value. The major factors considered by users in their choice of chewing stick materials in their order of importance are: cleaning action (32.9%), therapeutic value (29.1%), tooth breath/freshness (15.5%), taste/flavour (12.8%), availability of the species (7.8%), educational level (1.2%) and cultural background (0.8%). The study conclude that the perceived cleaning action and the therapeutic value of chewing stick materials are the principal consideration in the choice of materials to use as chewing stick in the study area and recommends a comprehensive ethno-botanical survey of chewing stick plants with medicinal potentials and validation of their constituents.

KEY WORDS: Chewing Stick, Phytochemical, Consumer, Preferences.

1.0 Introduction

Chewing stick is a type of plant material which is widely used for dental care throughout West African region; it is usually made from the roots, twigs or stems of a plant (National Institute of Industrial Research (NIIR, 2008). In Nigeria, as in other developing countries, a very significant proportion of orofacial diseases are due to microbial infections (Adekeye and Prabhu, 1992; Ndukwe *et al.*, 2002). Antibiotic agents are widely prescribed in dental practice in these regions for the treatment of microbial-related orofacial infection diseases (Okeke, 1996). One of the outcomes of improper use of these antibiotics is the development of resistant strains of microorganisms which is now recognized as important challenge in clinical practice (Levy, 1997) and there is, therefore, the need to look for non-conventional substances with proven antimicrobial activity which can be used in the treatment of microbial infection including those that are encountered in dental practice. Santhanathan, *et al.* (1996) reported that Africans that use chewing sticks have fewer carious lesions than those that use toothbrushes and their use has been encouraged by the World Health Organization (Almas and Al-Lafi, 1995).

Chewing sticks can be used by the vast majority of people who cannot afford to buy the commercial Western toothbrush and toothpaste (Kassu, 1999).

In view of the global challenges of oral health burdens and the unaffordable costs of oral health care services; there is the need for a research into the alternative sources of maintenance and remedies like chewing sticks use especially in developing economies like Nigeria.

It must also be stressed that the development of a good herbal toothpaste is consequent on the bioactivity of the constituents of chewing sticks against a wide range of oral pathogens; hence, the need for a research like this to investigate the phyto-chemical properties of extracts from selected chewing sticks in Nigeria to combat the dental pathogens on one hand and to boost the economy of the country through the development of a Small and Medium Enterprises in herbal toothpaste.

Enwowu (1997) indicated that chewing sticks provides mechanical

stimulation of the gums and also destroy micro-organisms; these advantages of the chewing sticks over the conventional toothpaste and brush has been associated with the strong teeth of Africans (Ugoji *et al.*, 2000). Previous investigations carried out on some selected chewing sticks materials showed that they possess antimicrobial activity against oral microbial flora such as *Staphylococcus aureus* and *S. auricularis* (Akande and Hayashi, 1998), *Candida albicans*, *Aspergillus flavus*, *Microsporium gypseum* and *Trichophyton metagrophytes* (Adekunle and Odukoya, 2006).

The objectives of this paper are to ascertain the reasons for Consumer's preferences of chewing sticks and determine the phyto-chemical properties some chewing stick materials in the study area with a view to domesticate and conserve important chewing stick tree species for development of a herbal toothpaste industry in the future to forestall oral infections among the respondents.

Materials and Method

1. Phytochemical screening

Basic phytochemical screening was performed on four replicates of each of the 11 selected chewing sticks plants to ascertain and describe their phyto-chemical and antimicrobial properties. Each of the samples was air-dried and grinded into powder using Herzog Milling Machine. The powdered samples were tested for the presence of secondary metabolites such as Saponins, Alkaloids, Glycosides, Flavonoids, Phlobatannins and Cardiac glycosides following the method described by Trease and Evans (1978).

1.1 Test for saponins

0.2g of the crude extract of the sample was shaken with 5ml of distilled water. The mixture was heated to boil. Frothing which persist for 40 minutes shows the presence of saponins.

1.2 Test for alkaloids

0.2g of the crude extract was added to 10ml of 2% H₂SO₄, the mixture was filtered and few drops of

Dragendorff's reagent were added. An orange red precipitate indicates the presence of alkaloids.

1.3 Test for glycoside

0.5g of the crude extract was added to 10ml of 2% HCl solution and neutralised with 5% NaOH solution. A drop of Fehling solutions A and B were added. Formation of red precipitate established the presence of glycoside.

1.4 Test for flavonoids

0.5g of the crude extract was dissolved in 5% NaOH and 2% HCl solution was added. A change from yellow solution to a colourless solution indicates the presence of flavonoids.

1.5 Test for phlobatanins

0.5g of crude of extract was dissolved in distilled water and filtered. The filtrate was boiled with 2% HCl solution. Formation of red precipitate indicates positive test.

1.6 Test for cardiac glycosides

0.5g of the crude extract was added to 2 ml of acetic anhydride. The mixture was then cooled in ice followed by the addition of concentrated H₂SO₄. A color change from violet to blue-green coloration indicates the presence of a steroidal nucleus (i.e. a glycone portion of the cardiac glycosides).

2. Four hundred randomly selected respondents in Ogun and Oyo states of South-western Nigeria were interviewed through the use of a Checklist to ascertain their reasons for preferring chewing sticks for oral hygiene and the responses are summarized and presented in frequency tables and *amygdalina*) contain flavonoids. Flavonoids are phenolic compounds which are also known to exhibit anti-microbial properties. For example, the anti-microbial activity of *Zanthoxylum zanthoxyloides* has been attributed to the presence of phenolic acids and alkaloids. Glycosides were present in samples 2 (Ayan- *Olox subcorpoida*), 3 (Booni- *Altonia boonei*), 5 (Pako dudu - *Khaya ivorensis*), 6 (Pako pupa- *Terminalia glaucescens*), 8 (Ayin- *Anageissus leiocarpus*) and 9 (Meyinro-*Sorindeia warneckii*). Cardiac glycosides were also present in samples 3, 5, 6, 8 and 9 respectively. No phyto-constituent was detected in Pako Ijebu (*Massularia acuminata*) which is the main commercial scale chewing stick that is generally used and sold in the study area. This is believed to be the result of long

distance involved in its sourcing and distribution which usually make it reach the ultimate consumers at a very dry stage when most of the phyto-constituents might have been lost due to change in state. The need to domesticate this highly important species is further emphasised. Phlobatanins were absent in all the samples evaluated.

The results compliment earlier observations by Rotimi *et al* (1988), Akande and Hayashi (1998) and Adekunle and Odukoya (2006) and this affirms the fact that these plant species are suitable for better oral and dental care given their various antimicrobial properties.

Table 2 reveals that the principal reasons for the preference of conventional toothpastes by respondents are convenience (30.9%) and efficiency (27.7%). Other reasons include ready availability (26%), civilization (14.1%), cheapness (7%) and miscellaneous reasons. This implies that convenience and efficiency of cleaning is more important to most people than oral health disease prevention and maintenance.

3.0 Results and Discussion

The results of the phytochemical screening of 11 widely utilized chewing stick materials are summarised in Table 1. The result shows that some of the samples can exhibit anti-microbial properties as a result of their phytochemical constituents. For instance, samples 3 (Booni- *Altonia boonei*), 4 (Emigbegiri - *Pseudocereia kotshyi*), 5 (Pako dudu - *Khaya ivorensis*) and 6 (Pako pupa - *Terminalia glaucescens*) contain alkaloids: physiological active substances that exhibits anti-microbial properties and this observation is in agreement with the findings of Jablonski, (1982). Similarly, samples 4 (Booni - *Altonia boonei*), 10 (Orogbo- *Garcinia kola*) and 11 (Ewuro- *Vernonia*

Table 3 shows that the respondents have chewing stick use experiences of between 6 and 10 years (30.6%), 1 to 5 years (23.4%) while only 6.3% have chewing stick use experience of above 20 years across the states. Within the states more (32.1%) of the respondents in Ogun state have chewing stick use experience of 1 to 5 years and about 9% have chewing stick use experience of above 20 years whereas more respondents 32.7%, 27.3% and 21.8% respectively have 6 to 10 years, 11 to 15 years and 16 to 20 years experiences in using chewing sticks. The table further shows that most (54.3%) of the users use chewing stick for mouth cleaning daily though a greater percent (64.1%) of them are found in Oyo state. Other categories of users are weekly (12.3%), monthly (11.9%), others (6.2%) and bi-monthly usage (15.2%) which are found only among the Ogun state respondents. It implies that, generally, chewing sticks are used daily by most respondents in the study area.

Majority (73.6%) of the respondents used chewing stick for mouth cleaning in the morning, 6.2% use it in the afternoon, 4.1% use it in the evening while 16.1% indicated usage anytime of the day. Ideally, chewing stick should be used before meals to remove the bacteria that convert

sugar into acid, or immediately after meals (Almas and Al-Lafi, 1995).

In terms of duration of mouth cleaning with chewing sticks, most (37.6%) and 29.8% of the respondents indicated the use of over 20 minutes and 5 to 10 minutes respectively of tooth brushing with chewing stick in the study area. Within the states, majority (55.3%) of respondents in Ogun state indicated the use of 5 to 10 minutes to brush with chewing sticks whereas majority (54.3%) of respondents in Oyo state indicated the use of over 20 minutes to brush with chewing sticks. This shows that chewing stick usage requires more time than the conventional toothpaste usage.

Nevertheless, five minutes of complete devotion to chewing stick usage is sufficient to ensure good cleansing and the resulting smooth feel of the teeth with the tongue gives a critical measure of the efficiency and effectiveness of the chewing sticks (Ra'ed *et al.*, 2007).

Conclusion and Recommendation

The study conclude that the perceived cleaning action and the therapeutic value of chewing stick materials are the principal consideration in the choice of materials to use as chewing stick in the study area and recommends a comprehensive ethno-botanical survey of chewing stick plants with medicinal potentials and validation of their constituents.

Table1. Phytochemical constituents of selected chewing sticks

s/n	Local name	Botanical Name	Saponins	Alkaloids	Glycoside	Flavonoids	Phlobatanins	Cardiac-glycosides
1	Pako Ijebu	<i>Massularia acuminata</i>	X	X	X	X	X	X
2	Ayan	<i>Olox subscorpioda</i>	√	X	√	X	X	X
3	Booni		X	√	√	X	X	√
4	Emigbegeri	<i>Pseudocerebra kotschyi</i>	√	√	X	√	X	X
5	Pako dudu	<i>Khaya ivorensis</i>	X	√	√	X	X	√
6	Pako pupa	<i>Terminalia</i>	X	X	√	X	X	√

		<i>glaucescens</i>						
7	Dongoyaro	<i>Azadiracta indica</i>	√	X	X	X	X	X
8	Ayin	<i>Anageissus leiocarpus</i>	X	X	√	X	X	√
	Meyinro	<i>Sorindeia warneckii</i>	X	X	√	X	X	√
10	Orogbo	<i>Garcinia kola</i>	X	X	X	√	X	X
11	Ewuro		X	√	X	√	X	X

Source: Field survey 2009

NOTE: X= Not present √= Present

Table 2. Materials used for cleaning teeth and preference for chewing sticks

Description	Ogun State		Oyo State		Total	
	Freq.	%	Freq.	%	Freq.	%
<u>Materials used for tooth Cleaning</u>						
Herbal Toothpastes	18	14.1	26	19.7	44	16.9
Conventional Toothpastes	17	13.3	6	4.5	23	8.8
Chewing Stick	26	20.3	36	27.3	62	23.8
Herbal Toothpastes & Chewing Stick	35	27.3	22	16.7	57	21.9
Conventional Toothpastes & Chewing Stick	17	13.3	17	12.9	34	13.1
Total	128	100	138	100	260	100
<u>Preference for chewing stick</u>						
Convenience	17	14.5	13	9.8	30	12.0
Cheapness	25	21.4	22	16.7	47	18.9
Ready availability	16	13.7	31	23.5	47	18.9
Medicinal/therapeutic Value	58	49.6	62	47.0	120	48.2
Others	1	0.9	4	3.0	5	2.0
Total	117	100	132	100	249*	100

Source: Field survey, 2009

Table 3. Preference for toothpastes

Reasons for preference of toothpastes	Ogun state		Oyo State		Total	
	Frequency	%	Frequency	%	Frequency	%
Convenience	44	35.5	35	26.5	79	30.9
Cheapness	12	9.7	6	4.5	18	7.0
Efficiency	34	27.4	37	28.0	71	27.7
Ready available	17	13.7	21	18.2	41	16.0
Civilization	14	11.3	22	16.7	36	14.1
Others	3	2.4	8	6.1	11	4.3
Total	124	100	132	100	256	100

Source: Field survey, 2009

*Lower due to non-response

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