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Culture for Health Promotion and Improvement of Health Outcome in Southeastern Nigeria: A Comparative Analysis of Kola Nut (Oji), Bitter Kola (Akilu), African Pepper Fruit (Mmimi), and Alligator Pepper as Lens

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Abstract: Background: All over the world culture shapes how we perceive pain, what humans describe as good or "good life", and how people ask for help. Culture is a binder, which influences a person's health behaviours and psychological resilience. Effective health services are often rejected, where such failed to acknowledge, and respect people's culture. Objectives: A comparative analysis to determine how cultural or traditional nutraceutical foods such as, Kola nut (Oji), BitterKola (Akilu), African Pepper fruit (Mmimi), and Alligator pepper (Oso oji) could create a road map and pave way for green economy, easy acceptance and use of cultural foods, which evidence has shown to possess potency for health restoration to ensure that findings bring about the desired social change. Theory: Systematic- Comparative Review: Community approach to intervention services. Methods: Searched the Internet, google scholar for data mining, and examined data to learn from the existing evidence about the nutritional, chemical, and phytochemical composition of. Only peer reviewed data obtainable from the internet were included, other sources were excluded. Results: Evidence showed that the aforementioned cultural food are high in macro and micronutrients, as well as phytochemical compounds, which evidence linked with pharmacological properties. Conclusion: Kola nut, Bitter Kola, African Pepper fruit, and Alligator pepper are rich in nutraceutical and being traditional revered food pave way for evidence easy acceptance and use for food and healing remedies.

INTRODUCTION

A systematic review is evidence-based pragmatic scientific philosophy of filtering information overload into actionable data for easy access. An unending rise in cost of medical treatment and huge adverse effect of some modern medicine has prompted a growing trend on the demand for nutraceuticals on grounds of its cost effectiveness and low to zero adversity. And yet in some cases culture stand as a barrier to acceptance and use of findings. This study therefore sought and performed a comparative analysis of the selected seeds to see how traditional acceptance of these nutraceuticals could bridge a gap of cultural negligence, and fast track outcome's use to effect positive social change and that is the purpose of this investigation. Because, culture influence quality of life and health outcomes through its capacity to shape social connections, dietary behaviours and healthcare delivery services. To promote or foster holistic wellbeing of individuals, families and communities, and improve patient's satisfaction, there is a need to integrate cultural practices into public health and healthcare systems (Jayasinghe et al., 2025, Loy, 2024, 19, 20-26, 35-37). And since the foundation of advocacy, policy change and reforms, professional practice and academia is research evidence, pioneering the championing of cultural link and integration was necessitated. Thus, in this systematic comparative review, credible peer reviewed scientific evidence was evaluated to filter out information overload

and retrieve valuable data analyzed to inform targeted users in this regards to set the ball rolling on cultural integration of clinical and research evidence of nutraceutical traditional food into public health and healthcare systems, while tapping from cultural acceptance of the nutraceutical to facilitate evidence acceptance and use to improve quality of life and health and well being of local and global communities. Structurally, this information was presented under subheadings, background, results and data presentation, discussion, conclusion, and the reference.

BACKGROUND

One may ask why bringing culture into healthcare and health promotion? Great question but evidence has shown that no person can pretend to be expert in another person's culture, at this point in time in public health movement, having dwelt so much on cultural competence, yet it is not enough, something more is demanded and required of professionals. Thus, science is shifting from cultural competence towards "cultural humility"- meaning that a person from a local environment remains the number one person with the most valuable expertise regarding own culture, hence the key person with the right cultural humility (19, 20- 26, 27-30, 32, 34-37). Thus, sending an invitation to healthcare providers and world leaders make it a duty to listen and co-create solution in a bid to solve human problems. Recognizing the local community identity signals a respect for their culture, which will no doubt lower their stress hormone, or anxiety, make them to relax, and begin to trust the service-provider or the leader, causing them to listen and accept health information or services brought at their doorstep (WHO int, 2024; 2025). This understanding of the necessity of culture is no longer considered as extra effort of a professional, but a core priority, which must be considered, if we must achieve a better health outcome and this concept defines the justification for this study crafted to see how the traditional use of the fruits/seeds studied could pave a way for easy acceptance and consumption of nutraceutical evidence to improve the quality of life of the local community in the Southeastern Nigeria, increase health outcome and bring about the desired seamless social change as the end gain of research. Culture goes beyond a collection of arts and traditions to include 'operating system' that enables a person, family, and community to process well-being, health and social connections, and it shapes behaviour (World Health Organization int 2024; 2025, Loy, 2025, Jayasinghe, Byrne, & Hills 2025, Froelich et al, 2025).

Lessons of specific mechanisms through which culture impact on health and health outcomes are:

2025 oncology research showed that cultures with low *power-distance-index* (PDI), received better safety and quality of care. PDI are situations which empowers patients to speak up to their doctors, which varies from culture to culture (Jayasinghe, Byrne, & Hills 2025).

Also, evidence revealed a link between positive acculturation and mental health: a situation whereby immigrants who balanced or integrated home culture with host culture to adapt better in host nation as against those that abandoned their culture entirely (2025). According to Jayasinghe, Byrne, and Hills, (2025), and Froelich C. et al, (2025) culture influence healthy choices and cardiovascular health and involving culture in co-creation and knowledge sharing is a new way for Ecological Solutions and sustainability.

Cultural Diets and Health Outcomes

Well-being, improved population health, cost reduction and patient satisfaction, which are core goals of health is better achieved through cultural responsible culinary practices (Loy, 2024). Benefits dwelt on: 1. Prevention- clinical evidence suggested that popular traditional culinary spices namely, ginger, garlic, and cinnamon to possess the capacity to regulate gut microbiome modulation, improve metabolism of sugar, and control of hypertension (Loy, 2024). 2. Diverse Nutrition- 'superfoods' consist mainly of ethnic and local healthy food, and ingredients with minimal and necessary processing rich in bioactive compounds such as polyphenols with clinical evidence of having potency for health control and diseases prevention. 3. Sustainability-tailored and plant-based food modern diet concepts aligns directly with traditional local or place-based nutritional diests (Jayasinghe, et al, 2025, 19, 22, 25, 26).

Mental Wellbeing and Social Connection

In the face of urbanization, social connection is a necessary determinant of health; essentially as it concerns seniors world wide (Jayasinghe, et al, 2025).

Twenty six percent of international seniors early mortality were connected to loneliness faced away from cultural environment (19, 22, 25, 26).. Intergenerational family and community bonding are part of benefits of indigenous physical literacy initiatives- clinging unto traditional ways of living and relationship-building- healthy bonds, which protects chronic diseases (Froehlich Chow et al., 2025).

Also, Community-based Ecotheraphy is benefit gained from livelihood and cultural activities example, gardening, which restores mental health by engaging individual and families their environment (19, 22, 25, 26).

Modern Healthcare Delivery and Cultural Humility

Like the modern healthcare practice in North America, all are encouraged to embrace a shift from cultural competence to cultural humility. A practice, which promotes lifelong reflection of care providers to redress power imbalances existing between patients and care provider, and foster the safety of Indigens, with Canada taking the lead by developing policies from 2024 to 2026 that made it mandatory for all public servants to undergo cultural humility training to address systemic discrimination and encourage 'two-eyed seeing' by blending Western medical practices with Indigenous knowledge. And use organizational health literacy to promote health literacy to counter health inequalities, a sustainable way to lower national non-communicable diseases healthcare costs (19, 22, 25, 26).

With the knowledge of impact of cultural approach in healthcare success or failure, lets examine the nutritional, chemical, and phytochemical four traditional seeds namely, Kola nut: *Cola acuminata* (oji), Alligator Pepper: *Aframomum melegueta* (oseoji), African Pepper: *Dennettia tripetala* (Mmimi), Bitter Kola: *Gracinia kola* (Akilu). These seeds are the cornerstones for Igbo traditional medicine and culture in Southeastern Nigeria, loaded with health giving bioactive compounds such as polyphenols, antioxidants, and stimulants (19, 22, 25, 26).

METHODS

A systematic review, which searched the Google Scholar and search engines to locate, filter and retrieve secondary data containing the quantitative data used for data analysis to generate the results as presented below. Only Peer reviewed articles available online were include in the study data samples analyzed, non-peer reviewed articles were excluded. Systematic Review is defined as community approach to intervention services. It is a qualitative or descriptive study, which gathers, appraises, analyzes, and summarizes various evidence on a particular subject to generate a more reliable evidence for decision making (4-7).

RESULTS AND DATA PRESENTATIONS

Results showed that the four culturally revered seeds investigated namely, Kola nut: Cola acuminata (oji), Alligator Pepper: Aframomum melegueta (oseoji), African Pepper: Dennettia tripetala (Mmimi), Bitter Kola: Gracinia kola (Akilu) are rich in macronutrients, phytochemical compounds and micronutrients -vitamins and minerals, which clinical evidence has suggested to have potency in managing metabolic syndrome diseases. Data were presented on tables 1-5 under subheadings, Qualitative Summary of Phytochemical compounds, chemical composition, micronutrient mineral composition, micronutrient vitamins composition and phytochemical compound composition each followed with the interpretation of the table content.

Table 1: Qualitative Summary of Phytochemical Composition of Four African Cultural Revered Seeds: Cola acuminata, Aframomum melegueta, Dennettia tripetala And Gracinia kola.

Seeds Local Names	Scientific Names	Phytochemical Compounds	Health and Nutritional Benefits
Akilu	Gracinia kola	Kolaviron (biflavonoid Complex), saponins, Xanthones	Anti-bacterial, anti-viral, hepatoprotective (Liver protection)
Oji	Cola acuminata	Tannins, Phenols, Caffeins, Theobromine	Suppresses hunger, increase metabolism, and blood pressure and physical endurance
Mmimi	Dennettia tripetala	Dennettia Essential oils, Flavonoids, Phenolics	Cough treatment, antioxidants, spicy flavour
Alligator pepper	Aframomum melegueta	Paradol, Shogaol, Terpenoids, Gingerol	Antimicrobial, aphrodisiac, anti-inflammatory

(1, 3, 26-30, 32, 34).

Interpretation

These seeds are high in bioactive compounds essentially Kolaviron from Bitter Kola – a mixture of biflavonoids, which offers a natural protection to the liver, and neutralizes toxins, and inhibit virus replication. High 6-paradol and 6-ginerol from Alligator pepper responsible for the heat and pepperish flavour possess thermogenic properties triggers the body to burn fat for energy release. It does this much more than capsaicin from chili pepper and piperine from Black pepper. And for Pepper Fruit, phenolic compounds are more

prevalent. While this seed is traditionally eaten for its pleasant flavour, and womb cleanser for women after childbirth, but evidence has shown that phenols have capacity to control several metabolic syndrome diseases. And Kola nut on the other hand is high in Caffeine and Theobromine, caffeine superior to that of coffee because these two compounds provides continuous energy boost to the body with out sudden sharp drop caused by coffee caffeine.

Table 2: Chemical Composition of Four African Cultural Revered Seeds: Cola acuminata, Aframomum melegueta, Dennettia tripetala And Gracinia kola.

Macronutrients	Aframomum melegueta	Gracinia kola	Dennettia tripetala	Cola acuminata
Moisture	7.80	9.2	8.00	20.60
Carbohydrates	71.80	70.30	62.00	62.55
Protein	13.00	11.20	15.30	8.65
Fat	7.50	1.03	3.4	0.8
Fibre	4.70	3.9	9.8	3.30
Ash (Minerals)	2.8	4.1	4.2	2.75

(1, 3, 26-30, 32, 34). Kola nut: Cola acuminata (oji), Alligator Pepper: Aframomum melegueta (oseoji), African Pepper: Dennettia tripetala (Mmimi), Bitter Kola: Gracinia kola (Akilu).

Interpretations

Garcinia kola is very high value traditionally for its cultural and medicinal values, which evidence has shown to be rich in secondary bioactive metabolites justifying its traditional use as native medicine. High cultural and medicinal value nevertheless, Garcinia kola is high in macronutrients. Carbohydrates, 70%, higher than Cola acuminata having 61% carbohydrates; but protein level of 11% is lower than Cola acuminata with higher protein of 17%; fat, 1% is slightly more than that of Cola acuminata with 0.8% fat, Fibre of 4% is slightly higher than Cola acuminata with 3.30%. In all all these four seeds, aside moisture, which is highest in Cola acuminata, other nutrients are lowest in it. Other than carbohydrates and fat which is highest in Aframomum melegueta, 71%, and 7.5% respectively, other more beneficial nutrients scored highest in Dennettia tripetala.

Table 3: Micronutrient Mineral Average Composition of Four African Cultural Revered Seeds: Cola acuminata, Aframomum melegueta, Dennettia tripetala And Gracinia kola. %

Micronutrient Mineral	Aframomum melegueta	Gracinia kola	Dennettia tripetala	Cola acuminata
Potassium (K)	275.00	2,736.00	2,500.00	135.00
Calcium (Ca)	125.00	1,833.00	1,800.00	72.00
Magnesium (Mg)	90.00	443.00	420.00	32.00
Phosphorus (P)	105.00	380.00	330.00	trace
Sodium (Na)	20.00	753	720	10.00
Iron (Fe)	7.00	3,506	17.70	28.00
Zinc (Zn)	0.33	0.13	0.23	0.01

(1, 3, 26-30, 32, 34).

Interpretation

Looking at the mineral table, we can see that seeds emerged as warehouses for minerals, with potassium (K) topping the list, and Garcinia kola having a disproportionate amount of 2,736.00 mg/100 g, followed closely by Dennettia tripetala, 2,500.00 mg/100 g, next was *Aframomum melegueta*, still high, 275.00 mg/100 g, and cola acuminata coming last but yet, a high score of 135.00 mg/100 g. A disproportionate levels, 1,833.00 and 1,800.00 mg/100 g of calcium yet occurred in *Garcinia kola* and *Dennettia tripetala* respectively, moderate but last amount, 72.00 mg/100 g occurred in *cola acuminata*. High amounts of magnesium (Mg), 443.00 and 420.00 mg/100 g occurred in *Garcinia kola* and *Dennettia tripetala* in that order. Generally speaking, *Garcinia kola* and *Dennettia tripetala* competed very closely with each other from high to disproportionate concentrations of minerals. Another example is Phosphorus (P), 380.00 and 330 mg/100 g. And Sodium (Na), 753.00 and 720.00 mg/100 g. Excessive concentration of Iron, 3,506.00 mg/100 g was located in *Garcinia kola*. Highest level of Zinc (Zn), 0.33 mg/100 g was found in *Aframomum melegueta* and *least in cola acuminata,* 0.01 mg/100 g. In general, cola acuminata scored the least in minerals compared with other seeds.

Table 4: Micronutrient Vitamins Average Composition of Four African Cultural Revered Seeds: Cola acuminata, Aframomum melegueta, Dennettia tripetala And Gracinia kola. mg/100 g.

Micronutrient Vitamins	Aframomum melegueta	Gracinia kola	Dennettia tripetala	Cola acuminata
Water-Soluble Vitamins				
Vitamin C (Ascorbic Acid)	122.50	12.60	115.80	2.25
Vitamin B1 (Thiamine)	0.18	0.45	0.22	0.15
B2 (Riboflavine)	0.12	0.22	0.15	0.08
B3 (Niacin)	1.15	0.61	0.10	1.20
Fab-soluble Vitamins				
Vitamin A (Retinol/Carotene)	3.20	1.36	388.20	0.22
Vitamin E (Tocopherol)	4.80	15.20	10.45	0.15

(1, 3, 27-30, 32, 34).

Interpretations

From the table it is obvious that the highest amount of vitamin C occurred in *Aframomum melegueta*, 122.50 mg/100 g, followed closely by *Dennettia tripetala*, 115.80 mg/100 g, Gracinia kola came third on the rank, 12.60 mg/100 g and *Cola acuminata* came last with a very low score of 2.25 mg/100 g., vitamin B1 was generally low in all, with Garcinia kola topping and *ola acuminata* at the bottom. Vitamin B3, cola acuminata topped the score with 1.20 mg/100 g, and Dennettia tripetala came last with 0.10 mg/100 g. And for vitamin A, the highest score 388.20 mg/100 g occurred in *Dennettia tripetala*, making it a warehouse of vitamin A, while the rest seeds scored low in Vitamin A, and cola acuminata scored the least, 0.22/100 g. *Garcinia kola* took the lead, with 15.20 mg/100 g score, with Dennettia tripetala following closely, with 10.45 mg/100 g, and cola acuminata occupying the bottom of the least with 0.15 mg/100 g score.

Table 5: Phytochemical Compounds Average Composition of Four African Cultural Revered Seeds: Cola acuminata, Aframomum melegueta, Dennettia tripetala And Gracinia kola. mg/100 g.

Phytochemical Compounds	Aframomum melegueta	Gracinia kola	Dennettia tripetala	Cola acuminata
Alkaloids	6.21	1.49	0.41	1.61
Flavonoids	2.50	1.43	1.00	0.31
Saponins	5.90	1.50	0.49	4.43
Tannins	2.23	0.90	2.15	3.70
Phenols	3.49	0.99	3.13	1.00
Steroids	0.65	0.24	0.40	0.35

(1, 3, 27-30, 32, 34).

Interpretations

The highest concentrations of phytochemical compounds were located in *Aframomum melegueta* having high Alkaloids, 6.21 mg/100 g, as against 1.61, 1.49, and 1.40 for Cola acuminata, Garcinia kola, and Dennettia tripetala respectively. It topped the score with 2.50 mg/100 g for Flavonoids and cola acuminata came least, 0.31 mg/100 g, for Saponins, it still came first, 5.90 mg/100 g, next was cola acuminata, 4.43 mg/100 g, and Dennettia tripetala came last with 0.49 mg/100 g, *Aframomum melegueta* yet took the lead for Phenols, 2.49 mg/100 g, while Garicinia kola and cola acuminate took bottom seats with 0.99 and 1.00 mg/100 g in that order. Other than steroids which occurred largest in *Aframomum melegueta,* 0.65 mg/100 g, and least in Garcinia kola, 0.24 mg/100 g, and Tannins, which occurred highest in cola cuminata, 3.70 mg/100 g, *Aframomum melegueta* topped the rank.

DISCUSSIONS

The rising burden of non-communicable diseases (NCDs) namely hypertension, diabetes, obesity, and cancer warrant a need to reintegrate highly nutritious cultural foods that occur naturally into the public health framework. The four naturally occurring selected seeds namely, *Cola acuminata* (oji), Alligator Pepper: *Aframomum melegueta* (oseoji), African Pepper: *Dennettia tripetala* (Mmimi), Bitter Kola: *Gracinia kola* investigated are typical examples nutraceuticals or potent food representing accessible and cost-effective traditional foods targeted for enhancing the wellbeing of the community (22-24). The time is now to harness African potent flora to promote a resilient health-conscious community. The results of the quantitative data were presented above under subheadings, macronutrients, vitamins, minerals, and phytochemical compounds were generic grouping of the subheadings for this discussion.

Respiratory and Sight Health

In this study, the diverse and unique landscape of healing potency of each of these seeds were revealed. Highly effective compound, an essential oil named 1-nitro-2-phenylethane for antibacterial and respiratory infection control was isolated from *Dennettia tripetala*.

And the highest concentration of vitamin A, 388.20 mg/100 g occurred in African Pepper fruit.

Hepatoprotective and Anti-viral Agent

A distinguished biflavonoid compound called Kolaviron with high potency for liver organ protection (Hepatoprotective) and virus control (antiviral) was located in *Garcinia kola*. Also the highest concentrations of potassium (K), 2,736 mg/100 g and Calcium (Ca), 1,833/100 g which foster acid-base balance, electro-chemical balance, healthy teeth and bone, and cellular defence exist in *Garcinia kola*. And high concentration of vitamin E, 15.20 mg/100 g makes *Garcinia kola* a fat-soluble antioxidant, which protects the cell membranes from oxidative stress, good for chronic liver pathologies and cell inflammation treatment (1, 2, 3, 7-9, 10-18, 26-30, 32, 34).

Immune Booster and Metabolic Thermogenesis

Potent anti-inflammatory and thermogenic agents, 6-gingerol, and 6-paradol were found in *Aframomum melegueta* in high concentration and the highest amount of vitamin C, 122.50 mg/100 g, which boosts the body immunity was located in Alligator pepper. These phenolic agents, 6-gingerol, and 6-paradol contrary to capsaicin from pepper and chilli pepper that promotes shivering (crashing) thermogenesis, 6-gingerol, and 6-paradol stir up a more superior non-crashing general body energy expenditure (thermogenesis) (1, 2, 3, 7-9, 10-18, 26-30, 32, 34).

Stimulation, Cardiovascular Health and Neuroprotective

And high theobromine in synergy with high caffeine located in *Cola acuminata* offers high potency for stimulation (stimulant). And high level of saponin, 8.06 mg/100 g, makes *Cola acuminata* potent agent for metabolic syndrome diseases control including cardiovascular health. Theobromine promotes vasodilation and inhibit vasoconstriction (jittery) side effect caused by caffeine, thereby enhancing healthy physical endurance and mental alertness during labor-intensive and high cognitive functions. High saponins further suggests cardiovascular health and cholesterol regulation (1, 2, 3, 7-9, 10-18, 20-25, 27-30, 32, 34).

Homeostasis and Acid-Base Balance

The disproportionate concentrations of minerals in these four seeds were useful for healthy homeostasis, Potassium-to-Sodium ration (K: N), essential for the control of hypertension. High amount of potassium (K), 2,736 mg/100 g and Sodium (Na), 753 mg/100 g in *Garcinia kola* foster nerve and muscle function, and same, 2,500 mg/100 g of Potassium and Sodium 720 mg/100 g of *Dennettia triprtala*, are essential for electrolyte balance and cardiovascular health; while high potassium, 348 mg/100 g and very low sodium, 10 mg/100 g of *Cola acuminata* support neurological health, and blood pressure control (1, 2, 3, 7-9, 10-18, 20-25, 27-30, 32, 34). In low dairy consumption nations such as Nigeria, high prevalence of calcium 1,833 mg/100 g, and 1,800 mg/100 g located in *Garcinia kola* and *Denettia tripetala* is very good news for teeth and bone health, and bone density.

Vision, Skin and Reproductive Health

High concentration of vitamin E located in all but *Cola acuminata* with low level is very essential for reproductive health, and high level of vitamin A in all but Cola acuminata with low amount suggested the seeds to be essential for vision, and skin health (1, 2, 3, 7-9, 10-18, 20-25, 27-30, 32, 34).

CONCLUSIONS

From the quantitative data analysis, results confirmed that *Cola acuminata* (oji), Alligator Pepper: *Aframomum melegueta* (oseoji), African Pepper: *Dennettia tripetala* (Mmimi), Bitter Kola: *Gracinia kola* are popular cultural artifacts loaded with bioactive metabolites with pharmacological properties namely, vitamins A, C, and E high quality bioavailable antioxidants to protect cells from oxidation and oxidative stress, as well as high fibre and phenols very beneficial for heart health, inflammation, and cholesterol control and host of other phytochemical compounds, which are clinically potent for chronic diseases management. And a such pave way for easy acceptance and use of finding.

RECOMMENDATIONS

The seeds are recommended for public Health integration and should be promoted as potent agents for metabolic syndrome diseases management, nutritional fortification, preventive Hepatology and sustainable stimulants for examples:

1. *Aframomum melegueta* to be promoted as potent agent for inflammation and weight control.
2. *Dennettia tripetala* to be promoted as natural Vitamin A fortification just like unripe plantain, while *Garcinia kola* should be marketed as natural bio-fortifier for calcium optimum intake. Also, just like coconut-water, it can act as antidote – neutralizing effects of drug; so caution is required and ensure that consumer is not on prescription drug.
3. Also, *Garcinia kola* to be promoted for moderate consumption for affordable agent for liver health and it protects liver from toxic oxidative stress.
4. While C*ola acuminata* provides high quality natural alternative to energy drink, and good for nerve and muscle function on account of its high magnesium and caffeine composition. Being a cultural artifact, moderate consumption should be encouraged because of its ability to increase blood pressure.

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