Traditional medical uses of different varieties of *Citrus species* consumed by the Agatu/Idoma tribe of Ayele in Nasarawa local government Area of Nasarawa State, Nigeria

PN Olotu, JP Olotu, IA Olotu, NM Gushit, HO Ejembi, NS Yakubu, U Ajima and EU Onche

DOI: https://doi.org/10.22271/phyto.2022.v11.i2a.14360

Abstract
Citrus is the second most popular and common fruit after mango that is widely consumed by the Agatu tribe of Ayele in Nasarawa Local Government Area of Nasarawa State, Nigeria since the ancient time. The objective of the research was to document different varieties of citrus in Ayele and their traditional medical uses. Well-known and respected individuals in the field of traditional medicine practices in Ayele community were interviewed orally on varieties of citrus and their uses and specimens were gathered for confirmations. Results of the findings showed that different varieties of sweet, bitter and sour citrus were used to manage various ailments such as cancer, inflammation, high blood pressure, diabetes, skin diseases, blurred vision, cuts, and loss of appetite, obesity, indigestion and flatulence. The varieties of citrus used and their folkloric uses were properly identified and documented by their Scientific, English, Agatu/Idoma and Hausa names.

Keywords: Ayele, citrus, variety, food, ethno-medicine

Introduction
*Citrus* was first known to China as documented in their old literature of 314 BC [1, 2]. In 1987, *citrus* was the highest orchard plants globally [3] and in 2010, the yearly harvest was about one hundred and twenty three million tons [4, 5]. In 2012, the world cultivation of sweet oranges increased to 70% [6] and in 2017, more than seventy three million tons of oranges were planted globally and Brazil was known to cultivate about 24% of the global total amount seconded by China and then India. [7]. The different species of oranges documented in the literature include *C. limon* (lemon), *C. medica* (citron), *C. aurantium* (sour orange), *C. paradisi* (grape fruit), *C. reticulata* (mandarin, tangerine), *C. clementina* (clementine) and *C. sinensis* (sweet orange) and are broadly classified into sweet sour and bitter oranges [3]. They are eaten throughout the world as it provides good quantity of ascorbic acid to the body as antioxidants and boosters [8]. Traditionally, citrus have been used to manage constipation, cramps, colic pains, diarrhea, bronchitis, tuberculosis, cough, cold, obesity, menstrual disorder, angina, hypertension, anxiety, and depression and stress [9]. Different chemical constituents have been associated with the fruits, peels, leaves, juice and roots such as flavonoids, steroids, hydroxyamides, alkalanes, fatty acids, coumarins, peptides, carbohydrates, carabamates, alkylamines, carotenoids, volatile compounds and nutritional elements like potassium, magnesium, calcium and sodium were identified [10]. Orange is one of the most useful edible trees in Nigeria consumed at home as food and in the industries for production. In the industry, citrus is rated highest above other fruits used as raw materials in juice industry with more than 70% of total consumption of fruits in Nigeria [11].

Materials and Methods

Study Design
Illustrative prevalence study was carried out in Ayele in Nasarawa Local Government Area of Nasarawa State, Nigeria to determine the different varieties of *Citrus species* used as traditional medicine by the community.

Study Area
Ayele village, founded by the Agatu in 1830, is a village under Loko District Council of Nasarawa Local Government Area in Nasarawa State. Ayele is located in a riverine area on the edge of the Benue River.
The main ethnic group and the inhabitants of Ayele village are the Agatus. As an agrarian community, farming, fishing, hunting and commerce are the preoccupation of the people with 99.99% of the population as Christians and only about 0.01% pagans and muslims. It has an area of 176,012 km² and a population of about 10,611 with more of the older people (50-90 years) than the youth (20-49 years). Ayele has only one Primary Health Care as Healthcare Delivery System with few and primitive facilities making over 95% of the entire population to depend on Traditional Medicine. Most of the youths in Ayele have left for cities in search of education and white collar jobs allowing the huge wealth of the knowledge in traditional medicine with the uneducated and old folks who are mainly farmers, business men, hunters, fishermen and herbalists and who may soon be gathered up to their ancestors.

Study Population
The sourced data includes patients on traditional medicine, farmers, hunters, fishermen and herbalists or any one identified and received by the community to have knowledge on traditional medicine for not less than ten years. The research area included people from the age of ≥ 40 years which have reside in the village for ≥ ten years.

Sample Size
The formula, \( N = X \times Y / (1 - Y) \) was used in the calculation of sample size.

Where
\( N = \) Approximate sample size
\( X = \) Standard value correlating to the preference measure of certainty
\( F = \) Error of clarity

Note: Putting on the non-respondent rate (5%) to the final sample size became 290 but 300 was adopted as the sample size for the research.

Oral Interview
The method used by [12] was acquired for the research work. Data on different varieties of oranges from Ayele were collected by oral interview of folks with treasures of grip on traditional medicine using designed question polls. Older folks, Traditional medical practitioners, herb-doctors and individuals with sufficient knowledge on the tradition and prescriptions; well-known and respected by the locality were interviewed. Plant samples were collected in company of the Traditional medical practitioners and digital photographs of the plant samples were taken. For the periods of the quiz, common plant names, beneficial medicinal parts, mode of preparation and application, dosage and length of treatment were documented. The research took one year to be completed (January 2021 to January 2022).

Plant Collection and Identification
Different varieties of orange leaves, flowers and fruits were gathered from Ayele in Nasarawa Local Government Area of Nasarawa State, Nigeria between 2nd January, 2021 and 17th January, 2021. The plants were identified in the field using pharmacognostic descriptive tools and conditions in the ‘Flora of West Tropical Africa’ [13] and the ‘Woody plants of Ghana’ [14]. This was then authenticated at the Department of Horticulture and Landscape technology, Federal College of Forestry, Jos, Nigeria and allocated Voucher Numbers by Mr. Joseph Jeffrey Azila and the specimens were deposited in the herbarium of the same institution.

Table 1: Identification of the Varieties of Citrus species

| S. No | Botanical Name | Authority | Family | English Name | Hausa Name | Idoma name | Type |
|-------|---------------|-----------|--------|--------------|------------|------------|------|
| 1     | Citrus bergamia | Risco et Poiteau | Rutaceae | Bergamot orange | Lemu mai dici | Alemu Onugba | BITTER |
| 2     | Citrus reticulata | Blanco | Rutaceae | Mandarin Orange | Lemu Mandarin | Alemu Mandan | SWEET |
| 3     | Citrus sinensis | L. | Rutaceae | Sweet/Common/Juice Orange | Lemu mai zaki | Alemu Olamu | SWEET |
| 4     | Citrus meyeri Citrus limon | Burm.F. | Rutaceae | Lemon | Lemu mai tsami | Alemu Opopmo | SOUR |
| 5     | Citrus aurantifolia | L. | Rutaceae | Lime-Orange | Lemu mai tsami | Alemu Ogbibil | SOUR |
| 6     | Citrus sinensis | L. | Rutaceae | Navel Orange | Lemu mai cibya | Alemu Agyiki | BITTER |
| 7     | Citrus macrocarantha | Hassk | Rutaceae | Heirloom navel/Washington Orange | Lemu mai cibya kara | Alemu Agrika kara | BITTER |
| 8     | Citrus aurantium | L. | Rutaceae | Seville Sour Orange | Lemu mai tsami | Alemu Ogbibil | SOUR |
| 9     | Citrus sinensis | L. (Osbeck) | Rutaceae | Red/Blood Orange | Lemu mai ji’ni | Alemu goyi | SWEET |
| 10    | Citrus paradisi | Macfad. | Rutaceae | Pink-grape Orange | Garehul | Yero Lemu | SWEET |
| 11    | Citrus medica | L. | Rutaceae | Citron | Lemu Citron | Alemu Citron | SOUR |
| 12    | Citrus sinensis | L. | Rutaceae | Acid-less Orange | Lemu mara acid | Alemu yew | SWEET |
| 13    | Citrus nobilis | King | Rutaceae | King-Mandarin | Sarkin-Mandarin | Oche-Mandalin | SWEET |
| 14    | Citrus paradisi | Macf. | Rutaceae | Florida-grape Orange | Garehul Florida | Alemu Florida | SWEET |
| 15    | Citrus sinensis | L. | Rutaceae | Cara-Cara | Lemu mai Jan cibi | Alemu Kala-Kala | BITTER |
| 16    | Citrus grandis/maxima | L. (Osbeck) | Rutaceae | Pomelo/Punmelo | Lemun tsami | Alemu Ogbibil | SOUR |
| 17    | Citrus reticulata | Blanco | Rutaceae | Murcott Mandarin | Lemu mai ruwa | Alemu oloyn | SWEET |
| 18    | Citrus reticulata | Blanco | Rutaceae | Golden-nugget Mandarin | Mandarin mai zinariya | Mandalin ga fiya | SWEET |
| 19    | Citrus reticulata | Blanco | Rutaceae | Clementine Orange | Klemeti | Klementin | SWEET |
| 20    | Poncirus trifoliata | L. Raf | Rutaceae | Trifoliate Orange | Lemu mai dici | Alemu Ogbibil | BITTER |
| 21    | Citrus sinensis | L. | Rutaceae | Pineapple Orange | Lemu mai Abarba | Alemu ko g’ede k’ebe | SWEET |
| 22    | Citrus unshiu | Yo-tanaka | Rutaceae | Satsuma/Unshu mikan/Cold hardy mandarin | Sa suma | Sa suma | SWEET |
| 23    | Citrus bergamia | Risso | Rutaceae | Bergamot orange | Lemu mai dici | Alemu ohio | BITTER |

Table 2: Ethno-medical uses of the different varieties of Citrus species

| S. No | Type | Uses |
|-------|------|------|
| 1     | Sweet | Management of cancer, inflammation, high blood pressure, diabetes, skin diseases, blurred sight, loss of appetite, obesity, indigestion & flatulence |
| 2     | Bitter | Control of high blood pressure, diabetes, wounds, indigestion & skin diseases |
| 3     | Sour | Control of high blood pressure, diabetes, wounds, skin diseases & flatulence |
Discussion
Citrus are very good source of ascorbic acid, antioxidant, folate, dietary fibers and bioactive constituents like carotenoids, hesperetin, naringenin and flavonoids that prevent cancer and other degenerative diseases [9]. Citrus also contain compounds that have antiinflammatory properties that inhibit the regulatory enzymes such as protein kinase c, phosphodiesterase, phospholipase and cyclooxygenase which control the formation of biological mediators responsible for the activation of endothelial and specialized cells responsible for inflammation [9]. Sweet, sour and bitter oranges do not contain sodium but are good source of fibre and potassium (14%) [9]. Low sodium, fibre and potassium keep the heart healthy by reducing the risk of increased blood pressure and heart diseases from developing and from being fatal [9]. Fibres upgrade the level of some biochemical factors such as protein and albumin in the blood and decreases cholesterol, triglyceride, high density lipoprotein and low density lipoprotein in the blood because of its capacity to lower or inactive multienzyme-complex of fatty acid synthesis HMG-CoA reductase [15] and this slows down diabetes development and progression. Ascorbic acid level of citrus also adds to collagen production that supports the skin, promotes wound healing and improves skin strength [8]. Furthermore, citrus contains excellent quantity of vitamin A and α- and β- carotenes, β- cryptoxanthin, zeaxanthin and lutein [8]. Vitamin A keeps mucus membranes and skin healthy and is useful for vision. It is a good source of B-complex vitamins such as thiamin, pyridoxine and folates for external skin replenishments [16]. The alkaline property of oranges stimulates digestive juices to relieve constipation [8, 16] but note that patients with gastro-esophageal reflux diseases may experience increase symptoms such as heartburn and regurgitation due to high acid content [8, 16]. Finally, oranges contain low calories with no saturated fats or cholesterol, but are rich in dietary fibre and pectin which is effective in patients with obesity [8, 16]. Pectin as a bulk laxative protects the mucus membrane from exposure to toxic substances [8, 16] and reduces cholesterol level in the blood by decreasing its reabsorption in the colon and by binding to bile acids. The alkaloid, synephine in the peel of oranges also reduces the mucus membrane from exposure to toxic substances [8, 16] and therefore, reduces cholesterol level in the blood.

Conclusion
Twenty three (23) different varieties of Citrus species in Ayele, Nasarawa Local Government Area of Nasarawa State, Nigeria were identified with their English, Hausa and Idoma/Aguatu names as these languages among others are commonly used as means of communication by the locality. Their traditional medical uses were also documented and this could explain why oranges are consumed in high amount in this part of the globe.

References
1. "Citrus ×sinensis (L.) Osbeck (pro sp.) (Maxima × reticulata) sweet orange". Plants.USDA.gov. Archived from the original on May 12, 2011.
2. Jump up to: a b c d e f g h i j Xu Q, Chen LL, Ruan X, Chen D, Zhu A, Chen C, et al. "The draft genome of sweet orange (Citrus sinensis)". Nature Genetics. 2013;45:59-66.
3. Jump up to: a b c d e f g h i j Morton, "Orange, Citrus sinensis. In: Fruits of Warm Climates". New CROP, New Crop Resource Online Program, Center for New Crops & Plant Products, Purdue University, 1987, 134-142.
4. GA Moore. Oranges and lemons: Clues to the taxonomy of Citrus from molecular markers. Trends Genet. 2001;17:536-540.
5. Abbate L, Tusa N, Del Bosco SF, Strano T, Renda A, Ruberto G. Genetic improvement of Citrus fruits: New somatic hybrids from Citrus sinensis (L.) Osb. and Citrus lemon (L.) Burn F. Food Research International. 2012;48:284-290.
6. Jump up to: a b Organisms. Citrus Genome Database.
7. Jump up to: a b "Production of oranges, 2017 – choose "Production, Crops, World Regions" in the left margin and picklist". United Nations, Food and Agricultural Organization, FAO Statistics. 2018. Retrieved 23 July 2019.
8. Etebu E, Nwaouzoma AB. A review on sweet orange (Citrus Sinensis Osbeck): Health, diseases, and management. American Journal of Undergraduate Research. 2014;2:33-70.
9. Milind P, Chaturvede D. Orange: Range of benefits. International Research Journal of Pharmacy. 2012;3:59-63.
10. Manuel J, Favela-Hernandez J, Gonzalez-Santiago O, Ramirez-Cabrera MA, Esquivel-Ferrino PC, del Rayo-Camacho-Corora M. Chemistry and Pharmacology of Citrus sinensis. Molecules. 2016;21(2):247-278.
11. National Horticultural Research Institute of Nigeria, Ibadan, Nigeria; established in 1975: PMB 5432, Jericho Reservation Area, Ibi-Shin, Ibadan. Document Retrieved 2019. www.nihort.gov.ng.
12. Olotu PN, Olotu IA, Gushit NM, Ejembi HO, Onche EU, Ajima U. Varieties of Mangifera indica L. (Anacardiaceae) used as food and medicine by the Idoma people of Eke-Ogodumu in Okpokwu local government Area of Benue State, Nigeria. Journal of Pharmacognosy and Phytochemistry. 2020;9(5):06-10.
13. Burkill HM. Useful plants of west tropical Africa: 2nd edn. Royal Botanical Gardens Ken Richmond, United Kingdom. 1997:4-430.
14. Irvine FR. Woody Plants of Ghana, Oxford University Press London, 1961, 81-83.
15. Nwakulite A, Nwanjo Hu, Nwosu DC, Obeagu EI. Evaluation of some trace elements in streptozotocin induced diabetic rats treated with Moringa oleifera leaf powder World Journal of Pharmaceutical and Medical Research. 2020;6(12):15-18.
16. Jyotsna A, Saoneres S. An overview of Citrus aurantium used in the treatment of various diseases. Africa Journal of Plant Science. 2011;5(10):390-395.