ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 12, Issue, 08, pp.13303-13307, August, 2020

DOI: https://doi.org/10.24941/ijcr.39278.08.2020

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

NUTRITIONAL AND ANTIMICROBIAL ACTIVITIES OF GUAVA (*PSIDIUMGUAJAVA*) SEED FROM MUBI ADAMAWA STATE, NIGERIA

Ezekiel Tagwi Williams, Sunday Godwin and Nachana'a Timothy

Department of Chemistry Adamawa State University Mubi, Nigeria

ARTICLE INFO

Article History:
Received 05th May, 2020
Received in revised form
27th June, 2020
Accepted 14th July, 2020
Published online 30th August, 2020

Key Words:

Determination, Nutrition, Antibacterial, Antifungal, Mineral, Vitamin and Proximate.

ABSTRACT

The nutritional and antimicrobial activity of Guava seed collected from Mubi and Mararaba main market were investigated. The nutritional and antimicrobial activities were determined by standard methods, while the elemental composition by using Atomic absorption spectrophotometer (AAS). The result revealed that the proximate analysis: protein content, fat, fibre, ash content, moisture and carbohydrate were 7.845 %, 6.280 %, 15.415 %, 8.220 %, 9.250 % and 52.990 % respectively. The result of the mineral composition showed that potassium has the highest value with 3241.532 ± 0.012 mg / 100 g and Magnesium having the least value of 8.525 ± 0.005 mg / 100 g. Also Guava seed contains beta carotene, B1, B2, B3, B5 and vitamin C with 47.530 ± 0.010 µg / 100 g, 0.530 ± 0.010 mg / 100 g, 4.155 ± 0.005 mg /100 g, 0.625 ± 0.005 mg /100 g, 0.325 ± 0.005 mg /100 g and 514.355 ± 0.005 mg / 100 g values respectively. The result of the antibacterial activity against three clinical isolated organisms was Staphylococcus aureus (12.436 ±0.009 mm), Escherichia coli (17.536 ± 0.009 mm) and Sterptococcus faecalis (4.560 ± 0.006 mm). The minimum inhibitory concentrations (MICs) for Staphylococcus aureus, Escherichia coli, Sterptococcus faecalis, Candida Albicans and Aspergillus Niger were 5.0, 5.0, 5.0, 10.0 and 10.0 mg / ml respectively. From the result, guava seed can be regarded as a good source of nutrients and also can be used in pharmaceutical industries.

Citation: ***Ezekiel Tagwi Williams, Sunday Godwin and Nachana'a Timothy*****. 2020.** "Nutritional and antimicrobial activities of guava (psidiumguajava) seed from mubi adamawa state, Nigeria", *International Journal of Current Research*, 12,(08), 13303-13307.

INTRODUCTION

Guava (*Psidiumguajava*) is a small ever green sub deciduous tree; it is a native of tropical America. Guava fruit is still enjoyed as sweet treat by indigenous people throughout the rain forest and the leaves and barks of the guava tree has a long history of medicinal uses that are still employed today. The leaves and barks of Guava are used as a cure of diarrhea, sore throat, vomiting, and stomach upset etc. In a recent study with guinea pigs Brazilian researches reported that Guava leave extract plays numerous important roles in cardiovascular system (Barbalho *et al*., 2012; Anita *et al*., 2018). Guava can be consumed processed as jellies, jams and juices. It is particularly rich in minerals and functional compounds such as vitamin C, dietary fibre, carotenoids and phelolic compounds (Thomas *et al*., 2014; Barbalho *et al*., 2012). *Psidiumguajava L*. is particularly known as Guava (family myrtaceae) and has been used traditionally as a medicinal plant throughout the world for a number of ailments. There are two most common varieties of Guava; the red (p.guajava var. pomifera) and the white (Barbalho *et al*., 2012).

Corresponding author: **Ezekial Tagwi Williams,**
Department of chemistry Adamawa State University Mubi, Nigeria.

All parts of *psidiumguajava*, including, leaves, bark and roots have been use for treating stomach arch and diarrhea in many countries. Leaves, pulp and seed are used to treat respiratory and gastrointestinal disorder and as an antispasmodic, anti-inflammatory, as a cough sedative, antidemhric, in the management of hypertension, obesity and in the control of diabetes mellitus. Also it possesses anticancer property (Ryu *et al*., 2012; Anita *et al*., 2018). The seed are used as antimicrobial, gastrointestinal, anti-allergic and anti-carcinogenic activities. The high cost of pharmaceutical medications conduces to such for alternative medicine to treat many ailments (Bontempo *et al*., 2012). The main constituents of Guava are vitamins, tannin, phenolic compounds, flavonoids, essential oil, sesquiterpene alcohols andtriterpenoid acid. These and other compounds are related to many health effect of Guava. Some authors have found high concentrations of carotenoids (Beta carotene, lycopene and B-cryptoxanthin), vitamin C and polyphenols in Guava pulp. Lycopene has been correlated with prevention of cardiovascular damage because of its positive effect on dyslipidemia. Ascorbic acid is recognizing for its important antioxidant effect (Barbalho *et al*., 2012; Shu *et al*., 2010). Guava leave extract has analgesic, inflammatory, antimicrobial, pepatoprotective and antioxidant activity. This effect is probably due to the presence of phenolic compounds (Hawrelak, 2003).,Wang, Jiao, Liu & Hong

(Wang, 2017) reportedthe presence ofhigh amount ofphenolic compounds with antioxidant activity in the leaves of white (psidiumguajava var. pyrifera L.) and red guava (psidiumguajava var. pomifera L.) when compared with other vegetable species (Fu *et al*.,, 2010). Plant seed are a good source of food for humans as while as animals, since they contain nutrient necessary for body growth, including many healthy fats, such as omega fats. In fact, the majority of foods consumed by human beings are seed – based food. Guava fruit is consumed by human while its seed when consumed is not easily digested by human and is assumed to have no nutritional value. This research work is aimed at ascertaining the proximate composition and elemental analysis of Guava fruit and its seed

MATERIALS AND METHODS

Sample collection: Random samples of the fruits (*psidiumguajava* L.) ofdifferent varieties that was used in the study was collected in plastic bags with appropriate labeling and was stored in an ice cooler for transportion to laboratory for pre-treatment and extraction.

Sample preparation: The seeds samples were removed from the flesh and dried in an air circulation oven for approximately 48 hours. After dehydration the seed and the flesh were grounded into a fine powder using a domestic blander. The particle size selected for extraction was from 0.2 – 0.3 mm. The sample was package in plastic bag and stored in the dark and dry place until the extraction was performed

Chemicals and reagent: All Chemicals and reagents used were of analytical grade.

Proximate analysis: The proximate composition (moisture, crude fibre, crude fat, ash content, protein and carbohydrate) of powdery sample of *psidiumguajava* was determined following the standard method described by AOAC (AOAC, 2000).

Determination of mineral Composition: The dried samples were weighed into crucible and placed in muffle furnace at room temperature and the temperature raise to 550^0C for 3 hours to complete ash. The ash was then dissolved in hot 10 % HNO_3, filtered and diluted to required volume in a standard flask with deionized water. This was used to determine the elemental composition using atomic absorption spectrophotometer (AAS) following the standard method of AOAC (AOAC, 2015).

Test organisms: Clinical isolate of staphylococcus, Escherichia coli and streptococcus faecalis were obtained from Mubi General Hospital laboratory, Adamawa State Nigeria. The isolate were propagated on nutrient ager plate and maintained on the Plate at 4^0C. The isolate were sub – cultured in nutrients broth at 37^0C for 8 hours prior to antibacterial testing.

Antibacterial sensitivity testing: Egar well diffusion technique as described by Nwinyi, Chinedu & Ajani (2008) was used to determine the antibacterial activity ofthe extracts.

Determination of minimum inhibitory concentrations (MICs): Egar well dilution method as described by Nwinyi, Chinedu & Ajani (Nwinyi, 2008) was used to determine the minimum inhibitoryconcentration (MIC) ofthe extract.

Statistical Analysis: All determinations were replicated three times and results were reported in mean (±) standard deviation

RESULTS AND DISCUSSION

Results

The result of proximate composition of Guava seed were presented in Table 1, while Table 2 shows the result of the mineral composition. Also Tables 3, 4, 5 and 6 shows the results of vitamin composition, antibacterial activity, antifungal activity and minimum inhibition concentration respectively.

Table 1. The resultof proximate compositionof Guava seed

Proximate	Value (%)
Protein	7.845
Fat	6.280
Fibre	15.415
Ash	8.220
Moisture	9.250
Dry matter	90.750
Carbohydrate	52.990

Table 2. Mineral composition of Guava seed

Mineral	Value (mg / 100 g)
Ca	241.260 ± 0.010
Fe	14.535 ± 0.015
P	502.365 ± 0.985
K	3241.532 ± 0.012
Na	74.585 ± 0.005
Mg	321.535 ± 0.015
Mn	8.525 ± 0.005
Zn	40.165 ± 0.015

Table 3. Vitamin compositionof Guava seed

Vitamin	Value
Beta carotene (µg/ 100g)	47.532 ± 0.015
B1 (mg / 100g)	0.530 ± 0.010
B2 (mg /100 g)	4.155 ± 0.005
B3 (mg / 100 g)	0.625 ± 0.005
B5 (mg / 100 g)	0.325 ± 0.005
C (mg / 100 g)	514 .355 ± 0.005

Table 4. Antibacterial activity of the ethanolic extract of Guava seed (5 mg/ ml) on different test organism

Bacteria Zone of inhibition	(mm)
Staphylococcus	12.436 ± 0.009
Escherichia coli	17.536 ± 0.009
Streptococcus faecalis	4.560 ± 0.006

Table 5.Antifungal activity of the ethanolic extract of Guava seed (5 mg / ml) on different test organism

Fungi (mm)	Zone of inhibition
Candida albil cans	20.153 ± 0.015
Aspergillusniger	18.543 ± 0.012

Table 6. MIC of the ethanolic extract of Guava seed

Bateria	MIC (mg / ml)
Staphylococcus aureus	5.00
Escherichia coli	5.00
Streptococcus faecalis	5.00
Fungi	
Candida	10.00
Aspergillus niger	10.00

DISCUSSION

Proximate composition: The moisture value (Table 1) found in this study was higher than those reported byUchoa, Castro, Beserra *et al*. (2014) who obtained a moisture value of 8.30 ± 0.03 for Guava seed powder. The ash value found was 8.220 ± 0.002. This value is higher than that of Matsuzhki, Ishii, Kobiyama & Kitanaka, (2010) which was 2.40 ± 0.10 and that ofThomas, Sousa, Carioca *et al*. (2014), whose ash value was 3.12 ± 0.03 for the common guava and 3.05 ± 0.01 for the areca, a fruit ofthe same species. The result presented in this study is close to those reported for the guava seed on dry bases (Anita *et al*.,2018). The protein from the seed has functional properties similar to those of other seed which has been used as food ingredient and may be an alternative source of protein for future use in processed food. Comparing the result of the protein analysis, the protein content of the powder obtained from Guava seed was lower than the one reported by Uchoa, Castro, Beserra *et al*. (2014)

Williams, Timothy & Chika (2019) & Thomas, Sousa, Carioca *et al*. (2014) reported that a food item can be considered a source of dietary fibre when it has 3 g/ 100 g in the finished product for solid food and 1.5 g / 100 ml for liquid; if it has twice as this amount, it can be considered as high fibre food. Nwinyi, Chinedu & Ajani (2008) obtained the value of67.00 g /100 g for total dietary fibre for Guava seed powder. The result presented (Table 1) suggests that new product based on fibres obtained from residues of this fruit can be formulated to prevent diseases, especially those related to the gastrointestinal traced and the cardiovascular system. Powder obtained from guava seed is a better source of insoluble fibre than the fractions of the seed and skin of the jabuticaba, a fruit belonging to the same family which has an insoluble fibre value of 26.93 and 26.43 g/ 100 g respectively (Farinazzi – Machado *et al*.,, 2012).

Mineral composition: Calcium is an important mineral required for bone formation and neurological function of the body. The Ca obtained in Guava seed in this study was 241.260 ± 0.010 mg /100 g which falls below the World Health Organization daily required of 800 mg / day for both adult and children. Sodium content obtained from the guava seed has the value 74.585 ± 0.005 mg /100 g which was below the World Health Organization recommendation for daily intake of 500 mg for adults and 400 mg for children (World Health organization, 2013). The mineral composition obtained from Guava seed shows that Fe has 14.535 ± 0.0015 mg/100 g which was slightly below the recommended dietary allowance for Fe (15 mg / day) for both adult and children. This result indicates that Guava is a rich source ofFe as Fe is required for the formation ofblood. Magnesium was found to be 321.535 ± 0.015 mg / 100 g which was little lower than the daily recommended dietary allowance of Mg in adult which is 350 mg / day but adequate for children which is 170 mg / day. Magnesium is very important in Ca metabolism in regulating blood pressure and insulin release (Onyiriuka *et al*., 1997). Zinc content ofthe guava seed was 40.165 ± 0.015 mg / 100 g which shows that Guava seed is rich in Zn. Zinc is important in diet because it helps in the formation of protein and enzymes e.g hemoglobin which prevent anemia (Lippard and Jeremy, 1994). World health organization (WHO) recommended standard ofZn for adult and children are 15 mg / day and 10 mg / day respectively. The result ofthe elemental analysis ofthe study revealed that among elements obtained in Guava seed K has the highest value with 3241.532 ± 0.012 mg / 100 g in the seed flour, indicating that Guava seed is a rich source ofK while Mn has the lowest value (8.525 ± 0.005 mg/ 100 g) which was higher than the daily intake requirement (2.5 mg / 100 g)(19).

Vitamin Composition: Vitamin composition ofGuava seed as investigated (Table 3) is a good source ofvitamin C. A cup of Guava seed has 377 mg ofvitamin C and 56 Calories (Padron-Marquez *et al*.,, 2012). The vitamin C in Guava will help the body absorb Fe from the food we eat and it also plays a role in fat metabolism and brain cell communication. This vitamin helps the body grow and helps to heal wounds; as an antioxidant, it also helps prevent cancer (Sandra *et al*., 2012). Guava also has vitamin A, another antioxidant. Vitamin A works to keep vision strong. It also helps create white blood cells and keeps bone strong. Vitamin A is a part ofthe process of cell growth and division. Vitamin A helps to prevent cells from growing in an abnormal way, which is often a sign ofthe development ofcancer (Padron –Marquez *et al*., 2012). As you eat Guava you are also consuming B – complex vitamins, particularly niacin, vitamin B5 and vitamin B6. Together, these nutrients help the cell perform chemical reactions needed for energy reduction. Niacin also plays a role in nervous system health, while vitamin B6 helps in the synthesis of red blood cell. Vitamin B5 maintains the hormone balance and promotes hormone synthesis. A single Guava fruit contains 1.8 mg of niacin, 744 and 182 µg of vitamin B5 and B6 respectively (Sandra *et al*., 2012).

Antibacterial activities: The antimicrobial compounds extracted from the plant have great therapeutic potential against microbes as they can help in ailment without undesirable side effect which usuallyoccurs with synthetic antimicrobial agents. Thethanoloic extract of seed of *psidiumgauajava* was subjected to the screening for antimicrobial activity against three pathrogenic bacteria including Gram positive strain Stathylococcusaureus, two gram negative strains Escherichia coli and Streptocopcusfaecalis. The activity of ethanolic extract of *psidiumguajava* was observed most inhibitory at pH 6.0 and temperature 35°C. In present study, the ethanolic extract of*P. guajava* has been found possessing antimicrobial activity against test microorganisms. Many plants contain potentially useful substances which can be used as alternative chemotherapeutic agents.

Large varieties of medicinal plants have been screened and many of them have been proven to possess antimicrobial or antifungal activity. It was found that the ethanol extract showed greatest bacterial inhibition (Mahmood *et al*., 2017). The essential oil extract showed inhibitory activity against S. aureus and antimicrobial effect of Guava seed extract shows that it inhibited the growth S. aureus. Guava leaves extract has been found to have good antimicrobial activity against different strain of Spaphylococcusauieus (Arima and Danno, 2002). The result (Table 4) ofthe present study may justify and support the use of extract of these plants in traditional medicine for the treatment of certain infections. This result showed an important antimicrobial activity of guava extract with clear zone of inhibition against the bacterial tested.

Antifungal activity: Previous studies have shown the fungicidal effect of organic extract derived from plant and also have been shown that the activity of secondary metabolite may vary depending on the type of solvent used. In accordance with this, antifungal activity has been reported in polar compounds such as glycosylated, flavonoids and saponins isolated from polar extract and in nonpolar compounds (Kim *et al*., 2010; Sandra *et al*., 2012). In this study ethanol extract (Table 5) showed comparable activity against the fungal strain, similar result was obtained by Nair & Chanda (2008) with inhibition zone diameters of 7.5 – 18 mm against Candida spp and C. neoformans (9 ± 1.15), the best antifungal activity was shown by the hexane extract. The observed activity for hexane extract is acceptable considering that a crude extract was used and the active compound was diluted. It is possible that isolating the active compound or compounds will provide better fungicidal activity (Padron –Marquez *et al*., 2012). The above results suggest that *P. guajava* will be an important source of non – polar compounds with antimicrobial activity. Report about antibacterial and anti fungal compound isolated from leaves of *P. guajava* show that in the polar extract (alcoholic), flavonoids such as quercetin and its glycosides derivate are responsible for strong antibacterial activity including against C. albicans (Arima and Danno, 2002).

Minimal inhibition concentration (MIC): Generally, lower values were obtained for the aqueous extract. Higher concentrations of the respective extract were needed to exhibit Escherichia coli, Staphylococcus aureus and Streptococcus feacalis compared to Candida Albicans and Aspergillus Niger. The MIC of the ethanolic extract of *P. guajava* was 5.0, 5.0 and 5.0 mg / ml for Escherichia coli, Staphylococcus aureus and Streptococcus feacalis respectively.

Conclusion

Comparing the result of the proximate analysis ofGuava seed and other fruit and food mineral, it is confirmed that Guava seed have considerable amount of protein, fats, fibre, and high amount of carbohydrate which enhance enzymes activity in the body and also a sources of energy to the body. The mineral composition showed that Guava seed is a good source of mineral in the diet which enhance the acid balance, maintenance of iron balance, teeth and bone development in young children and regulate muscles and nerve irritability in human health. Ethanolic extract of *P. guajava* showed antibacterial activity against Escherichia coli, Staphylococcus aureus and Streptococcus feacalis. This study has provided the bases for the use of *P. guajava* in the treatment of diarrhea, inflamed gum and stomach pain caused by Escherichia coli and Staphylococcus aureus. The potential antibacterial effect of the plant could be enhanced by extracting with ethanol instead of water as applied in the traditional practice.

Conflict of interest: None

Funding: None

Key Points

- The proximate composition and elemental analysis of locally available Guava seed was ascertained.
- Guava seed could be a source of energy to the body and minerals in diet.
- Guava seed could be used in the treatment of diarrhea, inflamed gum and stomach pain caused by Escherichia coli and Staphylococcus aureus
- The potential antibacterial effect of guava could be enhanced by extracting with ethanol instead of water as applied in the traditional practice.

REFERENCES

AOAC 2000 . Official Methods of Analysis of the Association of Official's Analytical Chemists, 17th edn. *Arlington, Virginia*. pp. 96-105

AOAC 2015 . Official methods of analysis of association of analytical chemists. AOAC International, 18th Ed; Horrowitz, W. ed vol 1 & 2, AOAC. *International Maryland. USA*. 2005;774-784

Arima H and Danno G 2002 . Isolation of antimicrobial compounds from guava psidium gaujava L. .and their structural elucidation. *Bio science. Biotcno. Bio chem.* Pp1727 – 1730.

Anita M, Satya P. M, Amrita A, Somendra K. M, Pooja M and Priyanka K 2018 . Guava Psidium Guajava L. - Review Article. Indian Journal of Drugs, 6 4 , 218-222

Barbalho SM, Flavia MV, Machado F, Goulart RD, Brunnati AC and Machado AM 2012 . Aplant of multipurpose medicinal applications. *Medicinal and Aromatic plant*.pp 1 – 4.

Bontempo P, Doto A, Miceli M, Mita L and Benedetti R 2012 Antineoplastic effect; Introduction of apoptosis and cell differentiation pp23 – 31.

Farinazzi – Machado F, Barbalho S, Guiguer E, Souza Mand Bueno P 20012 . Effect of psidium guajava on the metabolic profile of Wistar rats. *J. of Med. Plant Research*. 1; 104.

Fu H, Luo Y, Li C, Yang J and Zhang D 2010 . Psidials – c, three unusual meroterpenoids from theleaves of psidium guajava L. *Org. Lett* pp656 – 659.

Hawrelak J 2003 . Medicinal Herb monograph; Guava psidium guajava . *Aust Tradit – Med Soc.* Pp25 – 29.

Kim H, Suh H, Lee C, Kim J, Kang H, Park S and Kim J 2010 . Antifungal activity of glyceollins isolated from soy bean elicited with Aspergillus sojae. *J. Agric. Food. Chem* 9483 – 9487.

Lippard S and Jeremy M 1994 . Principle of bioinorganic chemistry .*university science books*, 411.

Mahmood R, Arif M, Mahwish A, Mohammad Z, Qamre A and Marium 2017 . Evaluation of antimicrobial activity of ethanolic extract of Azadirachta indica and psidium guajava against clinical important bacteria at varying. *Biomedical research*. 135 – 139.

Matsuzhki K, Ishii R, Kobiyama K and Kitanaka S 2010 . New benzophenone and quercetin galloyl glycosides from psidium guajava L. *J. Nat. Med*. 252 – 256.

Nair R and Chanda 2007 . Antimcrobial activity of Psidium guajava L. leave extract against clinically important pathogenic microbial strains. *Braz. J. Microbiol* 452 – 458.

Nwinyi O , Chinedu N and Ajani O 2008 . Evaluation of antibacterial activity ofpsidium guajava . *J. of Medicinal Plant Research.*2; 189 – 192.

Onyiriuka S, Nwadinigwe C, Nwaji M, Akwpansi L and Okoro U 1997 . Principle of organic chemistry. 1st edn. Pp 206 – 209.

Padron – Marquez B, Viveros – Valdez E, Oranday – Cardenas A and Carranza – Rosales P 2012 . Antifungal activityof psidium guajava.organic extract against Dermatophytic fungi. *J . of medicinal plant research* 6; 5435 – 5438.

Ryu NH, Perk KR, Kim SM, Yun HM and Nap D 2012 . Induce anticancer activity. *J. of Medicinal Plant* 18; 231 – 241.

Sandra M. B, Flávia M. V. F, Ricardo A G, Anna C S B, Alda M M B O and Cláudia C T N 2012 Psidium Guajava Guava : A Plant of Multipurpose Medicinal Applications. Medicinal & Aromatic Plants 4 1 : 1-6

Shu J, Chou G and Wang Z 2010 . Triterpenoid constituent in fruit ofpsidium. *Zhongguo Zhong Hao Za Zhi* 532 – 535.

Thomas A, Sousa E, Carioca J, Morais S, Lima A, Martins C and Rodrigues L 2014 . Chemical composition, fatty acid profile and bioactive compouds of guava seed psidium guajava L. . *Food Sci. and Technology*, pp2058 – 2061.

Uchoa T, Castro S, Beserra C, Maiade M, Alessandro de L, Clecio Galuvao M and Rodrigues S 2014 . Chemical composition and bioactive compound og guavaseed psidium guajava L. . *Food Sci. and Technology* pp485 – 492.

Wang B, Jiao S, Liu H and Hong J 2007 . Study on antioxidative activities of psidium guajava Lnn leaves extract, *Wei Sheng Yan Jiu* 298 – 300.

World Health organization 2013 . Review and updating of current WHO Recommendations on salt/ sodium and potassium consumption . Geaniva.

Williams ET, Timothy N and Chika A 2019 . Phytochemical Screening, Elemental and Proximate.Analysis of Maerua angolensis Capparaceaea . Stem Bark. *International Journal of Biochemistry Research & Review* 27 4 : 1-10,

****