

## East African Journal of Environment and Natural Resources

[eajenr.eanso.org](http://eajenr.eanso.org)

Volume 9, Issue 2, 2026

Print ISSN: 2707-4234 | Online ISSN: 2707-4242

Title DOI: <https://doi.org/10.37284/2707-4242>

**ENSO**

EAST AFRICAN  
NATURE &  
SCIENCE  
ORGANIZATION

Original Article

### Nutritionally Essential Macro and Micro Mineral Contents of *Aframomum angustifolium* and *Physalis peruviana* Wild Edible Fruits of Bunyoro-Kitara Kingdom, Uganda

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Article DOI: <https://doi.org/10.37284/eajenr.9.2.5011>

#### Date Published: ABSTRACT

21 May 2026

#### Keywords:

Proximate analysis,  
Macro minerals,  
Micro minerals,  
Wild edible fruits,  
Wild Food Plants.

Eating wild fruits can be really good for you and me, and not just because they taste great. Two types of wild fruits, *Aframomum angustifolium* and *Physalis peruviana*, were studied to see how many important minerals they have. These minerals, like calcium (Ca), potassium (K), Magnesium (Mg), Phosphorus (P), Manganese (Mn), Copper (Cu), Zinc (Zn) and iron (Fe), are essential for our bodies to work properly. We used special machines to measure how much of each mineral was in the 15 samples of each fruit. K and Na were determined using the flame emission photometer; P was quantified spectrophotometrically, while Ca, Fe, Mg, Mn, Cu, and Zn were assessed by atomic absorption spectrometry. The findings were compared to the amounts found in common mangoes. It turned out that these wild fruits are actually better sources of many minerals than mangoes. They have more phosphorus, sodium and magnesium, which are all important for our health. One of the wild fruits, *Aframomum angustifolium*, had more calcium and potassium than the other, *Physalis peruviana*. Both of them had a lot of iron and zinc, which are crucial for preventing diseases like anaemia. *Physalis peruviana* was especially rich in manganese, another important mineral. The good news is that eating these wild fruits regularly can help people get the minerals they need. This is especially important for people living in rural areas who might not have access to a variety of foods. The government and local leaders should think about how to make it easier for people to grow and eat these wild fruits. They could create policies to support the use of wild fruits in farming and gardening. This way, more people can benefit from the nutritional value of these amazing fruits. By making wild fruits a bigger part of our diets, we can stay healthier and stronger.

#### APA CITATION

Agea, J. G., & Akello, S. (2026). Nutritionally Essential Macro and Micro Mineral Contents of *Aframomum angustifolium* and *Physalis peruviana* Wild Edible Fruits of Bunyoro-Kitara Kingdom, Uganda. *East African Journal of Environment and Natural Resources*, 9(2), 236-249. <https://doi.org/10.37284/eajenr.9.2.5011>.

#### CHICAGO CITATION

Agea, Jacob Godfrey and Sarah Akello. (2026). "Nutritionally Essential Macro and Micro Mineral Contents of *Aframomum angustifolium* and *Physalis peruviana* Wild Edible Fruits of Bunyoro-Kitara Kingdom, Uganda." *East African Journal of Environment and Natural Resources* 9 (2), 236-249. <https://doi.org/10.37284/eajenr.9.2.5011>

#### HARVARD CITATION

Agea, J. G., & Akello, S. (2026). "Nutritionally Essential Macro and Micro Mineral Contents of Aframomum angustifolium and Physalis peruviana Wild Edible Fruits of Bunyoro-Kitara Kingdom, Uganda", *East African Journal of Environment and Natural Resources*, 9 (2), pp. 236-249. doi: 10.37284/eajenr.9.2.5011.

#### IEEE CITATION

J. G., Agea, & S., Akello "Nutritionally Essential Macro and Micro Mineral Contents of Aframomum angustifolium and Physalis peruviana Wild Edible Fruits of Bunyoro-Kitara Kingdom, Uganda", *EAJENR*, vol. 9, no. 2, pp. 236-249, May, 2026.

#### MLA CITATION

Agea, Jacob Godfrey & Sarah Akello. "Nutritionally Essential Macro and Micro Mineral Contents of Aframomum angustifolium and Physalis peruviana Wild Edible Fruits of Bunyoro-Kitara Kingdom, Uganda". *East African Journal of Environment and Natural Resources*, Vol. 9, no. 2, May 2026, pp. 236-249, doi:10.37284/eajenr.9.2.5011.

## INTRODUCTION

For a long time, people have been eating wild plants to survive, especially in rural areas where they rely on these natural resources to get by during tough times (Agea, 2010; Raj, 2018). Wild fruits and vegetables are a big part of this, and they're really good for you too. They have got lots of nutrients like potassium, iron and calcium that are essential for a healthy diet. The best part about wild fruits is that they are packed with tiny nutrients and fibre, which can help keep you from getting sick (Agea, 2010). They are also a great source of minerals like manganese, phosphorus and magnesium. Overall, eating wild fruits can have some amazing health benefits, and they're a great way to add some variety to your meals (Raj, 2018).

Fruits that grow in the wild are packed with good stuff like vitamins C and A and smaller amounts of vitamins E and B (Wargovich, 2000). They are also full of antioxidants, which help keep us healthy by fighting off bad things like carcinogens and signs of ageing (Pandey & Rizvi, 2009). These antioxidants come in many forms, such as phenolic compounds, anthocyanins and carotenoids, and they work together with vitamins C and E to keep our bodies in balance (Wargovich, 2000). Eating fruits has been shown to lower the risk of heart disease and certain types of cancer. Plus, they help keep our body's pH levels just right by providing precursors to bicarbonate ions, which soak up excess acidity (Crawford et al., 1994; Liu et al., 2000; Bazzano et al., 2002).

Overall, wild fruits are a great way to stay healthy and strong. They have lots of benefits, from

reducing the risk of heart disease to fighting off cancer. And they are not just good for our bodies, but also for our overall well-being. So, next time you are out for a walk, take a look around and see if you can spot some wild fruits growing. You might be surprised at just how many different types you can find. Fruits are also a great way to get the nutrients we need to stay healthy. They are full of fibre, vitamins and minerals, and they are low in calories. Plus, they are easy to incorporate into our daily diets (Neerja et al., 2019). We can eat them as a snack, add them to our meals, or even blend them into a smoothie. The possibilities are endless. In short, wild fruits are a superfood that can help us stay healthy, strong and happy. So, let us make an effort to eat more of them and take advantage of all the amazing benefits they have to offer. Whether we are looking to reduce our risk of disease, boost our energy levels, or just feel our best, wild fruits are a great place to start (Neerja et al., 2019).

Fruits make up a big part of the world's farm produce, but many wild fruits are still not well known. People are relying more and more on regular food systems, which has led to fewer people eating and appreciating wild foods (Agea, 2010). While regular food plants are grown and eaten a lot, wild foods are not used as much as they could be. Lately, there is a growing interest in finding new foods, especially wild fruits, and studying their nutritional value. Eating more fruits is widely encouraged because of all the health benefits and nutrients they provide. Research has shown that many local fruits can help people in rural areas get the nutrients they need, but in cities, people are eating fewer of these fruits and more exotic ones instead (Agea, 2010). However, in

rural areas of many developing countries, people still use wild fruits to supplement their diets (Ekesa et al., 2009). Some of these fruits are preserved for later use or sold in local markets (Agea, 2010). To get more people to eat wild fruits, we need to make them more popular and widely accepted as a healthy part of our diets. This study looked at the important nutrients in two popular wild fruits collected from Bunyoro Kitara Kingdom of Uganda, namely *Aframomum angustifolium* and *Physalis peruviana*. The objective was to determine the nutritionally essential macro- and micro-mineral composition of *Aframomum angustifolium* and *Physalis peruviana*, with a view to assessing their potential contribution to food and nutritional security.

These fruits are not only delicious but also packed with nutrients that are essential for our health. By eating more of these wild fruits, people can improve their overall well-being and reduce their reliance on regular food systems (Ekesa et al., 2009). It is time to start appreciating the value of wild fruits and make them a bigger part of our diets. Not only will this help us stay healthy, but it will also support local communities and promote sustainable farming practices (Agea, 2010). So, we need to make a conscious effort to include more wild fruits in our meals and snacks and encourage others to do the same. The benefits of eating wild fruits are numerous, and they can be a great addition to a healthy diet. They are rich in vitamins, minerals and antioxidants, which can help protect against chronic diseases like heart disease, diabetes, and certain types of cancer (Agea, 2010).

Wild fruits are also often lower in calories and higher in fibre than regular fruits, making them a great choice for people trying to manage their weight. Furthermore, eating wild fruits can help support local economies and promote biodiversity, which is essential for maintaining healthy ecosystems (Agea, 2010). In conclusion, wild fruits are a nutritious and delicious addition

to a healthy diet, and they deserve more attention and appreciation. By making them a bigger part of our diets, we can improve our health, support local communities and promote sustainable farming practices. So, next time you are at the market or out foraging, be sure to give wild fruits a try – your taste buds and body will thank you.

*A. angustifolium* is a type of herb that grows really tall, up to 4 meters and has lots of leaves. It produces beautiful red and yellow flowers, and its fruit is a lovely red colour when it is ripe (Lock, 2010). This plant is found in many parts of tropical Africa, Madagascar and the Mascarenes. One of the cool things about this plant is that its fruit grows above the ground, and inside the fruit, there are lots of sweet and tangy seeds surrounded by a yummy pulp (Katende et al., 1999). People, especially kids, love to eat this pulp as a snack. The seeds are also used in different ways, such as a spice or even as a special drink when mixed with other roots (Agea, 2010).

Another plant, called *P. peruviana* or Cape gooseberry, is a type of shrub that grows up to 1.6 meters tall. It has pretty purple branches that are soft to touch, and it produces small, round fruits that are orange-yellow in colour (Morton, 1987). These fruits are sweet and a bit tangy, like grapes, and are often eaten fresh or used in salads and cocktails (Duarte & Paull, 2015). The best part is that these fruits are super good for you, packed with antioxidants, vitamins, minerals and fibre, making them a great snack for anyone looking for a healthy treat (Zhao, 2007).

Plate a and b: *Aframomum angustifolium* (Sonn.) K. Schum. and *Physalis peruviana* L. fruits, respectively.

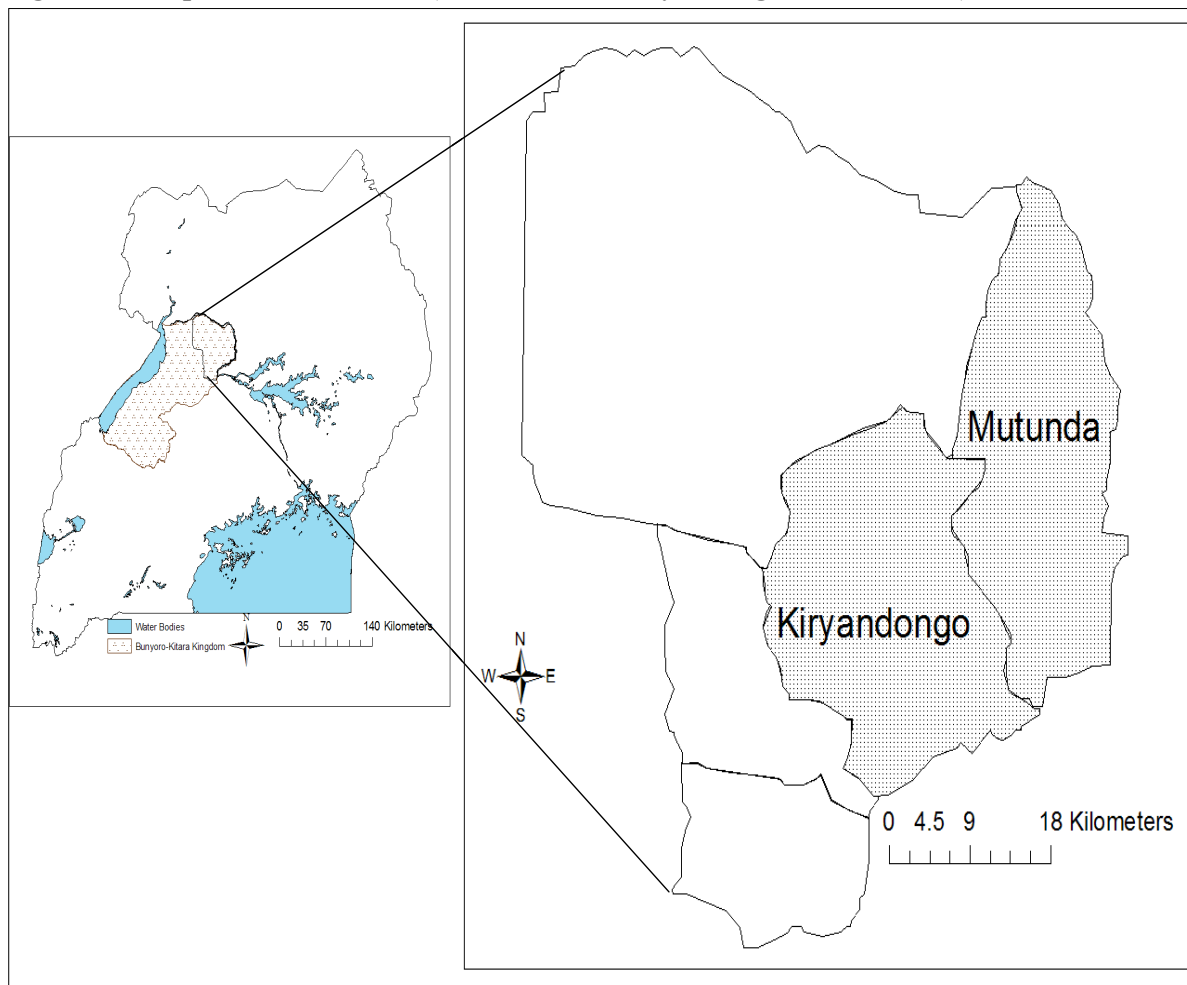


## MATERIALS AND METHODS

### Sample Collection

In Uganda, there is a unique and captivating place, full of natural beauty and rich cultural heritage Bunyoro-Kitara Kingdom. It is where the beautiful Lake Albert is located, and it covers a huge area of 19,621.8 square kilometres. The kingdom is made up of several districts, including Buliisa, Hoima, Kiryandongo and Masindi. If you look at a map, you'll see that it's situated between 0°36' and 2°20' N, and 30°30' and 32°23' E (UDI, 2005). This region is really blessed with

natural wonders. People have been living here for a very long time, and the stories of the past are shrouded in mystery and legend (Dunbar, 1965). The original inhabitants of this land lived in the forest, gathering wild fruits and roots, and hunting for food. It is a fascinating history. Field fruit samples were collected from Mutunda and Kiryandongo sub-counties in Kibanda County, which is part of the Kiryandongo District. This study is important because it helps us learn more about wild and semi-wild fruits that grow in this area.

**Figure 1: Sample Collection Sites (Mutunda and Kiryandongo Sub-Counties).**

Getting a good sample of plants is crucial for figuring out what nutrients they have. If the samples are not representative, then all the time and money spent on analysing them is wasted because the results will not be accurate (Temminghoff & Houba, 2004). To get a good sample, one needs to collect a certain number of plants - at least 15 to 25 - so that you have enough plant material to analyse and get reliable results (A & L Eastern Labs, 2006). In this study, we walked through the fields with local experts to collect plant samples. We collected 15 samples of each type of wild fruit, and also 15 samples of regular mangos. We put each sample in a plastic bag and labelled it with a number, the date, where it was collected and what kind of analysis we were going to do on it. This way, we made sure that our results would be valid and useful.

### Laboratory and Analytical Procedures

To get the samples ready for testing, we dried all the fruit in a special oven with a fan at 65 °C for 24 hours. We used a standard method, known as the AOAC air oven method No. 14.003, which was first used in 1980. After drying, we ground up the fruit so it could be tested for its chemical makeup. Each sample was tested three times to make sure the results were accurate.

### Potassium (K) and Sodium (Na)

To determine the concentrations of potassium (K) and sodium (Na) in plant samples, a Flame Emission Photometer was used. This device, a Jenway model PFP7 from the UK, relied on standards prepared from NaCl and KCl, following the guidelines set by AOAC in 1984. The process began with weighing 0.3 grams of oven-dried, ground plant samples into labelled, dry, and clean digestion tubes. Then, 4.4 millilitres of a digestion

mixture were added to each tube. This mixture consisted of selenium powder, lithium sulfate monohydrate, hydrogen peroxide, and sulfuric acid. The same digestion mixture was also added to reagent blanks for each batch of samples to ensure accuracy. These samples and blanks were then digested at a high temperature of 360 degrees Celsius for three hours, until the solutions became colourless. After cooling down, each tube was filled with 25 millilitres of distilled water, filtered, and then made up to 50 millilitres with distilled water. The resulting solutions were stored for further analysis.

For the analysis, stock solutions of 1000 milligrams per litre (ppm) of Na and K were prepared. This involved weighing out specific amounts of analytical grade NaCl and KCl - 2.541 grams and 1.907 grams, respectively - and dissolving them in distilled water to make one-litre solutions. From these stock solutions, working solutions of 100 ppm for both Na and K were prepared by diluting 20 millilitres of each stock solution to 200 millilitres. This detailed process ensured the accurate determination of K and Na concentrations in the plant samples, which was crucial for understanding their nutritional content and potential impact on the environment and health.

To analyse the amount of potassium and sodium in plant samples, a series of standard solutions were prepared with varying concentrations of these elements. The standards had concentrations of 0.0, 0.5, 1.0, 2.0, 3.0, 4.0, and 5 parts per million of sodium, and 0, 1, 2, 4, 6, 8, and 10 parts per million of potassium. These solutions were made by adding specific amounts of working solutions to 100 milliliter flasks, followed by the addition of a small amount of sulfuric acid and then filling the flasks to the 100-millilitre mark with distilled water. Next, a portion of the plant sample that had been broken down was added to a smaller flask and filled to the mark with distilled water. This solution, along with the standards and blanks, was then sprayed into a flame emission photometer, which is a device that measures the amount of light emitted by atoms when they are heated.

The photometer was set to a specific wavelength, 766.5 nanometres, to detect the potassium and sodium. By comparing the readings from the samples to the calibration curves, which are graphs of the amount of light absorbed versus the concentration of potassium and sodium, the amount of these elements in the samples could be determined. The concentration was calculated using a formula that takes into account the concentration of the element in the sample, the concentration in the blank, the weight of the sample, the volume of the solution, and a dilution factor. Finally, the concentrations of potassium and sodium were expressed in terms of milligrams per 100 grams of edible plant material, which is a common way to express the amount of nutrients in food. This allows for easy comparison of the nutritional content of different plant samples.

### ***Phosphorus (P)***

To determine the amount of phosphorus in a sample, a special machine called a spectrophotometer was used. This machine measures how much light is absorbed by a solution, and it can help figure out how much of a certain substance is present. In this case, the substance being measured was phosphorus. First, two special solutions were made. One solution had a chemical called ammonium molybdate, and the other had a chemical called antimony potassium tartrate. These solutions were mixed together and then diluted with water to make a bigger solution. Another solution was made with a chemical called ascorbic acid, which helps to reduce the phosphorus so it can be measured. This solution was added to the first solution, and then small amounts of the sample were added to it. The mixture was then left to sit for a while before being measured by the spectrophotometer. The machine measured how much light was absorbed by the solution, and this was used to figure out how much phosphorus was present. A special graph, called a calibration curve, was made to help with this measurement. The graph showed how much light was absorbed by different amounts of phosphorus, so it could be used to look up how much phosphorus was in the sample.

The amount of phosphorus in the sample was then calculated and expressed as a certain amount per 100 grams of the plant. This is a way of measuring how much of a certain nutrient is present in a food, and it can be helpful for understanding what nutrients are available in different foods. By following these steps, the amount of phosphorus in the sample was accurately measured and expressed in a way that was easy to understand. This information could also be useful for a variety of purposes, such as understanding the nutritional content of different foods or monitoring the amount of phosphorus in the environment. Overall, the process of measuring phosphorus in a sample involved several steps, including preparing special solutions, measuring the amount of light absorbed by the solution, and using a calibration curve to figure out how much phosphorus was present. By following these steps, it was possible to get an accurate measurement of the amount of phosphorus in a sample.

#### ***Calcium (Ca), Iron (Fe), Magnesium (Mg), Manganese (Mn), Copper (Cu) and Zinc (Zn)***

To figure out what is in plants, we used a special tool called Atomic Absorption Spectrometry. We used the Perkin Elmer 2380 AA from the USA, and the Varian SpectrAA 220 FS from Australia. First, we took a little bit of the plant, about 0.3 grams, and made sure it was really dry and finely ground. Then we put it in a special tube and added salicylic acid, selenium powder, and a strong acid called H<sub>2</sub>SO<sub>4</sub> to help break it down. We then let it sit for a couple of hours, and we also did this with two empty tubes to make sure everything is working right. After that, we heated up the tubes in a special machine called a block digester for about an hour. Then we let it cool down and added some hydrogen peroxide, waiting a bit between each addition. We then heated it up again, this time really hot, until the colour changes - sometimes it turns light yellow. Once it's cooled down, we put the mixture into a special container called a volumetric flask and added some water to fill it up. This way, we measured how much of certain elements like calcium, iron, magnesium, manganese, copper, and zinc are in the plant. It was kind of like a recipe: you take a little bit of

this, add some of that, heat it up, cool it down, and then you can see what was inside. This helped us to understand what plant samples were made of and how they can help us.

To analyse the elements in edible plant portions, standard solutions were first prepared for each element from their respective stock solutions. Then, a series of seven standards was created for each element by diluting its working solution. An air-acetylene flame was used in the atomization process for elements like calcium, magnesium, copper, iron, manganese, and zinc. The standard series, along with diluted samples and blanks, were then introduced into an Atomic Absorption Spectrometer (AAS) that had been calibrated for measuring each element at specific wavelengths - calcium at 239.8 nm, copper at 324.7 nm, iron at 248.3 nm, magnesium at 202.6 nm, manganese at 278.0 nm, and zinc at 213.9 nm. The machine directly provided the absorbencies and concentrations of each element in the sample solutions in milligrams per litre (mg/l). Later, these concentrations were calculated in terms of milligrams per 100 grams of edible plant portion to understand the elemental composition better. This process was crucial for assessing the nutritional value and safety of the plants for consumption.

#### **Data Analysis**

When it came to essential minerals, *Aframomum angustifolium* and *Physalis peruviana* fruits were packed with important macro minerals like calcium, potassium, magnesium, sodium, and phosphorus, as well as micro minerals like iron, manganese, copper, and zinc. But how did they compare to a more common fruit like the mango? To find out, we used a statistical analysis tool to look at the mineral content of each fruit. We used a technique called ANOVA (Steel RG & Torrie, 1980), which helped in identifying significant differences between groups. The results showed some interesting similarities and differences between the three fruits. By comparing the means of each fruit's mineral content, we were able to separate the results into distinct groups, with some fruits having significantly higher or lower levels

of certain minerals than others. This information is useful for people looking to get the most nutritional value out of their fruit.

## RESULTS

### Macro (Ca, K, Mg, Na, P) minerals

When we looked at the nutrient content of two wild fruits, *P. peruviana* and *A. angustifolium*, and compared them to mango, we found interesting differences (Table 1). For example, if we consider the essential elements like calcium, potassium, magnesium, sodium and phosphorus, we found that these two wild fruits have lower calcium content than mango - on average, mango had around 20.72 milligrams of calcium, which was significantly more than what we found in *P. peruviana* and *A. angustifolium*. On the other hand, *A. angustifolium* stood out for its extremely high potassium content, with an average of 365.64 milligrams, which was much higher than what we found in *P. peruviana* and common mangoes. But what was also notable is that both of these wild fruits had higher phosphorus content compared to mango - *A. angustifolium* had around 73.81

milligrams, and *P. peruviana* had around 51.07 milligrams, which was significantly more than the 24.07 milligrams we found in common mango. These comparisons gave us a better understanding of the nutritional value of these wild fruits and how they stacked up against more common fruits like mango.

When it came to sodium, two wild fruits - *A. angustifolium* and *P. peruviana* - had more of it than common mangoes. *A. angustifolium* had about 11.47 milligrams of sodium, while *P. peruviana* had around 8.57 milligrams. These two wild fruits were also better sources of magnesium than common mangoes. The difference was big enough to be significant (Table 1). *A. angustifolium* had the most magnesium, with about 37.72 milligrams, followed by *P. peruviana* with around 27.43 milligrams. This makes them a good choice for people looking to increase their magnesium intake. It was also interesting to see how these wild fruits compare to common mangoes in terms of their nutrient content. They all seem to have some advantages, at least when it comes to sodium and magnesium.

**Table 1: Essential Macro Mineral Contents of Selected Edible Wild Fruits Compared to *Mangifera indica* L. (Mean composition mg per 100-gram edible portion ±SEM).**

Elements	Species		
	<i>Aframomum angustifolium</i> (Sonnerat) K.Schum.	<i>Physalis peruviana</i> L.	<i>Mangifera indica</i> L. (Mangoes)
Ca	17.91 (0.64)	13.67 (0.64)	20.72 (0.74)
K	365.64 (0.44)	117.85 (0.18)	168.03 (1.31)
P	73.81 (0.43)	51.07 (0.38)	24.07 (0.65)
Na	11.47 (0.46)	8.57 (0.91)	1.88 (0.12)
Mg	37.72 (0.46)	27.43 (0.66)	8.73 (0.454)

Means are of three measurements. Bracketed are the standard errors of the mean. All the measurements were in mg/100 gram of edible portion.

### Micro (Fe, Mn, Cu, Zn) minerals

When we looked at the tiny but important elements in two types of wild fruits, *A. angustifolium* and *P. peruviana*, we saw some interesting things. If we check the numbers in Table 2, we find that *P. peruviana* has a lot more iron in it compared to regular mangoes. To be specific, *P. peruviana* had about 4.60 milligrams

of iron, which was a big difference from the 1.01 milligrams found in common mangoes. But when we compare *A. angustifolium* to regular mangoes, the amount of iron in them was pretty much the same, so there was no big difference there (Table 2).

When it comes to zinc content, the two wild fruits really stood out - they had a lot more of it than

common mangoes. In fact, *A. angustifolium* had the highest amount of zinc, with about 2.20 milligrams. On the other hand, common mangoes had much less zinc, with only about 0.16 milligrams. But when it comes to copper, the story was different. The two wild fruits actually had less copper than common mangoes. *A. angustifolium* has the lowest amount of copper, with only about 0.03 milligrams. Common mangoes, on the other hand, had about 0.16 milligrams of copper. Manganese is another important mineral, and one

type of wild fruit, *P. peruviana*, had a lot more of it than common mangoes. With about 0.26 milligrams of manganese, *P. peruviana* was a clear winner in this category. Common mangoes, by contrast, had only about 0.04 milligrams of manganese. So, if you are looking to get more zinc and manganese in your diet, wild fruits might be a good choice. But if you need more copper, you might want to stick with common mangoes (Table 2).

**Table 2: Essential Micro Mineral Contents of Selected Edible Wild Fruits Compared to *Mangifera indica* L. (Mean composition mg per 100-gram edible portion ±SEM).**

Elements	Fruit species		
	<i>Aframomum angustifolium</i> (Sonnerat) K.Schum.	<i>Physalis peruviana</i> L.	<i>Mangifera indica</i> L. (Mangoes)
Fe	1.63 (0.35) <sup>a</sup>	4.60 (0.17)	1.01 (0.02) <sup>a</sup>
Zn	2.20 (0.47)	1.30 (0.12)	0.05 (0.01)
Cu	0.03 (0.01)	0.09 (0.01)	0.16 (0.01)
Mn	0.01 (0.003)	0.26 (0.02)	0.04 (0.002)

Means are of three measurements. Bracketed are the standard errors of the mean. Means in the same row followed by the same superscript letter are not significantly different from those of the corresponding mangoes ( $P > 0.05$ ). All the measurements were in mg/100 gram of edible portion.

## DISCUSSION

### Essential macro (Ca, K, Mg, Na, P) mineral contents

Fruits like *A. angustifolium* and *P. peruviana* have a lot of good stuff in them, like calcium, potassium, and magnesium. These are important for keeping our bodies healthy. Calcium, for example, is crucial for strong bones and teeth. It also helps our muscles and nerves work properly. We need calcium to absorb vitamin B and to make certain chemicals in our brain. The amount of calcium we need varies - kids need between 500 and 1000 milligrams a day, while adults need around 800 milligrams. It's not easy to get that much calcium from our food, but eating wild fruits like *A. angustifolium* and *P. peruviana* can really help. They might not have as much calcium as regular mangoes, but they're still a great source. Other studies, for instance, have found that wild fruits are often rich in minerals like potassium and magnesium. For instance, fruits like *Garcinia gummigutta* and *Flacourtia jangomas* are packed with these nutrients (Valvi and Rathod, 2011).

Similarly, wild fruits from Northeast India have been shown to have high levels of calcium, sodium, potassium, and magnesium - even more than local mangoes and bananas (Sankaran et al., 2006). So, eating a variety of fruits, including wild ones, can be a great way to get the nutrients we need to stay healthy.

Fruits are a great source of potassium, an essential element for our bodies. The amount of potassium in two specific fruits varied from 117.85 to 365.64 milligrams per 100 grams. Potassium is one of the most abundant elements in whole foods, and it plays a crucial role in our overall health. Our cells absorb potassium with the help of a mechanism called the sodium pump (Naidu, 1999). This process is vital for life, and it is especially important for the way our nerve cells work. When our nerve cells are excited or sending signals, they rely on the movement of potassium and other ions. Potassium also helps activate certain enzymes that are necessary for normal growth and muscle function (Birch & Padgham, 1994). One fruit, *A. angustifolium*, is particularly rich in potassium,

making it a great option for people who are deficient in this essential element. Eating this fruit regularly could really help with potassium deficiency. It is worth noting that potassium is important for many bodily functions, and getting enough of it can have numerous health benefits (Birch & Padgham, 1994). Fruits like *A. angustifolium* are a delicious and natural way to boost our potassium intake. By incorporating these fruits into our diet, we can help support our overall health and well-being. Whether we are looking to address a specific health issue or just want to maintain a balanced diet, fruits rich in potassium are definitely worth considering. With their high potassium content and numerous health benefits, it is no wonder why these fruits are a great addition to a healthy lifestyle.

Magnesium is a crucial mineral that helps our nerves and muscles work properly. It is also important for keeping our hearts healthy. While calcium helps stimulate our muscles, magnesium helps them relax. This mineral is involved in over 300 different reactions that help our bodies function normally (Berdanier, 1994). It also helps build strong bones and teeth, and assists our bodies in absorbing other important minerals like calcium and potassium. Magnesium even helps our bodies process vitamin D, which is essential for healthy bones. If we do not have enough magnesium, we might have trouble absorbing calcium. Interestingly, two types of wild fruits that were studied had higher levels of magnesium than regular mangoes. The recommended daily amount of magnesium is 420 milligrams for men, 320 milligrams for women, and 240 milligrams for children (Institute of Medicine, Food and Nutrition Board, 1997). Eating these wild fruits could be a great way to get more magnesium in our diets and stay healthy. By incorporating them into our meals, we can help meet our daily magnesium needs and support our overall well-being. This is especially important since many of us do not get enough magnesium in our diets, and it is essential for so many different bodily functions.

Sodium is a key player in keeping our body's fluids balanced and our nerves and muscles

working properly (Martin et al., 1985). It helps our nerves send signals, and our muscles move. When we looked at two types of wild fruits, we found that they had more sodium than regular mangoes. Our bodies need about 1500 mg of sodium every day to stay healthy (Institute of Medicine, Food and Nutrition Board, 1997). So, eating these wild fruits could be a good way to get some of the sodium we need. This could be especially helpful for people who do not get enough sodium from their regular diet. By adding these fruits to our meals, we can make sure we are getting enough sodium to keep our bodies running smoothly.

Phosphorus plays a big role in keeping our bodies healthy. It helps build strong bones and teeth, and is important for how our kidneys work, how our cells grow, and how our heart muscles contract. Plus, it helps turn the food we eat into energy and makes sure we're using vitamins, especially the B-vitamins, properly (Turan et al., 2003). The two wild fruits had really high levels of phosphorus, even more than mangoes. Since adults need about 700 mg of phosphorus every day (Institute of Medicine, Food and Nutrition Board, 1997), eating these fruits can help make sure we are getting enough. This is a great way to support our overall health and make sure we are getting all the nutrients we need.

### **Essential Micro (Fe, Mn, Cu, Zn) Mineral Contents**

Wild fruits like *A. angustifolium* and *P. peruviana* have lots of good stuff in them, like micro minerals, which are just as good as, or even better than, what you find in regular mangoes. This is similar to what other researchers, like Ngurthankhumi et al., found out in 2024 - that wild fruits like *Syzygium cumini* and *Garcinia indica* are packed with micro minerals like iron, copper, zinc, and manganese. These micro minerals are really important for staying healthy, and not having enough of them can cause all sorts of problems. For example, iron is crucial for making haemoglobin, which helps our blood carry oxygen, and is also important for our nervous system and for burning energy from the food we eat. If we do not have enough iron, it can cause

anaemia, which affects a huge number of people - about 2 billion, according to the World Health Organisation. *P. peruviana*, in particular, had a lot of iron - about 4.60 mg per 100g of the edible part of the fruit. That is significant because adults need about 18 mg of iron per day (Institute of Medicine, Food and Nutrition Board, 1997), so eating this fruit regularly could really help meet that daily requirement. It is worth noting that iron is an essential microelement that plays a vital role in many bodily functions, including the proper functioning of cells, and its deficiency can have serious health consequences. Overall, incorporating fruits like *A. angustifolium* and *P. peruviana* into our diet could be a great way to boost our iron intake and stay healthy.

Manganese is a key player in how our bodies process vitamins B1 and E, and it helps get enzymes like decarboxylases, hydrolases, kinases, and transferases working properly, which is crucial for digesting food (Hurley & Keen, 1987). It also helps break down fats and cholesterol, and is important for healthy bones and sex hormone production. Without enough manganese, people can experience reproductive issues, stunted growth, birth defects, and problems with bone and cartilage development, as well as glucose issues (Hurley & Keen, 1987). Our research found that the fruit *P. peruviana* is packed with more manganese than common mangoes. In fact, eating this fruit every day would provide a significant amount of the recommended daily intake of manganese, which is set at 2-4 mg (Uganda National Drug Authority, 2009). This makes it a great way to supplement your diet with this essential mineral.

Copper is a really important nutrient that helps our bodies work properly. It plays a big role in how we absorb and use iron, and it also helps us get the most out of vitamin C. When copper and vitamin C work together, they help create elastin, which is a key part of the fibres that make up our muscles (Davis & Mertz, 1987). Copper is also crucial for making red blood cells, getting oxygen to all the different parts of our body, and keeping our bones healthy. Plus, it helps our thyroid gland do its job of balancing and releasing hormones. Davis &

Mertz (1987) looked at the copper content in different types of wild edible fruits. While they do not have as much copper as mangoes, these fruits are still a good source of this essential nutrient. So, eating a variety of fruits, including wild ones, can be a great way to get the copper our bodies need to stay healthy.

Zinc is a really important nutrient that helps our bodies in many ways. It is necessary for building proteins, healing wounds, and keeping our reproductive organs healthy (Hambidge, 2000). Zinc also plays a key role in keeping our immune system strong, which helps us fight off skin problems like acne and sore throats. Plus, it helps our bodies maintain a healthy balance and supports normal tissue function. Zinc even aids in digesting and processing phosphorus, which is another essential nutrient (Hambidge, 2000). When it comes to getting enough zinc, some fruits are better than others. For example, *A. angustifolium* and *P. peruviana* are both richer in zinc than common mangoes. The recommended daily intake of zinc is 11 milligrams for adults (Institute of Medicine, Food and Nutrition Board 2002), so eating these fruits regularly can really help supplement our diets. By making them a part of our routine, we can ensure we're getting enough zinc to support our overall health and wellbeing.

Wild fruits are, therefore, really good for you because they grow in their natural environment, which means they absorb all the good stuff from the soil. This gives them a high amount of important minerals, both big and small. On the other hand, regular fruits are often grown using chemicals like fertilisers and pesticides, and that can change how nutritious they are. When fruits grow naturally, they get to soak up all the essential nutrients from the earth, making them a healthier choice.

## CONCLUSION AND RECOMMENDATIONS

Eating wild fruits like *A. angustifolium* and *P. peruviana* can be really good for you. They have more of certain minerals like P, Na, and Mg than regular mangoes. *A. angustifolium* is especially

rich in Ca and K, while *P. peruviana* has a lot of Mn. Both of these fruits are great sources of Fe and Zn, which are important for our bodies. The only mineral they do not have a lot of is Cu. If people eat these wild fruits as part of their regular diet, they can avoid some common mineral deficiencies. This is especially important for people living in rural areas who might not have access to a lot of different foods.

So, it is a good idea for local and national leaders to make policies that support the use of wild edible fruits in farming and orchards. This way, more people can benefit from eating these nutritious fruits. By making wild fruits a bigger part of our food system, we can help people get the nutrients they need to stay healthy. It is a simple way to make a big difference in people's lives, especially in rural areas where food options might be limited. So, let's make sure to include wild fruits like *A. angustifolium* and *P. peruviana* in our diets and support policies that promote their use.

#### Disclosure Statement

We do not have any personal interests that could affect this article. We were in charge of planning the study, gathering the information, doing the research, figuring out what the results mean, and writing the article itself.

#### Acknowledgement

This research got money from the Commonwealth Scholarship Commission in the UK and a special grant from SIDA/SAREC, which was given to Makerere University's research team.

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