BIOLOGY, MEDICINE, & NATURAL PRODUCT CHEMISTRY ISSN 2089-6514 (paper)
Volume 14, Number 1, April 2025 | Pages: 465-472 | DOI: 10.14421/biomedich.2025.141.465-472 ISSN 2540-9328 (online)

Phytochemicals, Nutritional and Anti-Nutritional Composition of Aqueous Extracts of White and Red Onions Bulbs

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Manuscript received: 03 May, 2025. Revision accepted: 15 July, 2025. Published: 23 July, 2025.

Abstract

Onion bulbs have been consumed for foods and nutrition and management of many diseases including infections, diabetes, gastrointestinal disorders, cardiovascular and respiratory disorders. This study aims to evaluate the phytochemicals, nutritional and anti-nutritional composition of the aqueous extracts of white and red onions bulbs. Analytical techniques AOAC and AAS were used in phytochemicals and proximate analysis and determination of minerals, heavy metals, determination of anti-nutrients content of the aqueous extracts of white and red onions bulbs. The findings showed the presence of alkaloids, flavonoids, tannins, glycosides, saponins, steroids, cardiac glycosides, and anthraquinones in the aqueous extracts of red and white onions bulbs. The aqueous extracts of white and red onions bulbs contain significant ($p < 0.05$) amounts of moisture (89.68 and 87.04%), ash (3.22 and 2.03%), fiber (3.00 and 2.00%), carbohydrates (2.33 and 2.59%), proteins (3.19 and 1.04%), and crude lipids (1.22 and 2.66%), respectively. The aqueous extracts of white and red onions bulbs demonstrated significant ($p < 0.05$) level of potassium (987.10 and 756.24 ppm), sodium (42.50 and 32.50 ppm), calcium (8.90 and 6.10 ppm), phosphorus (3.87 and 4.04 ppm), zinc (2.32 and 1.13 ppm), magnesium (1.85 and 1.12 ppm), iron (0.62 and 0.58 ppm), and copper (0.47 and 0.17 ppm), respectively. Low concentrations of nickel (0.112 and 0.524 ppm), lead (0.034 and 0.023 ppm), cadmium (0.029 and 0.014 ppm), and chromiun (0.090 and 0.032 ppm) were observed in the aqueous extracts of white and red onions bulbs contain, respectively. The aqueous extracts of white and red onions bulbs exhibited moderate and low amounts of cynogenic glycosides (3.00 and 12.46 mg/100g), saponins (2.02 and 2.07 mg/100g), oxalate (0.63 and 3.75 mg/100g), tannins (0.90 and 1.09 mg/100g), and phytate (0.38 and 1.49 mg/100g), respectively. The aqueous extracts of white and red onions bulbs contain various phytochemicals and significant amounts of important nutrients with trace quantity of certain heavy metals and anti-nutrients.

Keywords: Anti-nutrients; Food, Nutrients; Onions bulbs; Phytochemicals.

INTRODUCTION

Plants based foods and their products have been consumed due to their nutritional contents and medicinal properties. Many communities in the world depend on the plants especially fruits and vegetables for food and nutrition and remedies. Reports showed that almost 80 % of people in the world depend on plants and herbs for foods and nutrition and remedies (Khan and Ahmad, 2019). Plants are widely available in every community in the world and contain several nutrients and bioactive compounds that demonstrate many pharmacological activities. Nutrients composition and phytoconstituents of foods and plants determine their nutritional value and medicinal properties. Nutrients in foods and plants are of significant biological importance and play vital roles in biochemical processes. Phytochemicals from plants demonstrate medicinal properties and pharmacological activities. The therapeutic uses and pharmacological activities of plants are attributed to their various phytochemicals. Several bioactive compounds isolated from different plants extracts have been used in the development of drugs (Kumar *et al.,* 2021). Anti-nutrients are substances that decrease nutrient absorption and nutritive value of foods. Certain anti-nutrients cause harmful effects on human and animal health. However, at low level, certain specific anti-nutrients may provide health benefits to human and animals.

Onion (*Allium cepa* L.) is a vegetable plant that belongs to the family Liliaceae (Tame & Afolabi, 2020). Onion is one of the most widely cultivated plants and the second largest produced vegetable crop worldwide (Eric, 2010; Ray, 2024). The report showed that in 2022, about

five million tonnes of onions and shallots were produced worldwide (FAOSTAT, 2024). Onions are consumed as raw or processed food and have been used as an ingredient in many food products. Onions contain many nutrients including proteins, carbohydrates, sugars, vitamins, and minerals that have many significant health benefits. Onion bulbs have been used as food and/or as an herb for the treatment of many diseases (Sami *et al.,* 2020). Onion bulbs demonstrated many pharmacological properties which may be due their several phytoconstituents. In Nigerian, onions are abundantly cultivated and produced in Northern region of the nation. The plant is locally called Albasa in Hausa and consumed by the communities in every day feedings. Onions have been used locally in the treatment of many diseases including skin disorders, infections, gastrointestinal disorders, pains, and parasitic disorders (Sami *et al.,* 2020; Kandoliya *et al.,* 2015). It has been reported that consumption of onions can reduce the risks of inflammatory diseases, coronary heart diseases, cancer, and respiratory disorders which could be attributed to their bioactive constituents (Sami *et al.,* 2021; Sami *et al.,* 2017; Upadhyay, 2016). Depending on their varieties onions are characterized by different colors such as red, yellow, white, green and purple. Red and white onions have been used as raw foods and processed (cooked) foods in many cuisines (Mower, 2009). Red onions have been used in the management of cancer, infections, oxidative stress associated disorders, cardiovascular and neurological disorders (Chadorshabi et al., 2022). This study aimed to evaluate the phytochemicals, nutritional and anti-nutritional composition of the aqueous extracts of white and red onions bulbs.

MATERIALS AND METHODS

Chemicals and Reagents

In this research the analytical grade chemicals and reagents were used. All the chemicals and reagents were produced by Reidel-de Haem (Merck, Germany), Abbott Laboratories (USA) and Sigma-Aldrich (St. Louis, MO, USA).

Samples Collection

The fresh onion bulbs of different varieties *Allium cepa .var. ascalonicum* (red onins) and *Allium cepa Blanc*. (white onions) were obtained from Gada Onions Market, Gada Local Government Area, Sokoto State, Nigeria. The samples materials were identified and authenticated (UDUH/ASN/088) at Taxonomy Unit, Department of Biological Sciences, Usmanu Danfodiyo University, Sokoto, Nigeria.

Extracts Preparation

The samples materials were washed with distilled water and then cut into pieces. The samples were shed dry at 25 ^{o}C for two weeks and then grinded to grainy powder using pestle and mortar. The corse-grainy powders were stored in a clean container at 25 ^{o}C for the nutritional and anti-nutritional analyses. The extracts were prepared according to the method described by Abubakar et al. (2021) with little changes. Five hundred grams of the powdered samples was separately soaked in deionized water (2 L) for forty eight hours with constant stirring at every sixty minutes. The samples extracts were filtered through Whatman filter paper No 1 and then concentrated to dryness in rotary evaporator under reduced pressure at 40 °C for 180 minutes. The weight of the dried extracts was measured using analytical weighing balance and the percentage yields of the extracts were obtained. The extracts were stored in sterilized desiccators at room temperature for further analyses.

Phytochemical Screening

Determination of Alkaloids

The aqueous extracts of white and red onions bulbs were analyzed for the presence alkaloids by Wagner's test using the method of Mosa et al. (2012) and Trease and Evans (1989). Three miles of one percent hydrochloric acid solution were transferred into separate test tubes. Three miles of the samples extracts were respectively added into the test tubes followed by heating for 20 minutes and then cool at room temperature. One mile of the Wagner's reagent was added into the test tubes in drops. A reddish-brown precipitate was formed which indicated the presence of alkaloids in the extracts.

Determination of Flavonoids

A sodium hydroxide test was employed for the qualitative determination of flavonoids in the aqueous extracts of white and red onions bulbs using the method of Mosa et al. (2012) and Ibrahim et al. (2024). Three miles of the samples extract were transferred into the separate test tubes followed by the addition of one mile of 10% sodium hydroxide solution. The development of an intense yellow colour which became colourless after the addition of dilute hydrochloric acid solution indicated the presence of flavonoids in the samples extracts.

Determination of Tannins

Tannins in the aqueous extracts of white and red onions bulbs were qualitatively estimated by Ferric chloride test using the method of Trease and Evans (1989) and Ibrahim et al. (2024). One mile of the samples extracts was transferred into the test tubes followed by addition of two miles of 5% ferric chloride solution. The present of tannins in the samples extracts was observed by the development of black or blue-green colour.

Determination of Saponins

Determination of saponins in the aqueous extracts of white and red onions bulbs was carried out using Froth

test as described by Mosa et al. (2012), Abubakar et al. (2022; 2020) and Trease and Evans (1989). Three miles of deionized water were transferred into separated test tubes followed by addition of three miles of the samples extracts. The test tubes were immensely shaken for half minute and then allowed to settle for half hour at room temperature. A stable persistent froth was formed which indicated the presence of saponins in the sample extracts.

Determination of Steroids

Steroid presence in the aqueous extracts of white and red onion bulbs was determined according to the method described by Trease and Evans (1989) and Ibrahim et al. (2024). The sample extracts (500 µL) were treated with five miles of chloroform and five miles L of sulphuric acid solution. The development of violet colour which changed to blue-green indicates the presence of steroids in the samples extracts.

Determination of Glycosides

The qualitative test for glycosides in the aqueous extracts of white and red onions bulbs was done using Salkowski's test according to the method described by Ibrahim et al. (2024) and Abubakar et al. (2022; 2020). Five miles of the sample extracts were added into the test tubes containing five miles of 1 % H_2SO_4 solution. The test tubes were heated at 100 ^oC for 15 minutes and then cool at room temperature. Five miles of Fehling's solution A and B were added into the mixtures after neutralized with 10% sodium hydroxide solution. The development of brick red precipitate of reducing sugars indicated the presence of glycosides in the samples extracts.

Determination of Terpenoids

The aqueous extracts of white and red onions bulbs were analyzed for the presence of terpenoids using the method of Trease and Evans (1989) and Ibrahim et al. (2024). The samples extracts in respective test tubes were treated with one mile of ethanol and one mile of acetic anhydride. Ten miles of concentrated sulphuric solution were added into the respective test tubes containing the mixture. A pink color was formed which indicated the presence of terpenoids.

Determination of Cardiac Glycosides

Cardiac glycosides presence in the aqueous extracts of white and red onions bulbs was qualitatively determined using the Keller-Killani test according to the the method described by Mosa et al. (2012) and Trease and Evans (1989). Five miles of the sample extracts in separate test tubes were treated with two miles of glacial acetic acid. One drop of $FeCl_2$ solution and one mile of concentrated H_2SO_4 solution were added into the test tubes. A brown ring was formed at the interface which indicated the presence of deoxysugar, a characteristic of cardenolides. However, a violet colour appeared below the brown ring which indicated the presence of cardiac glycosides in the sample extracts.

Determination of Anthraquinones

The qualitative analysis of anthraquinones in the aqueous extracts of white and red onions bulbs was performed using the method of Trease and Evans (1989). Two grams of the powdered samples in the respective test tubes were treated with 10 cm^3 of chloroform. The mixtures were vigorously shaken for five minutes and then filtered through the Whatman filter paper. The filtrates were treated with ammonia solution and then shaken for five minutes. The development of bright pink colour in the upper aqueous layer indicated the presence of anthraquinones in the samples extracts.

Proximate Analysis

Determination of the proximate composition **(**crude lipid, moisture, carbohydrate, crude protein, ash, and crude fiber) of the aqueous extracts of white and red onions bulbs was carried out using the method of AOAC (2010). The experiments were performed in triplicate. The data analyzed were expressed in percentages as the mean and standard deviation.

Determination of Minerals Composition

The levels of calcium, iron, zinc, magnesium, and copper in the aqueous extracts of white and red onions bulbs were determined by atomic absorption spectrophotometeric (AAS) technique using the method of AOAC (1990; 2005). The concentration of sodium and potassium in the aqueous of white and red onions bulbs was determined using flame photometeric technique according to the method described by AOAC (1990; 2005). The spectrophotometeric technique was employed in the determination of phosphorus levels in the aqueous extracts of white and red onion bulbs.

Determination of Heavy Metals Content

The concentration of nickel, cadmium, lead, and chromiun in the aqueous extracts of white and red onions bulbs was estimated using atomic absorption spectrophotometeric (AAS) technique according to the method described by AOAC (1990; 2005).

Determination of Ant-nutritional Composition

The level of oxalate, phytate, saponins, tannins and cyanogenic glycosides in the aqueous extracts of white and red onions bulbs was determined using the method of Gupta et al. (2005), Reddy and Love (1999), AOAC (1990), Harborne (1984), and AOAC (2005), respectively.

Statistical Analysis

The experiments were conducted in triplicate. The data were analyzed using Statistical Package for Social Sciences (SPSS) Statistics version 22 software and expressed as mean ± standard deviation. Differences

between the mean values were significantly computed by One-way analysis of variance (ANOVA) at 95 % confidence level. Significance was considered by two-tailed ($p < 0.05$) values.

RESULTS

Phytochemicals Screening of Aqueous Extracts of White and Red Onions Bulbs

Table 1 shows the phytochemicals constituents of aqueous extracts of white and red onions bulbs. High and moderate amounts of alkaloids, flavonoids, and tannins were observed in the aqueous extracts of red and white onions bulbs, respectively. The result showed that terpenoids and steroids were respectively present in the aqueous extracts of red and white onions bulbs at moderate and high amount. The aqueous extracts of red and white onions bulbs demonstrated a moderate and low amount of glycosides, saponins, and anthraquinones, respectively. A low amount of cardiac glycosides was found in the aqueous extracts of red and white onions bulbs (Table 1).

Table 1. Phytochemicals Screening of Aqueous Extracts of White and Red Onions Bulbs.

Phytochemical	White Bulb	Red Bulb
Alkaloids	++	+++
Glycosides	+	++
Flavonoids	++	+++
Tannins	++	+++
Saponins	+	++
Steroids	+++	++
Cardiac glycosides	+	+
Terpeniods	+++	++
Anthraquinones	+	++

+++ = Highly present, ++ = Moderately present, + = Slightly present.

Proximate Composition of the Aqueous Extracts of White and Red Onions Bulbs

The proximate composition of the aqueous extracts of white and red onions bulbs were presented in Table 2. The aqueous extracts of white and red onions bulbs contain higher significant ($p < 0.05$) amounts of moisture (89.68 and 87.04%), respectively. A significant ($p < 0.05$) amounts of ash (3.22 and 2.03%), fiber (3.00 and 2.00%), carbohydrates (2.33 and 2.59%), proteins (3.19 and 1.04%), and lipids (1.22 and 2.66%) were observed in the aqueous extracts of white and red onions bulbs, respectively. However, the aqueous extract of white onions bulbs exhibited higher amounts of moisture, ash, fiber and proteins compared to the aqueous extract of red onions bulbs (Table 2).

Table 2. Proximate Composition of the Aqueous Extracts of White and Red Onions Bulbs.

Parameter	White Bulb	Red Bulb
Moisture (%)	89.68 ± 1.44^{a}	87.04 ± 1.51^{b}
Ash (%)	3.22 ± 0.28^{c}	2.03 ± 0.15^{d}
Fiber (%)	3.00 ± 0.20^{c}	2.00 ± 0.14^{d}
Carbohydrates (%)	2.33 ± 0.06^{d}	2.59 ± 0.04^{d}
Proteins (%)	3.19 ± 0.02^{c}	1.04 ± 0.06^{e}
Lipids (%)	1.22 ± 0.09^{e}	2.66 ± 0.20^{d}

Values are expressed as mean ± SD (n = 3)

Minerals Contents of the Aqueous Extracts of White and Red Onions Bulbs

Table 3 shows the minerals contents of the aqueous extracts of white and red onions bulbs. The findings indicated that the aqueous extracts of white and red onions bulbs contain higher significant ($p < 0.05$) amounts of potassium (987.10 and 756.24 ppm) and sodium (42.50 and 32.50 ppm) than the other minerals, respectively. The aqueous extracts of white and red onions bulbs exhibited significant ($p < 0.05$) level of calcium (8.90 and 6.10 ppm), phosphorus (3.87 and 4.04 ppm), zinc (2.32 and 1.13 ppm), and magnesium (1.85 and 1.12 ppm), respectively. Also, low levels of iron (0.62 and 0.58 ppm) and copper (0.47 and 0.17 ppm) were observed in the aqueous extracts of white and red onions bulbs. In comparison with the aqueous extracts of red onions bulbs, the aqueous extracts of white onions bulbs demonstrated higher significant ($p < 0.05$) level of potassium, sodium, calcium, zinc, magnesium, iron and copper (Table 3).

Table 3. Minerals Contents of the Aqueous Extracts of White and Red Onions Bulbs.

Mineral	White Bulb	Red Bulb
Sodium (ppm)	42.50 ± 1.50^{a}	32.50 ± 0.46^{b}
Potassium (ppm)	987.10 ± 7.87^{c}	756.24 ± 5.31^{d}
Phosphorus (ppm)	3.87 ± 0.25^{e}	4.04 ± 0.08^{e}
Calcium (ppm)	8.90 ± 0.95^{f}	6.10 ± 0.23^{g}
Magnesium (ppm)	1.85 ± 0.11^{h}	1.12 ± 0.09^{i}
Copper (ppm)	0.47 ± 0.03^{j}	0.17 ± 0.02^{k}
Zinc (ppm)	2.32 ± 0.16^{h}	1.13 ± 0.10^{i}
Iron (ppm)	0.62 ± 0.08^{j}	0.58 ± 0.03^{j}

Values are expressed as mean ± SD (n = 3)

Heavy Metals Contents of the Aqueous Extracts of White and Red Onions Bulbs

The heavy metals contents of the aqueous extracts of white and red onions bulbs are shown in Figure 1. The results showed that the aqueous extracts of white and red onions bulbs contain trace level of nickel (0.112 and 0.524 ppm), lead (0.034 and 0.023 ppm), cadmium (0.029 and 0.014 ppm), and chromiun (0.090 and 0.032 ppm), respectively. However, the aqueous extract of white onions bulbs demonstrated high level of lead, cadmium, and chromium compared to the red onions bulbs extract (Figure 1).

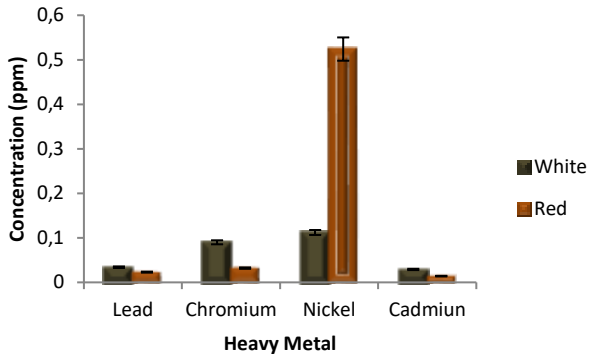

Figure 1. Heavy Metals Contents of the Aqueous Extracts of White and Red Onions Bulbs. Values are expressed as mean ± SD (n = 3).

Anti-nutrients Contents of the Aqueous Extracts of White and Red Onions Bulbs

Figure 2 shows the levels of certain anti-nutrients in the aqueous extracts of white and red onions bulbs. The results showed a high concentration of cynogenic glycosides (3.00 and 12.46 mg/100g) and saponins (2.02 and 2.07 mg/100g) in the aqueous extracts of white and red onions bulbs, respectively. The aqueous extracts of white and red onions bulbs exhibited low levels of oxalate (0.63 and 3.75 mg/100g), tannins (0.90 and 1.09 mg/100g), and phytate (0.38 and 1.49 mg/100g), respectively. However, the aqueous extracts of red onions bulbs exhibited high significant ($p < 0.05$) levels of oxalate, tannins, phytate cynogenic glycosides and saponins compared to the red onions bulbs extract (Figure 2).

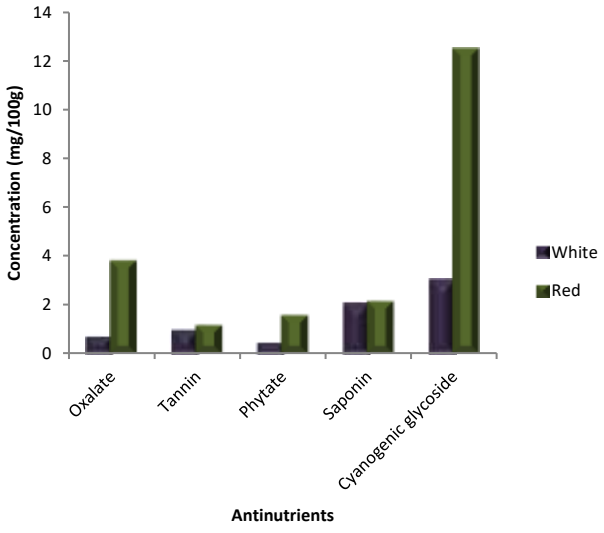

Figure 2. Anti-nutrients Contents of the Aqueous Extracts of White and Red Onions Bulbs. Values are expressed as mean ± SD (n = 3).

DISCUSSION

In this study, the aqueous extracts of red and white onions bulbs demonstrated significant amount of alkaloids, flavonoids, tannins, glycosides, saponins, steroids, cardiac glycosides, and anthraquinones. The results of this study is in agreement with the similar study by Dalhat et al. (2018) who reported that *Allium cepa* demonstrated significant amount of phytochemicals including alkaloid, tannins and flavonoids. Also, similar findings showed that Allium sativum contains reasonable amount of certain phytochemicals which include saponins and flavonoids (Martin & Griswold, 2009). Results of relevant studies by Aliyu et al. (2024), Ibrahim et al. (2024) and Abubakar et al. (2022) showed the presence of many phytochemicals in some plants materials. Phytochemicals exhibited many medicinal properties and pharmacological activities (Oghenejobo *et al.,* 2017). The plants saponins decrease the risk of coronary heart diseases (Gemede & Ratta, 2014). Study showed that terpenoids extracted from the plant demonstrated analgesic, antiimflammatory, anti-fungal, anti-microbial, anti-viral and anti-parasitic activities (Mercola, 2017). Cardiac glycosides from plants extracts have been used for the treatment of various complications of cardiovascular disorders (Denwick, 2002). Alkaloids have therapeutic uses and have been used in drug discovery and development (Okolo *et al.,* 2012). It has been documented that flavonoids from different plants extracts demonstrated antimalarial, antiinflammatory, and antioxidant activities (Liu, 2013). Sex hormones and steroidal drugs have been synthesized from the steroids isolated from plants extracts (Majeed *et al.,* 2004). It has been shown that tannins extracted from *Allium cepa* skin exhibited significant antioxidant and anti-inflammatory activities (Nwinuka *et al.,* 2005). Research showed that the medicinal properties of the plant for the treatment of ulcer, earache and as an antitussive could be attributed to its tannins content (Dalhat *et al.,* 2018).

In the present study, high significant amount of moisture, fiber, carbohydrate, protein, lipid, and ash content was found in the aqueous extracts of red and white onions bulbs. This finding is in line with the findings which showed that onion bulbs contain significant amount of proteins (Armand *et al.,* 2018). High percentage of proteins consume especially in low and middle income countries are sourced from vegetables. Proteins play many vital biological functions such as maintaining healthy skin, increase in body growth, and tendency to displace worms out of cells (Okwu & Morah, 2004). Significant amount of lipid in onion bulbs has been reported in similar study (Elhakem *et al.,* 2021). Lipids are important sources of high energy compounds and fat-soluble vitamins that play a vital role in biological and biochemical processes (Ogbuagu *et al.,* 2011). Results of the present study are in agreement with relevant findings by Tame and Afolabi (2020) which indicated that onion varieties exhibited significant quantity of ash contents. Minerals content of a foods and plants is determine by their ash content (Oloyede, 2005). High carbohydrate content was observed in different varieties of onion bulbs (Tame and Afolabi, 2020). This

finding agrees with the relevant studies by Dalhat et al. (2018) and Okwu and Morah (2004) who reported high fiber content in Allium sativum and *Allium cepa*. Dietary fiber provides an important role in regulation of normal peristaltic movement of the intestinal tract and in food digestion (Dalhat *et al.,* 2018; Okwu & Morah, 2004).

In the present study the aqueous extracts of red and white onions bulbs demonstrated a significant amount of sodium, potassium, phosphorus, calcium, magnesium, zinc, copper, and iron. Sodium and potassium play an important role in acid-base balance maintenance and regulation of osmotic pressure, membrane potentials, muscles contraction and transmission of nerve impulses (Aliyu *et al.,* 2024). Calcium serves many functions in biological system such as regulation of vasodilatation and vascular contraction, nerve transmission, muscle function, hormonal secretion, and intracellular signaling (Aliyu *et al.,* 2024; Catharine *et al.,* 2018). Calcium functions as blood clotting agent and in bone and teeth development (Abubakar *et al.,* 2022). Magnesium plays a significant role in growth and integrity of bone, muscles and nerves functions, and regulation of the cardiac cycle (Aliyu *et al.,* 2024; Allen & Sharma 2019; Gragossian and Friede 2019). Zinc provides an important role in tissues formation, immune cell proliferation and maturation, wound repair, hair growth, activation of signal transductor, regulation of oxidative stress, and gene expression (Baltaci *et al.,* 2018; Kimura & Kambe, 2016). Copper serves important function in development of bone, hematopoiesis process and certain enzymatic activities such as ferro-oxidase, catalase, cytochrome oxidase and tyrosinase (Leone *et al.,* 2006). Iron regulates the activities of certain enzymes in many biological and biochemical processes including synthesis of hemoglobin, transport of oxygen, oxidative processes, cellular growth and catalytic reactions (Akram *et al.,* 2020; Yiannikourides & Latunde-Dada, 2019).

In this study, trace amount of lead, nickel, chromium, and cadmium was found in the aqueous extracts of white and red onions bulbs. Heavy metals can produce adverse effects on human and animals health and the environment. Consumption of foods and plants accumulated with various heavy metals has adverse health effects (Ibemenuga *et al.,* 2019). High level of heavy metals in foods and plants causes toxic effect on certain organs and tissues (Abubakar *et al.,* 2022). Consumption of heavy metals in foods and plants can cause many adverse health effects including damage of nervous system, influencing fetal development, carcinogenicity and impaired immune function (Sekarwati *et al.,* 2015).

In the current study, a trace amount of phytates, oxalates, tannins, saponins, and cyanogenic glycosides was observed in the aqueous extracts of red and white onions bulbs. Anti-nutritional factors demonstrate several adverse effects in foods and plants and cause toxic effects in human and animals' body. Tannins bind proteins in foods and plants to form complexes which inhibit the activity of digestive enzymes such as trypsin, chymotrypsin and amylase affecting digestion of nutrients (Edet *et al.,* 2015; Amadi *et al.,* 2012; Duru *et al.,* 2012). Studies showed that phytates influenced the absorption of several important elements including iron, zinc, magnesium, and calcium (Masum *et al.,* 2011). Saponins decrease the activities many important enzymes such as trypsin and chymotrypsin thereby reducing the nutrients bioavailability (Liener, 2003). It has been reported that phytates inhibit the activities of digestive enzymes such as pepsin, trypsin and amylase (Kumar *et al.,* 2010). Oxalates bind calcium to form insoluble complexes which lower the capacity of body to absorb nutrients and cause harmful effects to humans and animals (Umar *et al.,* 2013). Report showed that consumption of foods rich in high concentration of oxalate causes irritation in the mouth and lower region of the gut (Gemede & Ratta, 2014).

CONCLUSION

The aqueous extracts of white and red onions bulbs contain many phytochemicals and significant amounts of proximate components and important minerals with trace amount of certain heavy metals and anti-nutrients. However, the aqueous extract of white onions bulbs demonstrated high significant amounts of proximate components and important minerals compared to the aqueous extract of red onions bulbs. Also, the levels of the heavy metals and the anti-nutrients were higher in the aqueous extract of white and red onions bulbs, respectively.

Conflict of Interest: The authors declared that there was no conflict of interest.

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