Direct Research Journal of Biology and Biotechnology
Vol. 10(2), Pp. 50-56, July 2024
ISSN: 2734-2158
DOI: https://doi.org/10.26765/DRJBB630942578
Article Number: DRJBB630942578

https://journals.directresearchpublisher.org/index.php/drjbb

The Proximate, Phytochemical and Mineral Properties of Senna Occidentalis Leaf and some Local Feed Ingredients

Mohammed Chado Isah[1]*, Aliyu Hamzat[1], Bintu Muhammad Mofio[3], Mohammed Kudu Yusuf[2], Mutah Nyadar Palmah[3], Abdulkadir Alhaji Adamu[1] and Safiya Yunusa Mohammed[4]

[1]Department of Biology, Ibrahim Badamasi Babangida University, Lapai, Nigeria.
[2]Department of Animal Production, Ibrahim Badamasi Babangida University, Lapai, Nigeria.
[3]Department of Biochemistry, University of Abuja, Nigeria.
[4]Department of Biological Sciences, University of Abuja, Nigeria.
Corresponding author email: isachado@gmail.com Tel: +2348037376393, orchid ID number: 0000-0002-8438-152X

Received 9 May 2024; Accepted 18 June 2024; Published 8 July 2024

ABSTRACT: This *Senna occidentalis* is a common tropical legume whose leave used to remedy many health challenges. These may be due to its nutritional status and can also be utilized as feed ingredient for fish and other domestic animals. The proximate, phytochemical and mineral properties of *Senna occidentalis* leaf will give insight of its bioactive components, nutritional and medicinal values. *S. occidentalis* collected from Fogbe and Lapai, in Niger state, Nigeria were investigated together with the proximate of soybean, maize and fishmeal purchased from Lapai market. The *S. occidentalis* leaves were air dried pulverized into powdered, soybean seed, maize and fish were also grind into powder. The proximate analyses of the feed ingredients were conducted. The phytochemical and mineral analyses of *S. occidentalis* leaf were done by using Atomic Absorption Spectrum (AAS). The *S. occidentalis* leaf has 30.83±4.59% protein, 2.95±1.41% moisture, 8.73±2.20 % ash, 18.12±2.12% fibre, 5.64±1.78% lipid and 33.73±1.00% carbohydrate contents. The proximate analyses show that fishmeal (67.35±5.55%) has high protein, soybean has high lipid (27.83±3.14%), and maize with high carbohydrate value of 79.47±1.07%. flavonoid (2.18±0.82mg/g) was high among the S. *occidentalis* leaf phytochemicals, phenolic compounds (1.58±0.75mg/g), alkaloid (1.23±0.32 mg/g) and saponin (0.33±0.01mg/g). *S. occidentalis* leaf was found to contain 105±0.43mg/L Chloride, 29.6±0.28mg/L calcium ion, 6.0±0.38mg/L sodium, 4.5±0.42mg/L nitrate, 3.0±0.08mg/L potassium, 0.07±0.01mg/L phosphate and 0.04±0.34mg/L nitrite that fall within normal range. With the foregoing constituents, S*. occidentalis* leaf has antibacterial, antiviral, anticancer, antioxidant anti-inflammatory properties and also precursor for syntheses of bioactive substances.

Keywords: Proximate properties, phytochemical profile, mineral characteristics, *Senna occidentalis* Leaf

Citation: Isah,M. C., Hamzat, A., Mofio,B. M., Yusuf, M. K., Palmah, N., Adamu,A. A., and Mohammed, S.Y. (2024). The Proximate, Phytochemical and Mineral Properties of Senna Occidentalis Leaf and some Local Feed Ingredients. Direct Res. J. Biol. Biotechnol. Vol. 10(2), Pp. 50-56. https://doi.org/10.26765/DRJBB630942578.

INTRODUCTION

The study of phytochemicals, proximate and mineral analyses of *Senna occidentalis* leaf is an important area of research in the field of nutrition and pharmacology. *S. occidentalis*, a plant that is commonly used in traditional medicine in many parts of the world. Several studies have been conducted on potential health benefits of *S. occidentalis*. Study by Omoikhoje *et al.* (2018) shows that, *S. occidentalis* leaf meal can be a potential source of vegetable protein and some vital mineral elements as supplements to poultry feeds, and promote growth by enhancing nutrient utilization, repair of worn out tissues and disease control could make *S. occidentalis* leaves

worthy of being a phytobiotic additive in poultry diets. Ismaila *et al*. (2011) analyzed the nutritional and phytochemical constituents of the leaves of *S. obtusifolia* indigenous to Mubi Nigeria, while Ogbuewu *et al*. (2010) investigated the effect of *S. occidentalis* leaf meal on the performance and blood chemistry of broiler chickens and found that the leaf meal improved the birds' performance, Oladejo*et al*. (2015) evaluated the antioxidant and antimicrobial properties of *S. occidentalis* leaf extract and found that it had potent antioxidant activity and was effective against a range of pathogenic microorganisms. Additionally, a study by Dahiru *et al*. (2016) investigated the effect of *S. occidentalis* leaf extract on the lipid profile of rats and found that it significantly reduced the levels of cholesterol and triglycerides in the animals.

The study of phytochemical, proximate and mineral analyses of *Senna occidentalis* leaf has significant implications for the development of functional foods and herbal medicines. These studies provide valuable information on the potential health benefits of *Senna occidentalis* and its bioactive compounds, which could be used to develop novel dietary supplements and pharmaceuticals.

Despite the potential benefits of *Senna occidentalis* leaves as a source of phytochemicals in animal diets, there is limited research on their effects on fish health and growth. Previous Studies have reported conflicting results on the use of *Senna occidentalis* leaves as a feed Ingredient for fish, with some studies showing positive effects on growth and immunity (Pereira-Filho *et al*., 2013), while others reported negative effects on fish performance and Histopathology (Akintoye *et al*., 2017). Fish diets should be based entirely on plant protein for growing catfish as it lower feed cost. Plant's constituents have been used in treatment of sickness, infection, genetic disorder and auto-immune disease (Adamu 2014). There is the need to understand the phytochemical constituents and the vitamin components of plants. Ujah *et al.* (2022).

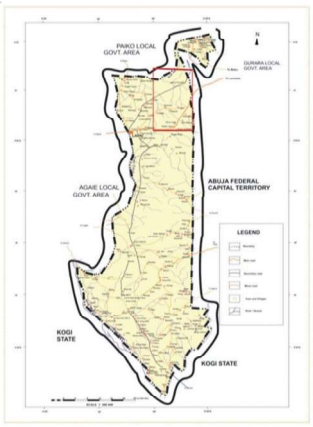
Limited research has been conducted on the potential effects of these compounds when incorporated into fish feed. However, the use of plant-based feed additives in fish nutrition requires a thorough evaluation of their phytochemical, proximate, nutritional composition, potential toxicity, and impact on fish health. The phytochemical proximate and mineral analyses of *S. occidentalis* leaf diet on fishes will provide valuable information on the bioactive compounds present in the plant and their potential impact on the health and growth of fish species.

The findings of this study will contribute to our understanding of the applicability of *Senna occidentalis* leaf diet in aquaculture and provide insights into the development of sustainable and natural feed additives for fish nutrition.

MATERIALS AND METHODS

Collection and identification of plant samples

The plant samples (leaf of *S. occidentalis*) was obtained at Lapai (Lat. 9.051468^0, long.6.566812^0), and Fogbe (latitude 8.719817^0, longitude 6.513930^0) both in Niger state, Nigeria. The plant samples obtained was identified in the Herbarium unit of the Department of Biology, Ibrahim Badamasi Babangida University Lapai, and Niger state by a Botanist with a voucher number: IBBU210520 where the voucher specimen was deposited. The leaves of *S. occidentalis* were washed thoroughly under running tap, dried under room temperature for a period of one (1) week and pulverized into powdered using mortar and pestle. The leaves were turned regularly to avoid uneven drying and decay. The dried crispy leaves were hammer milled through a 2mm sieve and stored in airtight containers to avoid the absorption of moisture till they were needed (Figures 1 and 2).



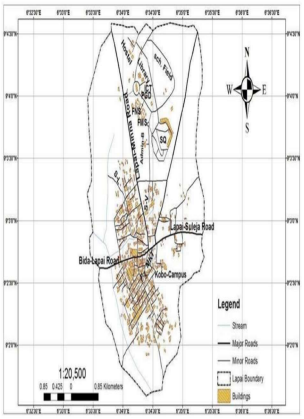


Figure 1: Map of Lapai LGA, Niger State, Nigeria. Figure 2: Map of IBBUL

Figure1: Map of Lapai LGA, Niger State, Nigeria. Figure2:Map of BBL Lapai.
(Source: Google search/ Department of geography IBBUL)

Phytochemical analysis of *Senna occidentalis* Leaf

Determination of alkaloids

A mass of 5.0g of sample was weighed into a 250ml beaker, and 200ml of 20% acetic acid in ethanol was added and covered to stand for 4h. This was filtered and extract was concentrated using a water bath to evaporate one-quarter of the original volume. Concentrated ammonium solution was added drop-wise to the extract until precipitation was completed. The entire solution was allowed to settle and the precipitate was collected by filtration, after which it was weighed (Obadomi & Ochuko, 2001).

$$\text{Alkaloid} = \frac{W_2 - W_1}{W_n}$$

W_1 = weight of crucible, W_2 = weight of crucible + sample, W_n= Weight of the sample and $W_1 - W_2$ = weight of extract.

Determination of saponins

Five grams (5.0g) of plant sample was weighed, and dispersed in 100ml of 20% ethanol. The suspension was heated over a hot water bath for 4h with continuous stirring at about 55^0C. The filtrate and residue were re-extracted with another 100ml of 20% ethanol. The combined extracts were reduced to 40ml over water bath at about 90^0C. The concentrate was transferred into a 25ml separating funnel and 20ml of di-ethyl ether was added and shaken vigorously. The aqueous layer was recovered while ether layer was discarded. The purification process was repeated and about 30ml of n-butanol was added. The combined n- butanol extracts were washed twice with 10ml of 5% aqueous sodium chloride. The remaining solution was heated in a water bath, after evaporation, the sample was dried in the oven to a constant weight. The saponin content was calculated (Obadomi & Ochuko, 2001).

$$\text{Saponin mg/g} = \frac{W_2 - W_1}{W_n}$$

W_1 = weight of crucible, W_2 = weight of crucible + sample, W_n= Weight of the sample and $W_1 - W_2$ = weight of extract.

Test for flavonoid

Five (5ml) of plant leaf extract was treated with 1ml of 20% NaOH, the yellow colour indicates presence of flavonoid compound (Eloleyi 1994, Harbone 1998).

Test for Tannins

Five drops of lead acetate solution were added to 2ml of aqueous solution of the extracts (plus 2ml of water) in a test- tube. The test tube was shaken. Appearance of colored precipitate indicates the presence of tannins (Kokate 2002)

Test for phlobatannins

10ml of aqueous extract of the leaf was boiled with 1% HCL acid in a test- tube after filtration. Appearance or deposition of a red precipitate indicates the presence of phlobatannins (Evans 2002, and Sofowara, 1993).

Test for phenolic compounds

2ml of the ethanolic extract of the powdered was added to 3mls of water in a test tube. To this was added 2 drops of 1% Ferric III chloride solution. Appearance of red, blue, green (blackish) or purple color indicates the presence of phenolic compound (Evans 2002)

Proximate analyses of the Feed ingredients

The proximate analyses of the feed ingredients (Maize, soybean, fishmeal, and S. occidentalis leaf) were conducted following the standard procedure of OAOC 2005 as modified by Muhammad (2019).

Moisture content

The samples (2g each) were weighed into each of the crucibles and the crucibles were then inserted into an oven at 105°C and allowed overnight. The crucibles were removed and inserted into a desiccator to cool for 5mins. Each sample was carefully removed from the desiccator and weighed. The %moisture content was calculated using:

$$\% \text{ Moisture} = \frac{\text{Losing Weight due to drying}}{\text{Weight of sample taken}} \times 100$$

Ash content

The samples (2g each) were placed in empty crucibles and weighed. The crucible containing the sample was then heated in muffle furnace at 600°C for 5 hours to burn off all the organic matter. After the ashing period, the samples were placed into a desiccator gently to cool and weighed. The ash content was calculated using the following:

$$\% \text{ Ash} = \frac{\text{Weight of ash}}{\text{Weight of sample}} \times 100$$

Crude lipid

The samples (2g each) were measured into glass bottle. 20cm^3 of n-Hexane was added. It was passed through a sohxlet extraction method. Empty petri-dishes were weighed. The oil was then carefully extracted into petri-dish and the solvent was allowed to evaporate and then weighed. The percentage crude lipid was calculated using the formula:

$$\% \text{ crude lipid} = \frac{\text{Weight of oil}}{\text{Weight of sample}} \times 100$$

Crude fiber

The samples (2g each) were placed in a conical flask, 20cm3 of distilled water and 20cm3 of 10% H2SO4 was added, it was fixed to boil for 20 minutes to maintain constant volume. The samples were filtered and rinsed with water. The samples were scrapped into a flask with the aid of spatula. 20cm3 of 10% NaOH was added and then placed on a heater again to boil for 25mins. The samples were filtered using a filter paper and ethanol was used to rinse the samples once again, it was allowed to drain and the residue was scrapped into crucibles. The crucibles were then placed in an oven to dry at 105°C after which the weight was taken. The crucibles were then placed in muffle furnace to ash for 2 hours at 550°C and allowed to cool in desiccators and weighed again. Percentage crude fiber was then calculated using the following:

$$\% \text{ Crude fiber} = \frac{\text{Weight after drying} - \text{weight after ashing}}{\text{Weight of sample}} \times 100$$

Crude protein

The samples (0.5g) were weighed into 2 different distillation tubes and 10cm^3 of Conc. H_2SO_4 was added into each tube followed by 40cm^3 of distilled water to dilute the acid then kjeldahl tablet was added to each tube of the mixture to digest the inorganic matter present. The tubes were sent into the digestion chamber for digestion. From the digestion tubes, 10cm^3 of the samples were measured respectively and added into the digestion flask followed by 20cm^3 distilled water and then 20cm^3 NaOH (40%) to make up the solution. The mixture was sent into the distillation chamber for the nitrogen content; to extract out ammonia present in the sample which will be evaporated into the boric acid indicator, before protein analysis.

It was allowed for about 3 minutes, where 20cm^3 of the boric acid indicator was placed into a flask and inserted beneath the distillation chamber used as the receiver of the nitrogen extracted. Where the ammonia was liberated into the boric acid and changes the indicator's colour from pink to green.

The green mixture with ammonia was titrated against 0.01M H_2SO_4 to end point, which give the actual amount of protein content in sample. The colour change was from green to pink and the end point and the titer values were recorded respectively.

The crude protein was calculated using the following equations

Crude protein = %Nitrogen x 6.25

The formula for calculating Nitrogen (N) in proximate analysis is:

% Nitrogen (N) = (% Kjeldahl Nitrogen x 100) / Sample Weight

Or:

% N = (Titration Value x Normality of HCl x 1.4011) / Sample Weight

Where: - Kjeldahl Nitrogen is the amount of nitrogen determined by the Kjeldahl method
- Titration Value is the volume of HCl (hydrochloric acid) used in the titration
- Normality of HCl is the concentration of HCl (usually 0.1 N)
- Sample Weight is the weight of the sample analyzed
- 1.4011 is a conversion factor to calculate nitrogen from ammonia

Mineral analysis

The minerals: calcium (Ca), potassium (K), magnesium (Mg), sodium (Na), copper (Cu), zinc (Zn), iron (Fe) and manganese (Mn) were determined using Atomic Absorption Spectrum (AAS) method with Atomic Absorption Spectrophotometer model 420. Phosphorus in the digest was estimated with vanadomolybdate solution and the colour so developed was read with spectrophotometer at 420 m/u. The concentration of K was estimated with a flame photometer using the methods of AOAC (1995).

Statistical analysis

Collected data were analyzed for their central tendencies (mean), and expressed in mean ± standard deviation of the observations. Using excel and SPSS software.

RESULTS

Nutritional composition of *Senna occidentalis* leaf and some local fish feed ingredients

The proximate composition of coffee senna (*S. occidentalis)* leaf, fishmeal, soybean and maize were carried out. The crude protein of *S. occidentalis* leaf (30.83 ± 4.59%) and that soybean (35.86 ±2.45%) has no significant difference (P = 0.05), while the crude protein content of Fishmeal (67.35±5.55%) is significantly greater (P >0.05) than that of maize (8.69± 064%), but the crude protein level of fishmeal were significantly greater than

Table 1: Nutritional composition of *Senna occidentalis* leaf and some other local fish feed ingredients.

Parameters	Crude protein	Moist content	Ash content	Crude fibre	Crude lipid	Carbohydrate
Senna occidentalis leaf	30.83 ± 4.59^{b}	2.95 ±1.41^{a}	8.73 ± 2.20^{c}	18.12 ± 2.12^{b}	5.64 ± 1.78^{ab}	33.73 ± 1.00^{c}
Fishmeal	67.35 ± 5.55^{c}	3.38 ±1.28^{ab}	4.67 ± 2.02^{ab}	2.32 ± 1.94^{a}	13.19 ± 6.85^{b}	9.08 ± 6.02^{ab}
Soybean	35.86 ± 2.45^{b}	6.26 ± 1.30^{b}	7.27 ± 0.52^{bc}	5.58 ± 0.24^{a}	27.83 ± 3.14^{c}	17.21 ± 1.26^{b}
Maize	8.69 ± 0.64^{a}	6.53 ± 1.02^{b}	1.38 ± 0.39^{a}	2.78 ± 0.02^{a}	1.15 ± 0.32^{a}	79.47 ± 1.07^{d}

Note: Different lettered superscript on the same column denotes significance difference (P ≤ 0.05).

Table 2: Phytochemical Screening Result of *S. occidentalis* leaf.

Phytochemical constituents	Qualitative properties	Concentration (mg/g)
Saponins	+	0.33±0.01
Tannin	++	1.48±0.91
Flavonoids	+++	2.18±0.82
Alkaloid	++	1.23±0.32
Phenolic Compounds	++	1.58±0.75

Note: +++ (Highly present), ++ (moderately present), + (present), – (absent)

Table3: Mineral properties of *Senna occidentalis* leaf.

Parameters	Quantity
Calcium ion (mg/L)	29.6± 0.28
Magnesium ion(mg/L)	26.8 ± 0.23
Fluoride (mg/L)	0.68 ± 0. 29
Nitrate (mg/L)	4.5 ± 0.42
Nitrite (mg/L)	0.04 ± 0.34
Chloride (mg/L)	105 ±0.43
Sodium (mg/L)	6.0 ± 0.38
Potassium (mg/L)	3.0 ± 0.08
Phosphate (mg/L)	0.07 ± 0.01

that of *S. occidentalis* leaf while that of maize is lower as expressed in (Table 1). The moisture content of *S. occidentalis* leaf (2.95 ±1.41%) and that of Fishmeal (3.38±1.28%) has no significant difference (P = 0.05), while the moisture content of maize (6.53 ± 1.02%) and that soybean (6.26 ±1.30%) has no significant difference. but the moist content of both maize and soybean were significantly higher (P<0.05) than that of *S. occidentalis* leaf. The ash content of *S. occidentalis* leaf (8.73 ± 2.20 %) and that of soybean (7.27±0.52%) has no significant difference (P = 0.05), while the ash content of fishmeal (4.67±2.02%) were significantly higher (P>0.05) than that of maize (1.38±0.39%) but the ash content of both fishmeal and maize were significantly lower than that of *S. occidentalis* leaf as expressed in table 4.1 below. The crude fiber of *S. occidentalis* leaf (18.12 ± 2.12%) is significantly greater (P>0.05) that of soybean (5.58 ±0.245%), maize (2.78 ±0.02%) and Fishmeal (2.78±0.03%), the crude fiber content of soybean were significantly higher (P>0.05) than that of maize and fishmeal, the crude fiber level of soybean, maize and fish were significantly lower than that of *S. occidentalis* leaf as expressed in (Table 1). The crude lipid of *S. occidentalis* leaf (5.64 ± 1.78%) and that Of maize (1.155±0.32%) has no significant difference (P = 0.05), while the crude lipid content of soybean (27.83±3.14%) is significantly greater (P>0.05) that of fishmeal (13.19±6.85%), but the crude lipid level of both soybean and fishmeal were significantly higher than that of *S. occidentalis* leaf as expressed in table 4.1 below. The carbohydrate content of *S. occidentalis* leaf (33.73 ± 1.00%) and that of soybean (17.21±1.26%),and Fishmeal (9.08±6.02%) has no significant difference (P = 0.05), but both soybean and fishmeal are significantly lower than *S. occidentalis* leaf , *S. occidentalis* leaf is significantly lower than the carbohydrate contents of maize (79.47±1.07%) as expressed in (Table 1). The Table 2 shows both the qualitative and quantitative phytochemical screening carried out on the leaves of *Senna occidentalis.* It appears that saponins, tannins, flavonoids, alkaloids, and phenolic compounds were present while and volatile oils and steroids were not detected. *Senna occidentalis* leaf have high flavonoid content (2.18±0.82 mg/g) this amount is widely followed by the phenolic compounds

(1.58±0.75mg/g), tannin was 1.48±0.91 and alkaloid (1.23±0.32 mg/g) and saponin (0.33±0.01mg/g) having the least values as shown in (Table 2). Chloride was highest mineral present in *S. occidentalis* leaf with (105 ±0.43 mg/L), this amount is widely followed by calcium ion (29.6± 0.28mg/L) and magnesium ion (26.8 ± 0.23mg/L) which were closely related, then sodium (6.0 ± 0.38 mg/L), nitrate (4.5 ± 0.42 mg/L) and potassium (3.0 ± 0.08 mg/L) that falls on the same range, whereas, fluoride (0.68 ± 0. 29 mg/L), phosphate (0.07 ± 0.01 mg/L) and nitrite (0.04 ± 0.34 mg/L) has the least values as shown in the (Table 3).

DISCUSSION

Proximate analysis of a plant material/food sample is the nutritional composition of that sample and helps in estimating the nutritive value of the sample (*Ahmed et al* 2021). The result of proximate analysis of this study presented in (Table 1) above revealed that the leaves of *Senna occidentalis* and other tropical food additives contains essential nutrients, energy sources for good human and animal health because of the percentage contents of protein (%), carbohydrate (%) and crude fibre (%) and it's within the acceptable limit. These results are similar with [Kendeson*at al* 2018] for evaluation of protein (%), carbohydrate (%) and crude fibre (%) contents in seeds of *Senna siamea* and [Omoikhoje s, *et al* 2018] for evaluation of protein (%), carbohydrate (%) and crude fibre (%) contents in leaves of *S. aocidentalis*). Samples rich in fibre have been reported to lower risk of constipation and diabetes, decrease. The percentage contents of carbohydrate, protein, moisture is in disagreement with the minerals, and proximate of *Senna occidentalis* as observed by Aja *et al.* (2017a). The results shows low percentage of moist content and crude lipid which is in agreement with (Ahmed *et al* 2021), Sample having lower level of lipid content have been reported to lower the serum cholesterol level in human and animal (Adefisan *et al* 2020) and Low value of moisture content indicates less chances of microbial degradation during storage because excess moisture can result in the breakdown of important constituents by enzymatic activity and as a result may encourage the growth of yeast and fungi during storage (Aja P *et al* 2017b). The ash content value recorded in this work was within the ranges of values for other wild legumes (*Omoikhoje et al 2018;* Ismaila*et al* 2011; Musbau 2018). This is reflective of the fact that *S. ocidentalis* leaf meal is a potential source of high amount of some diatary minerals (Omoikhoje *et al 2018*).

Phytochemical analysis is very useful in the evaluation of some active biological components of some plants (Carson and Riley, 2003). Phytochemical screening helps to reveal the chemical nature of the constituents of the plant extract which may also be used to search for bioactive agents that could be used in the synthesis of very useful drugs. As seen from the result of the study, the water extract of *Senna occidentalis* has high concentration of flavonoid, tannins, Alkaloids, and moderate saponins, and phenol. This result obtained is in agreement to the result obtained by Kendeson *et al*. (2018). This result is totally in disagreement with the work by Omokhoje *et al.* (2018) which showed the presence of all the phytochemicals in low concentration. High concentration of Alkaloid in leaf Indicates that *S. occidentalis* is a good source of Alkaloid in inducing a stress response and apoptosis in human breast cancer cell. More so, the result of the study revealed that *S. occidentals* leaf counter the with the report of Ismaila *et al*. (2011) which showed that *S. occidentalis* leaves are rich in all phytochemicals. This result also supported the reports of Aja *et al*. (2017c) that revealed high levels of phenols and other phyochemicals in *Dissotisrotun difolia* and *Cajanus cajan* leaves and seeds.

Senna occidentalis is a good source of flavonoids which could be used in the management of cardiovascular diseases and oxidative stress (Ujah *et al* 2022). Flavonoids provide protection against these diseases by supplying antioxidants vitamins and enzyme like glutathione peroxidase, superoxide dismutase, catalase, to the total antioxidant defense system to human body (Ujah *et al* 2022).

High levels of tannin in *S. occidentalis* leaf indicates that *Senna occidentalis* leaf have antimicrobial activities (Ujah *et al,* 2022). Tannins can also be effective in curbing hemorrhages and as well restrict bare swelling (Carson and Riley, 2003). Moderate levels of phenols were obtained, phenols in the leaf could account for its traditional uses in the treatment of rheumatism and painful swelling. Phenols are strong antioxidants which prevent oxidative damage to biomolecules such as deoxyribonucleic acid (DNA), lipid and proteins (Omoikhoje *et al*., 2018). Phenols can be used in reduction of risk for infection in minor skin irritations, kills germs; effective at relieving of itching, constituents of lotion for the relief of insect bites and sun burn (Srividya *et al*., 2017).

The concentration of chloride is higher which play a vital roles in maintaining the osmotic balance of fish i.e. osmoregulation (Hiroi *et al* 2012), acid base balance, effective fish functioning, proper nervous system functioning and detoxification process (Deane *et al* 2004), which goes in contrarily with the report of (Ismaila *et al* 2021; Khendeson *et al* 2018). Calcium ion and magnesium fall on the same range and they are known as essential elements required by organisms for various physiological processes, sodium, nitrates and fluorides are non-essential element but they are required in the

body in a minute quantity as they play a role in bone and scale formation, osmoregulation and eutrophication process. The results go in contrarily with the record of (Olapade *et al* 2018).

Conclusion

The study revealed that *S. occidentalis* leaf is a good source of food additives for fishes and human. The proximate analyses show that *S. occidentalis* is a good source of carbohydrates and proteins. Flavonoid (2.18±0.82 mg/g) was high among the phytochemicals of the S*. occidentalis* leaf, phenolic compounds, alkaloid and saponin. *S. occidentalis* leaf was found to contain Chloride, calcium ion, sodium, nitrate, potassium, phosphate and nitrite that falls within normal range.

Recommendations

With the foregoing properties mentioned, *Senna occidentalis* will be a very good ingredient, having pharmaceutical active ingredients and also nutritional value and it can be added into a feed ingredient for both fish and other domestic animals.

REFERENCES

Abdulkadir A G, Danja A B, Abdu Z, Alfazazi A (2018). Phytochemical Screening, Proximate and Elemental Analyses of *Senna siamea* (Lam.) leaves from Kashere metropolis of Gombe State, Nigeria. *International Research Journal of Chemistry and Chemical Sciences, 5(1): 082-085.*

Adamu, K. M. (2014).Selected Growth and Biochemical Parameters of Hybrid Catfish Fed Pumpkin Leaf and Parboiled Fermented African Locust Bean as Protein Source, *Lapai Journal of Science and Technology, 2(1): 177.*

Adefisan, I. O., Ebuehi, O. A. T. and Odesanmi, O. S. (2020). Proximate, mineral composition and phytochemical screening of aqueous leaf extract of *Alafia barteri* oliv. (apocynaceae) *international journal of biochemistry research and review,* 29(9): 108-112.

Ahmed Jibrin Uttu, Zakariya Ballama Maimalari and Musa Maryam Usman (2021). Proximate composition, mineral content and antinutritional factors of leaves OF *Senna occidentalis*(Linn). Africa. Journal of Pharmaceutical Research & Development. 13(2): 127-132.

Aja P. M., Aloke C., Udeh Sylvester M C., Orinya O F., Alume U., Edwin N and Ugwu Okechukwu P C. (2017a). Mineral and proximate composition of *Senna occidentalis* leaves. *International of Biology Pharmacy and Allied Sciences*. 6(2): 363-374

Aja P. M., UgwuOkechukwu P. C., Keke Kennedy, Ibere J. B. and Ekpono E. U. (2017b). Phytochemical analysis of *Senna occidentailis* leaves. *International Digital Organization for Scientific Research*. 2(**1**):75-91.

Aja P.M., Onuoha Maxwell Chijioke, Okohu M.O., Ibere J.B and UgwuOkechukwu P.C (2017c*)*. Mineral and proximate composition of *Senna occidentalis Leaves. IDOSR Journal of applied science 2(1) 59 – 74.*

AOAC (1995). Official methods of analysis 7th edition, the association of official analytical chemistry, Washington DC, USA.

AOAC (2005).Official method of analysis.16th Edition .Association of Official Analytical Chemists, Washington DC., USA, p. 200-210.

Carson C. F. and Riley T. V. (2003). Non antibiotic therapies for infectious diseases. *Communication Diseases Intelligence*. 27: S143-146 .

Harborne Z. B. (1973). Phytochemical method. A guide to modern techniques of plant analysis. *Champraan and Hall Press*, London, 11973; 95-280.

Hiroi J. and Mccormick S. D. (2012). New insight into gill ionocyte and ion transporter function in euryhaline and diadromous fish. *Respiratory physiology and Neurobiology*. 184: 257-268 .

Ismaila Y. Sudi, Denban M. Ksgbiya, Emmanuel K. Muluh, Augustine Clement (2011). Nutritional and phytochemical screening of *Senna obtusifolia* indigenous to Mubi, Nigeria. *Advances in Applied Science Research, 2 (3): 432-437.*

Mohammed Saleh AbdeAlsiede, M. S., Malik A. Abddrahman, and Ahamed E. M. Saeed (2015). Nutritional composition and fatty acids analysis of *Senna singueana* leaves and seeds. *American Journal of Science and Technology*. 2(6): 270-273.

Musa, D. D., Bashir, K. A., and Hassan, K. Y. (2018). Phytochemical screening and antibacterial activity of leaves extract of *Senna occidentalis* (*L.*). *Fudma Journal of Sciences*. *2*(1):2616 – 1370.

Obadomi DO and Ochuko PO (2001). Phytochemical studies and comparative efficacy of crude extract of some homestatic in Edo and Delta states of Nigeria. *Global Journal of Pure and Applied Science*. 8: 203 – 208.

Ogbuewu, I. P. ; Uchegbu, M. C. ; Okoli, I. C. ; Iloeje, M. U., 2010. Toxicological effects of leaf meal of ethnomedicinal plant - neem - on serum biochemistry of crossbred New Zealand white typed rabbit bucks. *Report and Opinion*. 2 (2): 54-57.

Olapade Abiodun Adekunle, Ajayi Oreofeoluwatomi Adedamola & Olaniyi Musbau Bayonle (2018). Proximate, phytochemical and mineral compositions of roasted seeds of coffee senna (*Senna occidentalis Linn*). Annals. Food Science and Technology. 51 -56 .

Omoikhoje, S. O., Eguaoje S. A., Ekpenisi F., Osayande E., & Edonije J. (2023). Proximate, mineral and pytochemical screening of ethanolic leaf extract of *Senna occidentalis* as phytobiotic additive in poultry rations. Sustainability, Agricultural, Food and Environmental Research. 11(**X**): http://dx.doi.org/ 10.7770/safer-V11N1-art2310 .

Omoikhoje, S.O, Uwaya, J.I, Adamu, I.A. and Idahor, E.F. (2019). Impact of Aqueous Leaf Extract of Coffee Weed (*Senna occidentalis*) on The Blood Profile of Broiler Chickens. *ASUU Journal of Science*. 6(1 & 2); 52 – 67.

Sofowora A. (1993). Medicinal Plants and Traditional Medicine in Africa *(2nd Ed.). Spectrum Books Ltd, Ibadan, Nigeria.* 191-289.

Trease G. E., Evans W. C. (1989). Pharmacognosy. Macmillian publishers, Tiridal. 1989; 11 20.

Ujah I. I., Onyishi C. K. and Onovo O. E. (2022). Photochemical and vitamin constituents of *Senna occidentalis* Linn (Uaki Mma). *GSC Advance Research and Reviews*. 11(01): 011 – 020.