

## Phytochemical Constituents and Proximate Composition of *Nephrolepis cordifolia* (L) C. PRESL grown in Nigeria

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**Abstract:** Phytochemical and proximate analyses of the matured leaflets of *Nephrolepis cordifolia* (L) C. Presl were carried out using standard methods. The results of the phytochemical screening showed the presence of tannin (11.50mg/100g), alkaloids (9.06mg/100g), flavonoids (16.53mg/100g), phenols (8.33mg/100g), saponin (1.20mg/100g) and glycosides (5.44mg/100g). Terpenes were however absent. The distribution of these secondary metabolites in the matured leaflets of *N. cordifolia* suggests their relevance in ethnomedicine and clinical research. Results of the proximate analysis showed that the matured leaflets of *N. cordifolia* contained moisture (86.58%), crude protein (0.78%), fat (0.34%), ash (2.50%), fibre (4.36%) and carbohydrate (7.79%). This suggests that the matured leaflets can be a source of nutrients especially for the ruminants when supplemented.

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**Keywords:** *Nephrolepis cordifolia*, phytochemical screening, proximate composition

### Introduction

In recent years, there has been a gradual revival of interest in the use of medicinal plants in developing countries because herbal medicines have been reported safe and without any adverse side effect especially when compared with synthetic drugs. Thus, a search for new drugs with better and cheaper substitutes from plant origin is a natural choice. Edeoga *et al.* (2005) reported that the medicinal value of these plants lie in some chemical substances that produce a definite physiological action on the human body. Plants are endowed with various phytochemical molecules such as terpenoids, phenolic acids, lignins, stilbenes, tannins, flavonoids, quinines, alkaloid and other metabolites which are rich in antioxidant activity (Zheng and Wang, 2001). Studies have shown that many of these antioxidant compounds possess anti-inflammatory, anticarcinogenic, antibacterial and antiviral activities (Sala *et al.*, 2002). In recent years, secondary plant metabolites (phytochemicals) previously with unknown pharmacological activities have been extensively investigated as a source of medical agents (Krishnaraju *et al.*, 2005)

*Nephrolepis cordifolia* is a fern native to northern Australia and Asia. It has many common names including erect sword fern, narrow sword fern and ladder fern and fishbone fern. It belongs to the family Nephrolepidiaceae. The tufts have finely-toothed sword-shaped fronds which rise from short, erect, hairy leaf stems. It grows to 2-3 feet tall usually as epiphytes on palm trees. The tubers of *N. cordifolia* are eaten raw/roasted by children in Nepal as their favorite wild snack. In India, young leaves are cooked as vegetables. Decoctions of fresh fronds have been

used to treat fever. It is also used to treat cough and skin diseases in India. The rhizomes are used for rheumatism, chest congestion and anorexia. The pinnae are used for coughs, wounds and treatment of jaundice. In Tamilnadu, the tuber extract is taken for stomach upsets and urinary problems. In India, local women use extract of the rhizome once during the menstrual period to cause permanent sterility. Studies have shown that extracts of *N.cordifolia* possess antibacterial and antifungal potentials (Rani *et al.*, 2010). Nutrient analysis of *N.cordifolia* has also revealed that the plant is a potential commercial crop (Guachan *et al.*, 2008). The rhizome juice of this plant has also proved to have diuretic potentials (Rajasekharah and Sivakumar, 2009).

In this study, a preliminary work was done on the matured leaflets of *Nephrolepis cordifolia* with respect to their proximate composition and phytochemical constituents.

### Materials and Methods

The plant was obtained from Agric Road, Ajilosun, Ado Ekiti, Ekiti State, Nigeria and was identified at the Herbarium section of the Department of Plant Science, Ekiti State University, Ado Ekiti, Nigeria. Matured leaflets were air dried for six weeks and ground into powder using a blender.

Proximate analysis was carried out on the dried sample according to the procedure of Association of Official Analytical Chemist (A.O.A.C., 1990). This constitutes the class of food present in samples such as carbohydrate, protein, fat, fiber, ash content and moisture content.

Phytochemical screening procedures carried out were adopted from the previous work on plant analysis (Odebisi and Sofowora, 1979). The analysis determines the biologically active non-nutritive compounds that contribute to the flavor, colour and other characteristics of plant parts. Examples of these are alkaloids, tannins, glycosides, phenolics, steroids, saponins, flavonoids, phlobatannins and hydroxyanthraquinones. The quantities of some of these phytochemicals were also determined in the plant.

### Results

The results of the qualitative phytochemical screening of *N. cordifolia* leaflets (Table 1) indicated the presence of alkaloids, flavonoids, tannins,

saponins, phenols and glycosides. Terpenes were absent in the sample analyzed. The amounts of phytochemicals in the leaflets of *N. cordifolia* were also determined quantitatively (Table 2) and the results revealed that they contained 16.53mg/100g of flavonoids, 9.06mg/100g of alkaloids, 11.50mg/100g of tannins, 8.33mg/100g of phenols, 1.20mg/100g of saponins and 5.44mg/100g of glycosides. Flavonoids had the highest value (16.53mg/100g) followed by tannins (11.50mg/100g) and alkaloids (9.06mg/100g). The result of the proximate analyses of *N. cordifolia* is presented in Table 3. The results showed that *N. cordifolia* contained 7.79% carbohydrate, 0.78% crude protein, 0.34% crude fat, 86.58% moisture content, 2.50% ash content and 4.36% crude fiber.

**Table 1: Qualitative phytochemical screening of *Nephrolepis cordifolia***

Constituent	Occurrence
Tannin	+
Alkaloid	+
Flavonoid	+
Phenols	+
Saponin	+
Glycosides	+
Terpenes	-

+ = Present, - = Absent

**Table 2: Quantitative phytochemical screening of *Nephrolepis cordifolia***

Constituent	Quantity (mg/100g)
Tannin	11.50 ± 0.11
Alkaloid	9.06 ± 0.11
Flavonoid	16.53 ± 0.12
Phenols	8.33 ± 0.01
Saponin	1.20 ± 0.12
Glycosides	5.44 ± 0.01
Terpenes	0.00 ± 0.00

Values = means ± standard deviation of triplicate determinations

**Table 3: Proximate composition of *Nephrolepis cordifolia* (%DM)**

Nutrient	Composition
Moisture	86.58 ± 0.12
Crude protein	0.78 ± 0.11
Fat	0.34 ± 0.11
Ash	2.50 ± 0.12
Fibre	4.36 ± 0.11
Carbohydrate	7.79 ± 0.12

Values = Means ± standard deviation of triplicate determinations

### Discussion

The results of the present study revealed the presence of certain phytochemicals in *N. cordifolia* which is in agreement with the reports in *Marsilea quadrifolia* (Pepsi *et al.*, 2012) and five species of

*Pteris* (Herins *et al.*, 2013). The result also compares favorably with that of Oloyede *et al.* (2014) who worked on the phytochemical screening of five species of *Nephrolepis*. The result of the quantitative analyses of the phytochemicals in this study is in

accordance with the earlier findings of Herins *et al.* (2013) who reported that flavonoids contents were highest (11.25 – 17.55mg/100g) in all the five *Pteris* species investigated, followed by alkaloids (9.50 – 16.40mg/100g). However, the alkaloid content quantified in this study (9.06mg/100g) was lower when compared with the values obtained for *Pteris vittata* (12.10mg/100g) and *Pteris biaurita* (16.40mg/100g) but compared favourably with *Pteris confusa* (10mg/100g) and *Pteris multiamrita* (9.50mg/100g) (Herins *et al.* 2013). Alkaloids, the most acclaimed pharmacologically active of all the phytochemicals are found to have actions in promotion of diuresis, respiratory system and malignant infections (Trease and Evans, 1989). Pure isolated alkaloids and their synthetic derivatives are important basic medicinal agents for their analgesic effect and bactericidal properties. Flavonoids carry out various biological functions. Various studies have recognized flavonoids for their antioxidant, anti-inflammatory properties (Alan and Miller, 1996; Okwu, 2004). Tannins are known to possess general antimicrobial and antioxidant activities (Riviee *et al.*, 2009). At low concentration, tannin can inhibit the growth of microorganisms and act as antifungal agent at higher concentration (Adekunle and Ikumapayi, 2006). Saponins have been reported to possess both beneficial and harmful properties (Price *et al.*, 1987). The value of saponins recorded in *N. cordifolia* in this study was low compared to the other phytochemicals. The result obtained was higher than 0.06mg/100g reported for *M. quadrifolia* (Pepsi *et al.*, 2012). Studies have revealed the beneficial effects of saponins on reduction of the uptake of certain nutrients including glucose and cholesterol at the gut through physico-chemical interaction (FAO/WHO/UNU, 1990). They are also used for the treatment of viral diseases (Zhaljazkov, 2008). The quantity of phenol (8.33mg/100g) obtained in this study is low when compared to 60.2mg/100g reported by Pepsi *et al.* (2012) in *M. quadrifolia*. Phenols are strong antioxidants and play a role in chronic diseases such as cancer and cardiovascular diseases. Hollman (2001) reported that phenols may interfere with various stages of the cancer process, thereby resulting in a reduction of cancer risk. Cardiac glycosides are useful in the treatment of failing heart disorders. It acts on the heart muscle and increase renal flow (Sale and Maji, 2006).

The results of the proximate analyses observed in this study are different from what was previously reported for *N. cordifolia* by Guachan *et al.* (2008).

From the above results, it was shown that *N. cordifolia* is rich in bioactive compounds and also contained appreciable amounts of nutrients such as protein, carbohydrates and crude fibre that determine

antimicrobial activity, physiological activity as well as nutritional value of the fern.

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