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Proximate analysis and Phytochemical Screening of *Clitoria ternatea* in sudan

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Abstract

Many plants in tropical belts have not been discovered not detected for their chemical constituents, biological activities or pharmacological characteristics.

Objective: The objective of this study focuses on the proximate analysis and phytochemical screening of *Clitoria ternatea* (*C. ternatea*), which is well known as a butterfly pea belonging to the family fabaceae.

Methodology: The methods of proximate analysis such as moisture content, total ash, crude protein, oil content, fiber and carbohydrate of leaves, flowers and seeds *C. ternatea* were determined according to AOAC methods and the phytochemical components analyzed were, phenolic compounds, steroids and/or triterpenes, alkaloids, flavonoids, and saponins, phytochemical analyses to test for the presence or absence of various phytoconstituents.

Results: The results showed seeds, leaves and flowers of *C. ternatea* the highest moisture content, ash, protein and oil content, in seeds (4.67, 38.88, 26.11, and 1.16% respectively), while the highest carbohydrate (87.66%) showed in flowers. Phytochemical analyses to test of *C. ternatea* high content of phenolic compounds in flowers, present flavonoids in all parts of plant and alkaloids showed in seeds and flowers, while saponins just in leaves, steroidss and triterpenes absent in all parts plant

. **Conclusions:** The results obtained showed was a good source of fodder and therapeutic.
Keywords : Proximate analysis; phytochemical screening; *Clitoria ternatea*; flowers; phenolic compounds.

1.Introduction

Clitoria ternatea (butterfly pea), belonging to the family fabaceae is a perennial leguminous twiner (Pulok, 2002; Rose *et al.*, 2023). It is also known as clitoria, blue-pea, kordofan pea (Sudan), and cunha (Brazil or pokindong (Philippines) (Parimaladevi *et al.*, 2003; Gupta, *et al.*,2010). The genus Clitoria encompasses approximately 60 species, most of which are predominantly distributed within tropical regions. However, a small number of species are also found in temperate zones. Among these, *Clitoria ternatea* is the species most frequently documented (Agarwal *et al.*, 2007). It used in treatment of digestive system, the drug shankhapushpi used as nerve tonic and skin disease at the same time different part can use as edible food products in Thailand, Malaysia, and Philippines (Pulok, 2002). In addition, the seeds containing an unique sequence of amino acids in the nucleo protein with its similar to insulin, but they do not contain cysteine, histidine, proline, and threonine. Mean while other secondary constituents were founded in clatoria but pentacyclic triperpenoids were the major constituents (Banerjee and Chakravarti,1964; Gupta *et al.*, 2010). Like seeds contain flavonol glycosides and cinnamic acid whereas leaves contains glycosides of kaempferol (Solanki and Jain, 2010).

The petals of flowers contains the main classes of phyto-chemical substances such as skaempferol, flavonol glucosides, and alkaloids such as myricetin, and quercetin. Triterpenoids, phenolic compounds such as (phenols and flavonoids), antho-cyanins, and saponins that share to the tea's medicinal proprieties of tea (Gomez, 2003). *C. ternatea* is a good source of secondary metabolites components which have pharmacological properties. In addition to it's advantages to the plant defenses' contains antifungal proteins that are homologous (ct-AMP1full expression). Furthermore, this plant is advantageous to the environment by nitrogen fixation which is used to improve soil (Thevissen *et al.*, 2000). In this study evaluation the proximate analysis and phytochemical screening of *C. ternatea.*

2. Material and Methods

2.1 Chemicals and reagents

All the chemicals, solvents and reagents used in this study were of analytical grade or equivalent.

2.2 Plant material

Fresh *C. ternatea* was collected from the Abu-Naama area, Sinnar State, Sudan (12.83^0N, 33.95^0E) and sorted according to different parts seeds, leaves, and flowers. The plant species was taxonomically identified by Dr.Mubarak Siddig, Department of Taxonomy and Phytochemistry, Medicinal, Aromatic and Tradition Medicine, Research Institute, National Center for Research, Khartoum, Sudan. The plant parts were dried at room temperature for one week, to prevent the loss of volatile constituents, after which, they were grounded in a laboratory grinding mill (Model ED-5) for further analysis in Figure 1.



Figure1. A *Clitoria ternatea.,* (seeds, leaves and flowers).

2.3 Preparation of extracts

Separately, 20 g from seeds, leaves and flowers of *C. ternatea* were extracted consecutively by ethanol (100 mL), using a shaker apparatus for about 24 h at room temperature, filtered, and then solvents were evaporated under vacuum using a rotary evaporator. The resultant dry extracts from each sample were weighted and stored at 4°C until used (Haifa *et al.,* 2024).

2.4 Proximate analysis

Proximate analysis was performed according to the method stipulated by the Official Agricultural Chemists (AOAC) International(1990). Six parameters were determined including moisture, ash, fat, protein content, fiber and carbohydrate content.

2.5 Phytochemical screening

The flowers were screened for the presence of flavonoids, saponins and steroids and/or triterpens were carried according to (Harborne,1998). Tannins and alkaloids and/or nitrogen bases were tested according to (Balbaa,1974).

2.6 Statistical analysis

The procedures for proximate analysis repeated in triplicate. The descriptive analysis mean was used to discuss the results.

3. Result and discussion

3.1 Results

All plant parts (seeds, flowers and leaves) were used a long time. The results of the proximate analysis of the *C. ternatea* parts are presented in Table 1. The clitoria seeds leaves and flowers contained moisture as (4.67, 3.81 and 3.76% respectively), ash (38.88, 0.83 and 0.59% respectively), protein (26.11, 8.53 and 7.60%respectively), oil content (1.16, 0.36 and 0.26%respectively), crude fiber as (6.26, 0.91 and 0.15% respectively) and carbohydrate as (22.9, 85.58 and 87.66% respectively). The phytochemical analyses to test of *C. ternatea.,* high content of phenolic compounds in flowers, present flavonoids in all parts of plant and alkaloids showed in seeds and flowers, while saponins just in leaves, steroids and triterpenes absent in all parts plant in Table 2.

Table 1. Approximately analysis of tested *Clitoria ternatea.,*

Approximate (%)	Seeds	Leaves	Flowers
Moisture	4.67	3.81	3.76
Ash	38.88	0.83	0.59
Protein	26.11	8.53	7.60
Oil content	1.16	0.36	0.26
Fiber	6.26	0.91	0.15
Carbohydrate	22.9	85.58	87.66

Table 2. Qualitative analysis of secondary metabolites in *Clitoria ternatea*.,

Tests	Seeds	Leaves	Flowers
Phenolic compound	-	+	+++
Steroids and / or Triterpens	-	-	-
Alkaloids	+	-	+
Flavonoids	+	+	+
Saponins	-	+	-

Key : + = present ; - = Absent.

3.2 Discussion

The results showed seeds, leaves and flowers of *C. ternatea* the highest moisture content, ash, protein and oil content, in seeds (4.67, 38.88, 26.11, and 1.16% respectively), while the highest carbohydrate (87.66%) showed in flowers in Table 1. The findings of this study align with those reported by Deshmukh and Jadhav (2014) regarding moisture content. Kavitha and Premalakshmi (2013) observed a moisture content of 11.52% on a dry weight basis in *C. ternatea* leaf samples. Similarly, Taur *et al.* (2010) documented a moisture content of 12.5% in dried powdered *C. ternatea* leaf samples, while Jain and Shukla (2011) reported 5.92% moisture content in the stem of *C. ternatea* on a dry weight basis. The high levels of carbohydrates and proteins found in the leaves and flowers support the use of this plant as a popular animal feed. According to Ujowundu *et al.* (2010), the ash content in *C. ternatea* leaves and seeds was recorded as 6.90% and 7.50%, respectively, while the crude fiber content in the leaves and seeds was 11.70% and 8.10%, respectively. Akinlade *et al.* (2007) found crude protein levels of 26.95% in the leaves and 48.30% in the seeds of *C. ternatea.* The Clitoria seeds were revealed carbohydrates (36.69%) by (Uma, 2009).

The plant is a rich source of secondary metabolites products, with high content of phenolic compounds in flowers in Table 2. A similar investigation into the phyto-constituents of the flowers, being a significant part of the plant, are rich in phenolic acids, flavonoids, anthocyanins, and various other phenolic compounds, serving as natural antioxidants (Youwei *et al.*, 2008), and the roots has revealed the presence of terpenes, alkaloids, flavonoids, saponins, tannins, carbohydrates, proteins, resins, starch, taraxerol, and taraxerone, as reported by Uma *et al.* (2009). Provide study have consistently shown that the *C. ternatea* plant contains tannins, phlobatannins, carbohydrates, saponins, triterpenoids, phenols, flavonoids, flavonol glycosides, proteins, alkaloids, and steroids (Madhu, 2013), with flavonoids and other phenolic compounds identified as its primary natural constituents (Johnson, 2001). Additionally, a wide range of secondary metabolites such as flavonol glycosides, triterpenoids, anthocyanins, and steroids has been detected in *Clitoria ternatea* L., (Mukherjee *et al.*, 2008).

1. Conclusion

The proximate analysis, it is quite interesting in that has more ash content, crude fiber, and also the presence of higher content, protein content would make them good protein supplements to poor quality roughages especially during the dry season. *Clitoria ternatea* a rich source of secondary metabolite products, the main phyto-constituents found is the flavonoids in most tested parts.

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