

## Potential of *Thaumatococcus danielli* in Animal Nutrition

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**Abstract:** This study investigates the potential effect of *Thaumatococcus danielli* in animal nutrition. Proximate analysis and phytochemical studies of *T. danielli* of leaves and roots was carried out. Protein contents were analyzed by (Kjeldhal method), carbohydrate (Anthon method), moisture (Oven method) and lipid (soxhlet extraction). Results revealed that the leaves and roots of estimated protein was [14.88(± 0.18g)/7.00(±0.12g)], carbohydrate [31.25(±0.52g)/18.75(±0.37)], fibre [36.61(±0.18g)/48.98(±0.32)], moisture [5.16(0.26g)/17.27(0.09)], lipid [0.90(±0.02g)/1.80(± 0.06)] and ash [10.60(± 0.19g)/17.27±(0.22g )]. It is apparent from this study that *T. danielli* is a suitable replacement for cereal grains and therefore must be encouraged if the increasing demand for animal protein must be sustained in Nigeria especially in this period of economic recession.

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**Keywords:** *Thaumatococcus danielli*, animal nutrition, economic recession, Nigeria, cereal.

### 1. Introduction

Plants as protein source for animal offer a good scope to meet the increasing protein requirements at large, particularly in a recessive economy as we are presently experiencing in Nigeria. However, before such indigenous foodstuffs can be recommended, their nutritional properties and biochemical value should be thoroughly investigated (Raimi *et al.*, 2011). One of the many underutilized plants in Nigeria is *Thaumatococcus danielli*, a non sacchariferous sweet plant which is common throughout the West African rain forest zone.

In Nigeria, the plant grows predominantly in the cocoa growing areas of the south west, where it is called “Ewen Eran” or “Adundunmitan” (Elemo *et al.*, 2001). The arils of the seed contain an intensely sweet protein, thaumatin, which is about 2000-3000 times the sweetness of an 8 – 10 sucrose solution on a weight basis. Extraction of thaumatin from the arils of *Thaumatococcus danielle* leads to the generation of substantial waste, largely made up of the seed and pulp of the fruit and which constitute over 99% of the entire fruit weight (Elemo *et al.*, 1999a, 2001). Potential application of *T. danielli* waste as a raw material in livestock feed formulation was suggested in earlier reports (Elemo *et al.*, 2001).

The seed is relatively high in protein, starch and minerals especially calcium and magnesium. Preliminary toxicological studies have indicated the presence of some anti-nutrients, particularly tannis and trypsin inhibitor which could however be inactivated by simple processing methods (Elemo *et al.*, 2001). This study was therefore intended to evaluate the

potential of *Thamutain Danielli* in animal nutrition using the leaves and root (Obi *et al.*, 2008).

### 2. Materials and Methods

The *Thaumatococcus danielli* of leaves and roots used in this study were harvested from a nearby farm in Rumuokuta in Obio/Akpor Local Government Area. They were washed and allowed to dry normally before they were later oven dried. The dried leaves and roots were crushed to powder and passed through 0.05mm pore sized sieve.

An aqueous extract of the sample was prepared by soaking 100g of the powdered sample in 200ml of distilled water for 12 hours. The extracts were filtered using Whatman filter paper No. 42 O (125mm). Then, the sieved powdered sample or the aqueous extracts was used for the analyses in plant science and Biotechnology laboratory in University of Port Harcourt (UNIPORT) Choba.

The analyses done are grouped into two namely; Proximate analysis which comprises; analysis of carbohydrate, proteins, moisture, lipid, ash (Furnace Method) and phytochemical analysis; (Tannis, Saponins, Steroids, flavonoids, Alkaloids Ascorbic acid and Cardioic, Glycosides. Data collected were then compared with other research works on animal nutrition as shown on Table 1.

### 3. Results and Discussions

Domestication of animals as a food source generates energy loss due to diversion of cereal grains from humans to animals. Hence suitable replacement for cereal grains must be developed if this increasing demand for animal protein must be sustained. This

study was intended to evaluate the potential of *T. danielli* in animal nutrition.

Phytochemical studies of the leaves and roots were carried out. Proximate analysis of protein was carried out with dried root and leaf samples by KjeLDAHI method, carbohydrate (Anthrone method), moisture content (Air oven) and lipid (soxhlet method).

Results revealed that the leaves and roots of *T. danielli* can serve as a good supplement for grains based on their protein content [14.88(± 0.18g)/7.00(± 0.12g)], carbohydrate [31.25(± 0.52g)/18.75(± 0.37)], lipid [0.90 (±0.02g)/1.80(± 0.06)] Ash [ 10.60(± 0.19g)/17.27(±0.22g)], fibre [36.61 (± 0.18g)/48.98(± 0.32)] and moisture [5.16(0.26g)/17.27(0.09)] as shown in Table 1, when compare to those of other plants as shown in table 2.



**Fig. 1:** From L-R: *T. danielli* (Benn.) Benth: (a) Leaf, (b) Fruits, (c) Seeds and (d) Arils

**Table 1: Proximate composition of the leaf and root of *T. danielli* (g per 100g)**

Parameters	Leaf (g)	Root (g)
Moisture	5.16(± 0.26)	17.27(± 0.09)
Ash	10.60(± 0.19)	6.20(± 0.22)
Carbohydrate	31.25(± 0.52)	18.75(± 0.37)
Protein	14.88(± 0.18)	7.00(± 0.12)
Fibre	36.61(± 0.18)	48.98(± 0.32)
Lipid	0.90(± 0.02)	1.80(± 0.06)

Values are expressed in mean ± standard error of mean (M±SEM) n =4

**Table 2: Chemical composition of the convention forages on % dry matter basis**

Parameters	Elephant grass stem	Guinea grass stem	Pineapple top	Sugar cane growing point
Carbohydrate	25.4	22.7	19.8	24.9
Protein	6.78	5.13	4.89	5.92
Crude fibre	17.4	14.1	15.6	15.3
Ash	11.7	12.4	8.73	11.5
Ether Extract	1.93	1.90	1.86	1.09
Nitrogen free extract	36.7	43.7	49.17	41.2

**Table 3: Phytochemical analysis of the leaf of *T. danielli***

Parameters	Leaf
Tannins	+
Saponins	+
Flavonoids	+
Alkaloids	+
Cardiac Glycosides	+

**Phytochemical Screening of the root of *Thaumatococcus danielli***

Parameters	Root
Tannins	+
Saponins	+
Flavonoids	+
Alkaloids	+
Cardiac Glycosides	+

+: Present

As the demand for milk and meat increase, competition in the use of crops for human food increases world grain production, for example has declined in recent years and in consequent stock have been depleted and prices have risen to such a high level that this is becoming uneconomical to continue feeding grain to livestock as generously as in the past.

Herdsmen and farmers clashes were now a common occurrence in Nigeria due to grazing place. Thus there is more reason now than ever before particularly in period of economic recession and demand for animal protein, for human consumption is scarce; to make use of every crop plant or by product (local content) that could serve as animal feed.

Proximate composition of the leaf and root of *Thaumatococcus danielli* shows that they have obvious nutritional and medical benefits. The leaf and root have a high content of protein, phosphorus, fibre and low fats content (lipid). This indicates that they can be helpful in improving intestinal motility and prevention of intestinal disorders such as constipation, colon and rectum carcinoma (Showemimo and Olarewaju, 2004). The leaf and root are also good source of protein and fat. Phytochemical screening shows that the leaf of *Thaumatococcus danielli* contains tannins, saponins, flavonoids, alkaloids and cardiac glycosides. According to recent studies by other researchers flavonoids have antioxidant activity and reduce the risk of many diseases.

The medicinal values of plant leaves may be related to their constituent phytochemicals (Oforibika and Uwakwe, 2017; Oforibika and Ezekiel, 2017). According to De Sousa *et al.* (2007) the secondary metabolites (phytochemicals) and other chemical constituents of medicinal plants account for their medicinal value. For example, cardiac glycosides are

naturally cardiactive drugs used in the treatment of congestive heart failure and cardiac arrhythmia.

Similarly, tannins act as anticarcinogenic by reducing mutagenic activity of mutagens and play a protective role as antioxidants. In accordance to animal nutrition, nutritional requirements that have to be met in order to meet up with the standards using feeds containing plant secondary compounds and essential oils is recommended as a means for reducing rumen menthone. *Thaumatococcus danielli* was found to contain such.

They can be used as sources of energy and/or protein instead of cereals either as ingredients in concentrate mixtures or as feed supplements. Also, saponins are natural detergents found in many plants such as *Thaumatococcus Danielli* and can be used as a possible means of suppressing or eliminating protozoa in the rumen.

#### 4. Conclusions

In conclusion, there is need to sustainably produce *Thaumatococcus Danielli* in Nigeria. The leaf and root have high nutritional value and potential medicinal uses. The leaves could serve as vegetables in addition to the traditional use for wrapping processed foods. The presence of important medicinal metabolites in the leaves of *T. Danielli* shows that beside the use of these leaves as food wrappers, they are potential source of herbal ingredients that can add value to the food to promote good health for consumers. Unsaturation level of *T. Danielli* oil was low, while free fatty acids were high. The leaves can be incorporated into animal feed especially taken into cognizance the high protein and fat content. The major limitation in this study is that no feeding trials were carried out to assess the digestibility and acceptability by the wistar albino rats. Further investigation on *T. Danielli* in its entity should be exploited constructively particularly in this period of global economic recession.

#### 5. Recommendations

1. Awareness should be increased on the potential benefits of *T. Danielli* for animal nutrition and medical purposes.

2. From the result of nutritional and phytochemical analysis obtained, it is recommended that people substitute cereals for the plant as it contains mineral and nutrients including protein.

3. It can be used in beverage, confectionary and pharmaceutical industries.

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