Volume 4, 2020 ISSN: 2617-3530
DOI: https://doi.org/10.31058/j.as.2020.41002

Proximate Analysis of Some Exotic Plant Species Grown in the Tropics

Ubong Ime Udoakpan[1*], Daniel Etim Jacob[1], Kufre Edet Okon[1], Amoo Deborah Olajumoke[2], Imaobong Ufot Nelson[3]

[1] Forestry and Wildlife Department, University of Uyo, Uyo, Nigeria
[2] Ladoke Akintola University of Technology, Ogbomosho, Nigeria
[3] Biodiversity Preservation Center, Uyo, Nigeria

Email Address
ubongudoakpan@gmail.com (Ubong Ime Udoakpan)
*Correspondence: ubongudoakpan@gmail.com

Received: 12 December 2019**; Accepted:** 2 February 2020**; Published:** 15 March 2020

Abstract:
The objective of this study was to determine the nutritive contents of *Ixora coccinea, Tectona grandis* and *Duranta repens* plants. Samples of *I. coccinea, T. grandis* and *Duranta repens* were collected from the University of Uyo. The samples were cleaned with distilled water and ovendried, then grind to fine powder for proximate analysis. The crude protein content, crude fiber content, moisture content, and ash contents of the samples were determined according to the Association of Official Analytical Chemists methods. The results indicated that crude protein, crude fiber, moisture and ash contents were significant ($p < 0.05$). *I. coccinea, T. grandis* and *D. repens* have some dietary contents which may be beneficial to animal health.

Keywords:
Forage Species, Proximate Analysis, Duranta Repens, Tectonal Grandis and Ixora Coccinea

1. Introduction

Protein, carbohydrates, and fats are necessary elements of life [1]. These elements could be obtained from plant extracts and had prompted a lot of researches to be carried out on several plant species while a great number of them are still unexplored. The studies on plants explore among other things their nutritive contents [2] in order to estimate the nutritive value of forages available to grazing animals. However, some factors such as plant species, rainfall, and season of growth, soil fertility, temperature, weathering patterns of plant material and grazing intensities have been reported to affect the chemical composition of these forage plants [3,4]. Balanced diet is essential for normal physiological functions of ruminant animals [5]. According to [6] when animals are fed with balanced diets, their productivity is enhanced and they will be better equipped to fight diseases as a result of the improvement in their immune system.

Forage species still serve as a major source of essential elements for grazing animals in the tropics. However, there is inadequate information available on the

nutritional status of *Ixora coccinea, Tectona grandis* and *Duranta repens* on which animals subsist. Considering the importance of these plants in the provision of daily nutritional requirements for livestock, their proximate analyses have to be evaluated. The objective of the work was to determine the chemical compositions of *I. coccinae*, *T. grandis* and *D. repens* plants.

2. Materials and Methods

2.1. Study Area

The study was conducted in the Department of Forestry and Wildlife Arboretum, (4°351 and 5°351N and 7°351 and 8°251E), University of Uyo, Akwa Ibom State.

2.2. Sample Collection

Samples of *Ixora coccinea, Tectona grandis* and *Duranta repens* were collected from the ornamental plants of the Annex campus of the University of Uyo. The samples were washed with distilled water to remove impurities and dust particles and then followed by oven-drying at 65 ˚C to reduce the moisture content.The oven-dried samples were chipped and grinded into fine powder and kept in air-tight plastic containers for proximate analysis as described by [1].

2.3. Chemical Analysis

Crude protein, moisture content, ash content and crude fiber content were determined according to the methods described by the Association of Official Analytical Chemists [7].

2.3.1. Crude Protein Content

Crude protein content of the samples was determined according to macro-Kjeldahl method. The digested samples were distilled after the addition of alkali. The released ammonia was collected in 4% boric acid. Boric acid along with ammonia was titrated against 0.1 NH_4Cl and by multiplying with 6.25% of nitrogen was converted into protein.

2.3.2. Moisture Content

A crucible was oven-dried at 105 ˚C for 2 h. After oven-drying , the crucible was placed in a desiccator to cool. The crucible was weighed and 2 g of the powder was placed in the crucible. The sample was oven-dried at 100 ˚C for 3 to 4 hour and then weighed to determine the percentage of dry weight and the percentage of moisture content.

2.3.3. Ash Content

Ash content was performed as described in moisture content. 2g of sample was put into crucible, the weight recorded and placed in muffle oven at 550 ˚C for 8 hour.

2.3.4. Crude Fiber Content

Two grams of sample was put into 250 ml conical flask and 1.25% sulfuric acid solution was added. The sample was heated for 30 minutes, filtered and then washed until traces of acid could not be detected using pH paper. The acid extracted was transferred into 250 ml conical flask and 1.25% NaOH solution was added. The

samples were heated for 30 minutes, filtered and the washed. The samples were transferred into crucible and oven-dried at 120˚C for 12 hour. After that the crucible was placed into muffle oven at 550˚C for 12 hour and weight of crucible recorded.

2.4. Statistical Analysis

Analysis of variance (ANOVA) were performed using SPSS Software version 15 and significant mean values were separated by least significant difference (LSD) at 0.05 level of probability.

3. Results and Discussion

3.1. Crude Protein (CP)

The CP content of *I. coccinae*, *T. grandis* and *D. repens* ranged from 9.45% to 16.98% (Figure 1). The lowest mean CP content (9.63%) was found in *I. coccinea* and the highest CP content (16.74%) was obtained in *D. repens*. The CP content showed significant ($P < 0.01$) variation among all species (Table 1). These forage plants possesses a CP content higher than those reported for mature, dried foliage and stems of grasses, which are usually low in protein (less than 3% CP) and are variably leached of soluble components, including minerals, proteins, sugar and starchy carbohydrates [8]. As observed from the results, the CP contents of *I. coccinae*, *T. grandis* and *D. repens* plants are above the critical value of 7.0% as reported by [9]. This result agrees with the results of [3,6]. They further reported high CP contents in different forage plant species in Nigeria. CP is essential in the growth and reproduction of animal, as it is the basic structural material from which all body tissues are formed [3]. The CP contents in the studied forage species, were higher than both the recommended 5% CP by the National Research Council (NRC) which is the daily protein needs for preservation for ewes that weigh approximately 50 kg [10] and the 7% minimum CP content required for optimum rumen function [6,11].

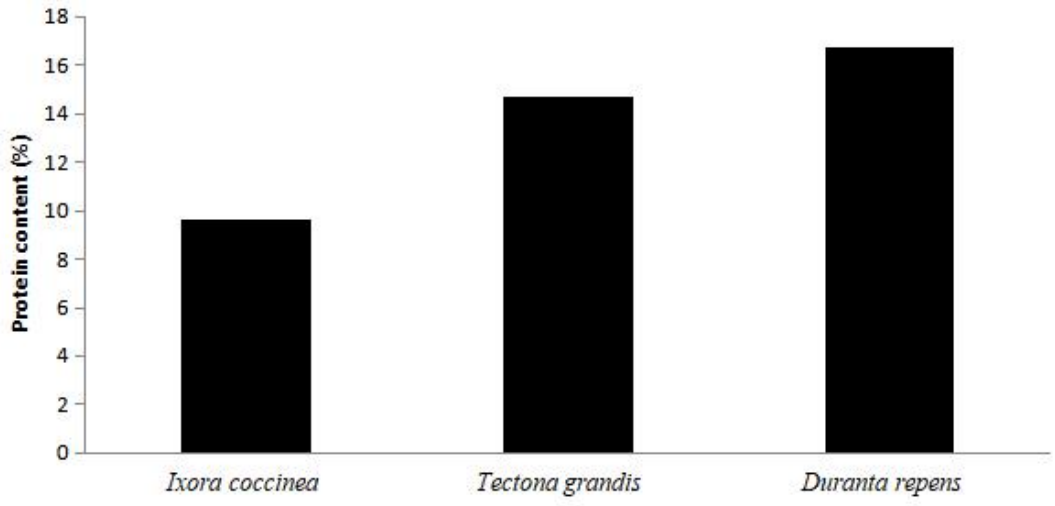

Figure 1. *Protein content in Ixora coccinea, Tectona grandis and Duranta repens plant spcies.*

Table 1. *Proximate composition of Ixora coccinea, Tectona grandis and Duranta repens plant.*

Variables (%)	*Ixora coccinea*	*Tectona grandis*	*Duranta repens*	Significant level
Crude protein (CP)	9.63±0.03**a**	14.7±0.12**b**	16.7±0.07**c**	***
Moisture content (MC)	63.29±0.02**a**	66.92±0.01**b**	73.858±0.01**c**	***

Ash content	3.62±0.03**a**	2.39±0.02**b**	4.58±0.02**c**	***
Crude fiber (CF)	8.80±0.01**a**	6.40±0.02**b**	10.74±0.01**c**	***

*** = *Significant at 1% probability level*

3.2. Moisture Content

Moisture content of *I. coccinae*, *T. grandis* and *D. repens* is indicated in Figure 2. The results showed that *D. repens* had the highest moisture content (73.85%), followed by *T. grandis* (66.92%), while *I. coccinae*, had the least moisture content (63.29%). Table 1 showed that there was significant differences ($P < 0.051$) in moisture content among *I. coccinae*, *T. grandis* and *D. repens* . The moisture content obtained in this work is higher than the moisture content obtained by [13] in their work. The variations in moisture content could be attributed to a wide range of factors such as regions where the plants are cultivated, growth conditions, nature of soil, seasonal changes, genetic make-up of the plants and storage conditions as well as the period of analysis [1,12].

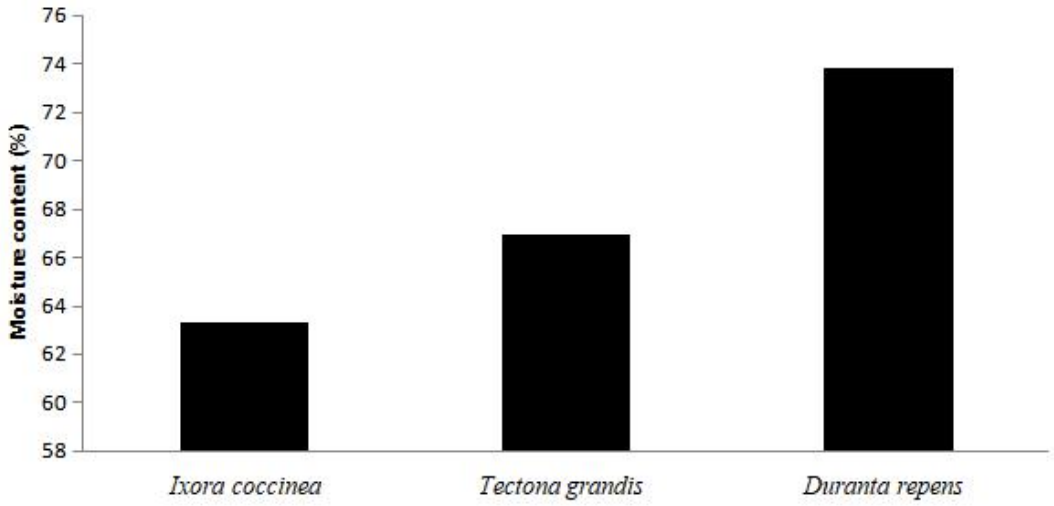

Figure 2. *Moisture content of Ixora coccinea, Tectona grandis and Duranta repens plant.*

3.3. Ash Contents

The ash content of *I. coccinae*, *T. grandis* and *D. repens* varied from 2.28% to 4.61%. The lowest ash content (2.39%) was recorded in *T. grandis and* the highest in *D. repens* (4.58%) (Figure3). Ash content varied significantly among the plants (Table 1). Generally, the ash content obtained in this study was lower in D. repens compared to the results reported by [13]. This may be due to either the site or stages of maturity of the plants. This results is in accordance with [1,14] who reported that ash contents of forage plants decline progressively with maturity of the plant. On other hand, [15] attributed high ash contents with increasing degree of maturity of plants. According to [1], the increase or decrease of ash contents in different plants species may be due to variation in soil and other habitat features that need to be explored.

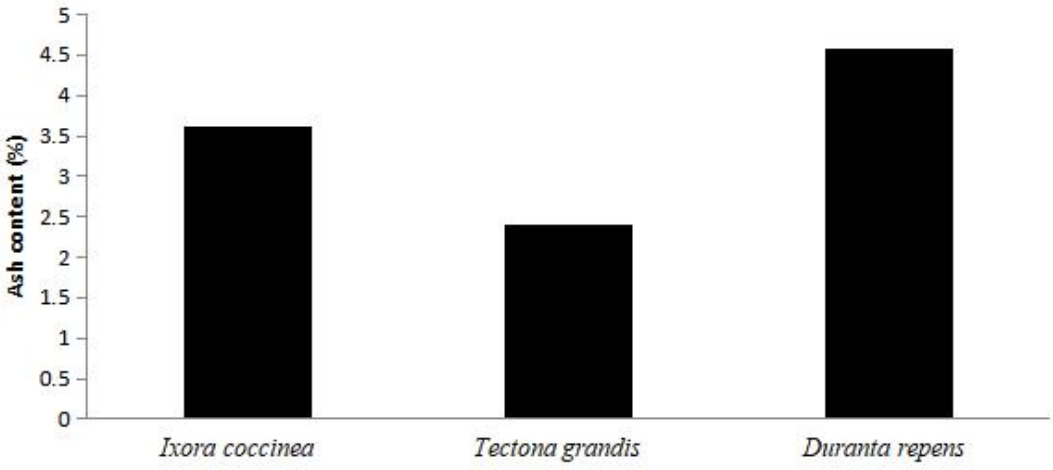

Figure 3. *Ash content of Ixora coccinea, Tectona grandis and Duranta repens plant.*

3.4. Crude Fiber

Crude fiber content differed significantly ($P < 0.05$) in *I. coccinae*, *T. grandis* and *D. repens* (Table 1). *D. repens* had the highest (10.74%) crude fibre content, followed by *I. coccinea* with 8.80% crude fiber content, while T. *grandis* had the least (6.40%) crude fiber content (Figure 4). The Crude fiber contents obtained in this present study were lower compared to crude fiber content reported by [3,6] for some other plants. [13] reported a crude fiber content of 13.63% for *D. repens* which is higher than what is obtained in this present study. The variation in crude fiber content among the various plant species could be attributed to the age of the various plants. This is in accordance with the observation by [1,3,16] who reported that as the plants became older, the crude fiber content tend to increase some plants than others. The high crude fibre content observed in *D. repens* may contribute to its anti-herbivoral nature as supported by the works of Marty and [17,18] that forage plants with high fibre contents are difficult for herbivores to chew or bite, thus have adverse effect on the efficiency of feed utilization.

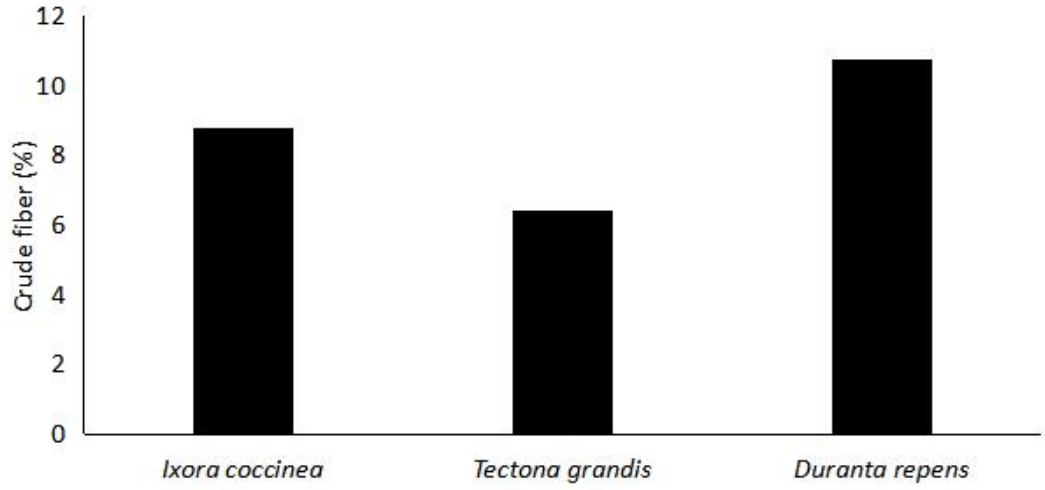

Figure 4. *Crude fiber content of Ixora coccinea, Tectona grandis and Duranta repens plant.*

4. Conclusion

The tropical rainforest of Nigeria have high diversity of trees, shrubs and herbs which serve as sources of feed for animals, hence the need to utilize some of these plant species. The study showed that there are significant variations in the crude protein content, crude fiber content, moisture content and ash content of *Ixora coccinea, Tectona grandis* and *Duranta repens* plants. The differences in the nutritional contents of these plants may be due to habitat characteristics, soil and stages of maturity. In summary *I. coccinea, T. grandis* and *D. repens* plants have some dietary contents when used in the appropriate proportions could be of remarkable benefits toanimal health.

Conflicts of Interest

The authors declare that there is no conflict of interest regarding the publication of this article.

Funding

This research received no specific grant from any funding agency in the public, commercial or not-for-profit sectors.

References

[1] Ahmed, K.; M. Shaheen, F.; Mirzaei, Z.I.; Khan, S.; Gondal, A.; Fardous, A.; Hussain, F.A.; Mehmood, T. Proximate analysis: Relative feed values of various forage plants for ruminants from semi-arid region of Punjab, Pakistan. *Agricultural Sciences,* 2013, 4, 302-308.

[2] Mushtaq, A.Q.; Rahmatullah, A.; Muhammad, A.K.; Muhammad, Z. Traditional herbal remedies used for the treatment of diabetes from district Attock (Pakistan). *Pakistan Journal of Botany*, 2009, 41, 2777-2782.

[3] Mbaya, Y.P.; Hussaini, A.S.; Shehu, A.J. Acceptance of Aerial yam (Dioscorea bulbifera L.) for food in Biu Emirate Council, Borno State, Nigeria. *Journal of Biology, Agriculture and Healthcare,* 2013, 3(10), 18-22.

[4] Eze, S.M. The effect of season on the chemical composition of some forage grasses and legumes found in Nsukka derived savannah zone of Nigeria. B. Agric project report. Department of Crop Science University of Nigeria, Nsukka. 2010; pp. 60.

[5] McDonald, P.; Edwards, R.A.; Green Halgh J.F.D.; Morgan, C.A. Animal Nutrition. 5th Edn., Longman, London, 1998; pp. 602.

[6] Onyeonagu, C.C.; Eze, S.M. Proximate compositions of some forage grasses and legumes as influenced by season of harvest. *African J. Agric. Res*. 2013, 8, 4033-4037.

[7] AOAC. Official Methods of Analysis. 15th Edition. Association of Official Analytical Chemists, Washington DC, 1990.

[8] FAO. Protein Sources for the Animal Feed Industry. Proceedings Expert Consultation and Workshop Bangkok, 29 April - 3 May 2002, 2003. Available online: http://www.fao.org/docrep/007/y5019e/y5019e00.htm#Contents (accessed on 13 February 2019).

[9] Minson, D.J. The digestibility and voluntary intake of six varieties of Panicum. *Australian Journal of Experimental Agriculture and Animal Husbandry*, 1971, 11, 18-24.

[10] NRC. Nutrients Requirements of beef cattle (17th edition) National Academy Press, Washington D.C. USA, 1985.

[11] Van Soest, P.J. Nutritional Ecology of the Ruminant; Comstock Publishing Associates A division of Comell University press. LTTIECA and London, 1994.

[12] Imeh, U.; Khokhar, S. Distribution of conjugated and free phenols in fruits: Antioxidant activity and cultivar variations. *Journal of Agricultural and Food Chemistry,* 2002, 50, 6301-6306.

[13] Johnson, E. Anwanabasi Udoh, Emmanuel Etim, Emmanuel Attih and Imoiboho Williams. Phytochemical Studies, Proximate and Mineral Composition of Ethanol Leaf Extract of *Duranta repens* Linn (Verbenaceae). *Research Journal of Phytochemistry,* 2018, 12, 1-6.

[14] Kilcher, M.R. Plant development, stage of maturity and nutrient composition. *Journal of Range Management*, 1981, 34, 363-364.

[15] Liu, Y.Z. Study on the dynamic features of nutritive substances in Inner Mongolia Steppe. *Grassland of China*, 1993, 4, 16-20.

[16] Nagra, S.S.; Shingari, B.K.; Ichhponani, J.S. Feeding of guar (*Cyamopsis tetragonoloba*) meal to poultry. 1. Growth ofcommercial broiler chicks. *Ind. J Poult. Sci*. 1985, 20, 188-193.

[17] Marty, J.; Vernay, M. Absorption and metabolism of volatile fatty acids in the hind gut of the rabbit. *Brit. J. Nutr*. 1984, 51, 265-277.