Accessing the nutritional composition and phytochemical screening of *Panicum maximum* and *Newbouldia laevis* leaves

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Abstract

Ruminant livestock in most parts of the tropics graze extensively on naturally growing forages which are poor in quality. These tropical forages compared to those in the temperate, support lower levels of ruminant animal production mainly because they contain less nitrogen and are less digestible. The quality and quantity of these grasses become more critical in the dry seasons and thereby imposing more serious constraint to the development and productivity of these animals. Therefore, a study was conducted to access nutritional composition of Panicum maximum and Newbouldia laevis. Phytochemical screening of Newbouldia laevis was also carried out. Newbouldia laevis had higher crude fibre, ether extract and crude protein compared to Panicim maximum. The phytochemical screening revealed the presence of Tannin, Alkaloids, Flavonoids and Saponnin in Newbouldia laevis. The percentages of tannin, alkaloids, flavonoids and saponin in the Newbouldia laevis were 11.5, 52.07, 3.1 and 0.64, respectively while none was recorded for Panicum maximum. The relatively high crude fibre, ether extract and crude protein values for both plants s appeared satisfactory for animal production. Also, the presence of the phytochemicals in the plant showed it importance in ethno veterinary medicine and pharmacology.

Keywords: Nutritional composition, Phytochemical screening, *Panicum maximum* and *Newbouldia laevis* leaves

Introduction

The nutritive value of any feedstuff is determined by its chemical composition and degradability and this is related to the forage and its environment. The rate of acceptability of forage is related to the readiness to which the forage is selected and consumed. Leguminous forages and the foliage of multipurpose trees that are found in Africa are promising sources of protein and essential nutrients if used as a supplement to ruminants receiving low-quality forages (Devendra, 1990).

In the past, research efforts on alternative feed resources for ruminants have concentrated more on a limited number of the available plant foliages with little or no information on the nutrient status of the various other foliages in relation to their being utilized as feed for ruminants. (Bamike,*et al,* 2004)

Ruminant livestock in most parts of the tropics graze extensively on naturally growing forages which are poor in quality. These tropical forages compared to those in the temperate, support lower levels of ruminant animal production mainly because they contain less nitrogen and are

less digestible (Minson, 1980). The quality and quantity of these grasses become more critical in the dry seasons and thereby imposed more serious constraint to the development and productivity of these animals (Topps, 1992). A wide variety of plant species are found in the tropics with shrubs and trees being the most visible forms in many of these landscapes (McKell, 1980), however, information on their utilization is very scanty in literature (Kallah, *et al*., 2000).

The potential value of browse trees lies in the provision of protein, vitamins and also the mineral elements that are lacking in grassland pastures during the dry season (Bamikole, *et al,* 2004). There are many forage plants and tree species that have the ability to produce high yields of biomass, but could not be utilized for improvement of livestock production because there is dearth of information on their nutrient composition, hence, this study was carried out to access nutritional composition of *Panicum maximum* and *Newbouldia laevis*.

Materials and Method

Plant samples collection:

Panicum maximum and Newbouldia leavis leaves were harvested at the late wet season (September-November, 2011) around villages under Odeda Local Government, Abeokuta. The plants were identified at the Department of Botany, University of Lagos. The fresh samples harvested were air-dried, wilted at room temperature for 2 weeks. They were later chopped and ground into powder and bulked for analysis.

Data collection and Analysis

Proximate analysis: The estimation of the various food parameters namely moisture content, total ash, crude fat, crude fibre, crude protein and total carbohydrate on dry matter basis were carried out using 50 g of dried powdered sample. In crude protein determination, Nitrogen was determined by Kjeldahl method (Pearson, 1976) and converted to protein by multiplying by a factor of 6.25. Moisture content, crude fat, crude fibre and total ash were determined by AOAC (2000) and to determine the total carbohydrate was determined based on the difference using the formula below (James, 1995).

Total carbohydrate
= 100-[%crude protein+ %crude fat+ %crude fibre+ %crude total ash]

Phytochemical screening: Phytochemical tests on the powdered leaves of *Newbouldia leavis* and *Panicum maximum* were carried out using standard procedures as described by Harborne (1973) and enunciated by Sofowora (1993) and Evans (2002).

Result and Discussion

Table 1 presents the proximate composition of *Panicum maximum* and *Newbouldia leavis* leaf grown in southwestern part of Nigeria. Dry matter content ranged between 92.80 g/100 gDM in *Newbouldia leaf* and 97.14g /100 gDM in *Panicum maximum*. The values recorded in this study were higher than those reported by Babayemi and Odedire (2008) and Ikhimioya *et al*. (2007). However, the values were comparable to those reported by Esonu *et al*. (2006) from the leaf meal of *Azadirachta indica*. Ambient temperature, seasonal or climatic factors may be responsible for the disparity in the dry matter content (Agriculture, 2011). Crude fibre likewise varied from 30.72g/100 g DM in *Panicum maximum* to 32.46 g/100 DM in *Newbouldia laevis*. Fibre has received a great deal of research attention among animal scientists because of its

Table 1: Proximate composition (%) of *Panicum maximum* and *Newbouldia leavis* leaf.

Parameters	*Panicum maximum*	*Newbouldia leavis*
Dry matter (%)	97.14	92.80
Crude fiber (%)	30.72	32.46
Ether extract (%)	5.87	24.70
Ash (%)	8.94	8.38
Crude protein (%)	11.75	18.72
Carbohydrate	42.72	15.74

importance to the ruminant. In the ruminant, it represents the plant cell wall that is utilized as an energy source by the rumen microflora, and is extensively degraded. The value of crude fibre in this study is lower compared to those obtained by Aduku (1993) for tropical grasses and crop residues and was higher than the value obtained for *Moringa*, which compares very well with the average of 19.8 % crude fiber for selected multipurpose trees (Fadiyimu 2000). This disagrees with the observation of Okoli *et al.* (2003) that crude fiber content of tropical grasses is usually higher than that for browse shrubs and trees. Ether extract content was higher in *N. laevis* compared with *P. maximum* while those obtained for ash were comparable in both plant. Plant materials contain a group of substances, insoluble in water and organic compounds like ether. They are referred to as lipids and act as stores of energy (Verma, 2006). Ether extract is the lipid component and the energy derived from it is utilized by the animal for body maintenance and production. The higher value of ether extracts in *N. laevis* is an indication of higher energy level for the animal (Babayemi and Bamikole, 2006; Babayemi and Odedire, 2008) and this is a major form of energy storage in plants which is being utilized by the animals for body maintenance and production. The ash values recorded in this experiment were higher than that obtained for tree fodders (Sandoval-Castro, *et al.,* 2005). Ash represents the mineral level in a feed, which contains majorly phosphorus, calcium, or potassium and large amount of silica (Verma, 2006).

Generally, the Crude Protein values from the examined plant species (*Panicum maximum* with the value of 11.75 % and *N. leavis* with 18.72 % respectively*)* were substantially above the critical range of 8 to 10%. Similarly, the value obtained for *N. leavis* in this study also falls within the range of 17.4 to 20.68 % reported by Fact Sheet, 1997), Babayemi and Bamikole, 2006) and Esonu *et al*. (2006). On the contrary, the value were lower to 35% CP from *A. indica* leaves (Obaroh and Achionye-Nzeh, 2011) and does not fall within the range of 31.40 to 40% CP recorded by Musalia *et al*. (2000) and Saxena *et al.* (2010) for its seed cake. Crude protein contents in *N. leavis* leaf was higher than the average of 12.50% obtained for other native browse plants by Le Houerou, 1980 while that of *Panicum maximum* is lower (11.75 %) but it is higher than 7.7 % as reported by Aduku (1993). With a Crude Protein content of 18.72 % in *N. leavis* higher than 15.57%, as reported by Ikhimioya *et al*. (2007).

The results of phytochemical screening of *P. maximum and N. leavis* are presented in Table 2. This revealed the presence of tannin, alkaloids, flavonoids and saponin in the *N. laevis* while none was found in *P. maximum*. These phytochemical compounds are known to support bioactive activities in plants (Akinpelu and Kolawole, 2004). However, reports by

Akinpelu and Kolawole, 2004) only showed the presence of tannin, alkaloids and flavonoids while saponin was found absent in *N. laevis* leaf extract. The percentages of tannin, alkaloids, flavonoids and saponin in the *N. laevis* were 11.5, 52.07, 3.1 and 0.64, respectively. Eman (2010) reported that *Fagonia arabica* leaves had 113.40 % alkaloids, which is higher than that obtained in this study. Thus, it can be inferred that *Fagonia arabica* leaf had higher secondary metabolite than *Newbouldia leavis* leaf (Eman (2010). Alkaloids have been associated with medicinal uses for centuries and one of their common biological properties is their toxicity against cells of foreign organisms. Extensive studies have been carried out on their potential use in the elimination and reduction of human cancer cell lines (Nobori, *et al*., 1994). The tannin content (11.5 %) of *N. leavis* was higher compared to 0.77 % obtained by . High concentrations of tannins reduce voluntary feed intake and nutrient digestibility, the consumption of plant species with high condensed tannin (CT) contents (generally > 50 g kg^{-1} of dry matter, DM) significantly reduces voluntary feed intake, while medium or low consumption (< 50 g kg^{-1} DM) did not to affect it whereas low to moderate concentrations may improve the digestive utilization of feed mainly due to a reduction in protein degradation in the rumen and a subsequent increase in amino acid flow to the small intestine. Tannin is also known to be useful in the treatment of inflamed or ulcerated tissues and they have remarkable activity in cancer prevention and worm expeller (Olajide, *et al*., 2004; Li *et al*., 2003). Thus, *N. laevis* leaf containing this tannin may serve as sources of bioactive compound in the treatment of cancer and serves as anthelminth if such extracts from these plants are improved upon. The higher level of flavonoids (3.1 %) compare with 0.78% of *Fagonia arabica* leaf (Eman (2010), would increase its use greatly because flavonoids in plants can function as color definitions and attractants to pollinators and seed dispersers and also as antioxidants to protect plants against ultraviolet (UV)-radiation, (Croteau, *et al*., 2000). The antioxidant properties can be useful in reduction of oxidative stress in ruminant animals and also, the application of antioxidants are widespread, in industries they are used in preventing polymer from oxidative degradation, rubber and plastic from losing strength, gasoline from autoxidation, synthetic and natural pigments from discolouration and as additives to cosmetics, food (especially food with high fat content) beverages and baking products (Kanner *et al.*, 1999). In recent years, there has been an increase in the application of antioxidants in medicine since oxidative stress has been implicated in most human diseases (Halliwell *et al*., 1999). Oxidative stress results when the concentrations of free radicals exceed the available antioxidants necessary for their reduction. Flavonoids have been shown to exhibit their actions through effects on

Table 2: Phytochemical compounds present in the leaves of *Panicum maximum and Newbouldia laevis*.

Phytochemical compounds	*Panicum maximum*	*Newbouldia leavis*	Amounts in percentages
Tannin	nil	Present	11.5%
Alkaloids	Nil	Present	52.07%
Flavonoids	Nil	Present	3.1%
Saponin	nil	Present	0.64%

membrane permeability, and by inhibition of membrane-bound enzymes such as the ATPase and phospholipase A2 (Hausteen, 1983) and it serve as health promoting compound as a results of its anion radicals (Ferguson, 2001). Saponin had the lowest of all the value 0.64 % and it is also lower compared to 2.34 % in *Newbouldia laevis* as reported byIkhimioya *et al*. (2007). The lower content of saponnin obtained in the present study can aid in improving the palatability of the plant if fed to ruminants because saponin are often bitter in taste, and so can reduce plant palatability (for example, in ruminants feeds), or even imbue them with life-threatening animal toxicity (Foerster, 2006). Saponins are also known to produce inhibitory effect on inflammation (Just *et al*., 1998).

Conclusion

Newbouldia laevis leaves proved to be useful as ruminant diet especially being a common boundary or living fence evergreen plant. The relatively high crude protein and ether extract values in the plants appeared satisfactory for animal production since they exceeded the minimum requirement for ruminants. Also, the presence of the phytochemicals in the plant showed it importance in ethno veterinary medicine and pharmacology as recent research tends towards organic/sustainable livestock production.

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