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NUTRITIVE VALUE OF RUBBER SEED (*Hevea brasiliensis)*

Md. Emran HOSSAIN*[1], Mohammad Hasanul KARIM[2], Sanjida ALAM[3] and Sabuj Kanti NATH[2]

[1]*Department of Animal Science and Nutrition, Chittagong Veterinary and Animal Sciences University, Khulshi, Chittagong-4225, Bangladesh*
[2]*UG student, Faculty of Veterinary Medicine, Chittagong Veterinary and Animal Sciences University, Khulshi, Chittagong-4225, Bangladesh*
[3]*Department of English Language and Literature, University of Science & Technology Chittagong, Bangladesh*
[4]*Department of Animal Nutrition, Faculty of Animal Husbandry, Bangladesh Agricultural University, Mymensingh, Bangladesh*
*Email: emrancvasu@yahoo.com

ABSTRACT*:* The study was undertaken to find out the chemical composition of rubber seeds (*Hevea brasiliensis*) available in Bangladesh. *Hevea brasiliensis* seeds were collected directly from 200 rubber trees of the rubber garden in the Bandarban area under standard random sampling technique. Seeds were decorticated, ground and dried in hot air oven. Chemical analyses of the samples were carried out in triplicate for moisture, dry matter (DM), crude protein (CP), crude fiber (CF), nitrogen free extract (NFE), ether extract (EE) and ash in the animal nutrition laboratory, Chittagong Veterinary and Animal Sciences University, Chittagong, Bangladesh. Metabolizable energy (ME) was calculated mathematically by using standard mathematical formula. Results indicated that, decorticated *Hevea brasiliensis* seeds contained 85.7% DM, 26.1% CP, 43.0% CF, 13.8% NFE, 11.0% EE and 1.8% ash. ME contents in in the seeds was 2101.1 kcal/kg DM. Since, decorticated rubber seeds contained substantial amount of metabolizable energy and proximate components, therefore it could be assumed that, like other unconventional feeds, it might be a promising feed resource for livestock.

Keywords: Chemical Composition, *Hevea brasiliensis*, Metabolizable Energy, Nutritive Value.

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INTRODUCTION

The rubber tree (*Hevea brasiliensis*) is a perennial plantation crop indigenous to South America and a cultivated industrial crop in Southeast Asia since 1876 (Abdullah and Salimon, 2009). The British planters first introduced it in Bangladesh in the early twentieth century and commercial plantation was started in 1961 by the government in Chittagong and Sylhet hilly regions. Later on, plantations were expanded in Chittagong Hill Tracts and Madhupur by the government and public enterprises. The British and some other private companies also planted rubber trees in the fellow lands of tea estates. At present about 25,000 hectare of land is under rubber plantation in Bangladesh and annual production is about 7,500 tons against 20,000 tons of the total demand of natural rubber (Anonymous, 2006). Rubber tree starts to bear fruit at four year of age. Each fruit contains three or four seeds, which fall to the ground when fruit ripens and splits away. Each tree yields about 800 seeds (5 kg/tree annually) twice a year (Bressani et al., 1983). Rubber plantation is estimated to produce about 800-1200 kg rubber seed/ha/year which is normally regarded as waste in Bangladesh. There is no doubt that at this moment persistent shortage of conventional feedstuffs for livestock in Bangladesh is due to inadequate production of farm crops to meet their growing demands at commercial scale. These scenario forcing animal nutritionists to evoke and intensify research for potentially useful but neglected crop products like rubber seed (*Hevea brasiliensis*) obtained from rubber tree (Babatunde et al., 1990).

The Malaysian, Nigerian and Indian rubber seeds are rich in oil (10.1-68.5%), crude protein (14.9-34.1%), ash (2.4-3.1%) linoleic acid, lysine (4.26 mg/16gN), leucine (6.81 mg/16gN), isoleucine (3.28 mg/16gN), valine (7.08 mg/16gN), threonine (3.72 mg/16gN), methionine (1.37 mg/16gN) and other non-essential amino acids. Rubber seed oil is very rich in linolenic and linoleic acids (Babatunde and Pond, 1987b). Malaysia, Indonesia, Nigeria and Srilonka has already extracted and used rubber seed meal in livestock feed. However, no systematic studies have so far been carried out in Bangladesh to find out the nutritive values of rubber seeds and feasibility to explore it as

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feed in livestock industry. Therefore, current study aims to estimate the nutritive value of decorticated rubber seeds collected from different rubber gardens available in Bangladesh.

MATERIAL AND METHODS

Study area

Most of the rubber gardens of Chittagong Hilly areas are located in Cox's bazaar and Bandarban areas. Therefore, the current study was conducted in randomly selected three rubber gardens of Bandarban district. The study area has a latitude of 22°21'N, longitude 91°49'E and elevation of 29 m. The area is fairly hot with annual average temperature of 25.1 °C. The variation of daily average temperature is 8.8 °C. Mean monthly temperature has a variation of 9 °C the hottest month is May having a mean temperature of 28 °C. The coolest month is January which has a mean temperature of 19 °C. The average annual relative humidity of the area is 73.7% and average monthly relative humidity ranges from 58% in January to 86% in August. The area has an average of 2735 mm rainfall per year.

Collection of sample

The rubber tree begins to produce fruit at 4 years of age. A fruit contains 3 to 4 seeds, which consist of a hard shell, which is brown or black with some white spots and a soft white kernel. The proportion of the kernel is about 50% of the total weight of the seed. The soft kernel is used to produce oil and the by-product is rubber seed meal (Dong, 2003). Dried rubber seeds containing intact kernel were collected from 200 trees of the Bandarban area under standard random sampling technique. Total 10 kg of rubber seeds were collected for a period of 30 days. Seeds were packed in airtight sacks and sent to the Animal Nutrition Laboratory, Chittagong Veterinary and Animal Sciences University for chemical analysis.

Preparation of sample

Entire dried seeds were decorticated, kernels were ground (1-3 mm sieve) and dried in hot air oven. Dried ground kernels were blended to powder. Later on, it was mixed properly and exposed to shade to cool down. Samples were wrapped up by polythene bag and preserved in the laboratory for chemical analysis.

Analysis of sample

Chemical analyses of the samples were carried out in triplicate dry matter (DM), crude protein (CP), crude fiber (CF), nitrogen free extracts (NFE), ether extracts (EE) and total ash (TA) in the animal nutrition laboratory, Chittagong Veterinary and Animal Sciences University, Chittagong, Bangladesh as per AOAC (2006).

Calculation of Metabolizable Energy (ME)

Metabolizable Energy (ME) was calculated from proximate components by mathematical formula as per Lodhi et al. (1976).

RESULTS AND DISCUSSION

Dry matter (DM)

The DM content of rubber seeds determined in this study was 95.7% (Table 1). The result is in close agreement with earlier studies where it was 96.1% (Eka et al., 2010), 96.1% (Onwurah et al., 2010), 96.4% (Giok et al., 1967), 97.0% (Ukhun and Uwatse, 1988) and 94.2% (Madubuike et al., 2006). However, the result differs with the findings of other investigators who reported it 91.0% (Oyekunle and Omode, 2008), 90.4% (Ly et al., 2001) and 90.6% (Babatunde et al., 1990).

Crude protein (CP)

The crude protein content of rubber seeds determined in this study was 26.1% (Table 1). The result is in line with previous studies where it was reported to be 23.6% (Chanjula et al., 2011), 22.3% (Onwurah et al., 2010), 28.3% (Babatunde et al., 1990), 27.4% (Narahari and Kothandaraman, 1984) and 27.0% (Giok et al., 1967). However, the result differs with the findings of other investigators who reported it 17.4% (Eka et al., 2010), 14.9% (Ly et al., 2001), 18.2% (Achinewhu, 1986) and 11.4% (Bressani et al., 1983).

Total ash (TA)

The TA content of rubber seeds determined in this study was 1.8% (Table 1). The result is similar with studies where it was 2.6% (Onwurah et al., 2010) and 2.4% (Giok et al., 1967). However, the result differs with the findings

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of other investigators who reported it 3.1% (Eka et al., 2010; Mmrole, 2008; Ly et al., 2001) and 3.5-5.0% (Ukhun and Uwatse, 1988; Oyekunle and Omode, 2008).

Ether extracts (EE)

The EE content of rubber seeds in the present study was 11.0% which is in good comparison with Mmereole (2008) (10.1%). However, this result differs with other researchers who reported it 40.8% (Chanjula et al., 2011); 68.5 % (Eka et al., 2010); 42.5% (Onwurah et al., 2010); 28.4% (Ly et al., 2001); 28.8% (Babatunde et al., 1990); 21.8% (Achinewhu, 1986); 24% (Narahari & Kothandaraman, 1984) and 32.3% (Giok et al., 1967). The possible reason for high ether extract content could be either due to variation in the proportion of kernel content of the seeds or preparation techniques of rubber seed meal.

Table 1 - Nutritive value of decorticated rubber seed meal available in Bangladesh (N=200)

Ingredient	ME	DM	CP	CF	NFE	EE	ASH
Rubber seed	2101.1	85.7	26.1	43.0	13.8	11.0	1.8

DM=Dry matter, ME=Metabolizable energy, CP=Crude protein, CF=Crude fibre, NFE=Nitrogen free extract, EE=Ether extract

Table 2 - Nutritive value of rubber seed meal available worldwide

Investigators	ME	DM	CP	CF	NFE	EE	TA
Chanjula et al., 2011	4674.8	-	23.6	-	-	40.8	-
Eka et al., 2010	-	96.1	17.4		-	68.5	3.1
Onwurah et al., 2010	-	96.1	22.3	-	29.0	42.5	2.6
Mmrole, 2008	2520	-	34.1	4.4	-	10.1	3.1
Ly et al., 2001	-	90.4	14.9	-	-	28.4	3.1
Babatunde et al., 1990	-	90.6	28.3	-	-	28.8	-
Achinewhu, 1986	-	-	18.2	13.7	35.7	21.8	-
Narahari & Kothandaraman, 1984	-	-	27.4	15.9	-	24.0	-
Giok et al., 1967	-	96.4	27.0	-	-	32.3	2.4

DM=Dry matter, ME=Metabolizable energy,CP=Crude protein, CF=Crude fibre, NFE=Nitrogen free extract, EE=Ether extract

CONCLUSION

Rubber seed is a neglected waste but nutritionally promising unconventional feed resource for Bangladesh. Therefore, if rubber seed meal could be incorporated in animal diet, it would reduce production cost of broilers, layers as well as other farm animals. Additionally, rubber seed oil could be exploited for the industrial use of paint and varnish. The seeds contain cyanogenetic glycosides but this disadvantage can be overcome by proper cooking. The main limitation in rubber seed meal is the presence of hydrocyanic acid up to 540 ppm. However, both heat treatment and storage time can be used to reduce it.

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