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EFFECT OF AGE OF THE SHEA TREE (VITELLARIA PARADOXA) ON THE FLOW OF SHEA LATEX

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Abstract

Shea latex samples was tapped from ten experimental trees in five age groups (0-3 years (T3), 4-6 years (T6), 7-9 years (T9), 10-12 years (T12) and 13-15 years (T15)) each obtained from Nyankpala in the Tolon – Kumbungu District in Northern Ghana. The trees were identified randomly and tagged for latex extraction from February to April 2016. Results indicated that shea latex flow decreases with the age of the tree. The mean shea latex flow obtained over the period were 37.55g, 32.54g, 23.89g, 15.38g and 9.00g for T3, T6, T9, T12 and T15 respectively. The proximate composition of the Shea latex with respect to the various ages of the Shea trees also revealed a significant variation. Crude fat and moisture were slightly higher in the younger trees than the mature trees. However, crude protein, crude fibre, ash and carbohydrate were found to be significantly higher in the mature trees.

Key words: Shea latex, Proximate composition, Crude fat, Crude protein, Crude fibre, Moisture content, Ash content, Carbohydrate.

Introduction

Shea tree (*Vitellaria paradoxa*) is an important multipurpose tree which plays an important role as the principal source of income for the local population in the Sahel region. The tree is one of the most indigenous assets in West and Central Africa and particularly abundant in the Northern Savannah areas of Ghana. The tree is native to Africa and occurs across the Sahel region from Senegal to Nigeria and further East in Sudan and Uganda (Maranz *et al.,* 2004).

The most important product of the tree is the shea butter, which is extracted from the dried kernels. The oil is widely utilized locally for domestic purposes such as cooking, as a skin moisturizer and as an illuminant (Lovett and Haq, 2000).

A study by Fosu and Quainoo (2013) compared the proximate composition of shea latex and the natural rubber latex (*Hevea brasilienesis)*. Results from their study indicated that the proximate composition of the shea latex varied considerably and may be dependent on a number of factors including climatic conditions, season of the year and time of tapping. The study revealed that compared with the natural rubber, shea latex recorded low protein content which may cause less allergic reactions and may therefore be exploited and used in the manufacture of products such as balloons, gloves and condoms.

Quainoo et al., (2014) also reported that agro-ecological zones and land use did not have any influence on the quality of the proximate composition of the shea latex. The aim of this study was to investigate the effect of age of the shea tree age on the flow of shea latex.

Methodology

Shea latex was tapped from shea trees on the Nyankpala Campus of the University for Development Studies (U.D.S) in the Tolon-Kumbungu District in the Northern Region of Ghana. Ten (10) experimental trees in five (5) age groups each; namely 1-3 years (T3), 4-6 years (T6), 7-9 years (T9), 10-12 years (T12) and 13-15 years (T15) were identified randomly and tagged for latex extraction from February to April, 2016 at an angle of 45 degrees.

The ages of the trees were determined following the method of Steve Nix (2014) by taking a diameter measurement at breast height (Bh) of the tree species with a tape measure and multiplying it by its growth factor. The growth factor of the shea tree is 0.102 (Abdul Mumeen et al., 2012). The samples were dried at room temperature for a period of three (3) days prior to laboratory analysis.

Proximate Analysis of Shea latex

Laboratory analysis of the Shea latex was carried out at the Faculty of Agriculture, University for Development Studies, Ghana. The samples were subjected to proximate analysis (% crude fat, % crude protein, % crude fibre, moisture content and % ash) based on the procedure of Fosu and Quainoo (2013) and the protocols of the International Association of Official Analytical Chemists (AOAC).

Kjeldahl method was used to determine the crude protein and the soxhlet method for the determination of crude fat percentage. The moisture analyzer was used to determine moisture content of the shea latex set up at a temperature of 105^0C for one hour after which the moisture content in the samples was evaporated gradually and the final moisture content determined.

Results and Discussions

The younger the shea tree the greater the flow of latex as shea yield decreases from T3 to T15 (Table 1). These finding conforms to the finding of Kovuttikulrangsie and Tanaka (1999), that the age of younger trees has an influence on the size of latex particles. The higher flow in the younger trees may be due to the small particle size of the younger trees compared to the matured ones.

T3 recorded the highest shea latex flow of 37.55 g followed by T6 with T15 as the lowest. There was no significant difference between the flow of shea latex between T3 and T6. However, T3 and T6 were significantly different from T9, T12 and T15. This suggests that tapping of shea latex may be efficient at 0-6 years.

Table 1. Age of shea tree and mean flow of latex

Age of shea tree (Years)	**Mean Flow of Shea latex (g)**
0-3 (T3)	37.551
4-6 (T6)	32.540
7-9 (T9)	23.891
10-12 (T12)	15.383
13-15 (T15)	9.002
LSD (0.05)	6.290

Field Data, 2016

Table 2: Age of Shea latex and proximate composition of samples.

Parameters Age group	%Moisture	% Crude fat	%Crude protein	% Crude fibre	% Ash content	%Carbohydrate
0-3	2.064±0.119	58.961±0.512	1.094±0.005	7.805±0.063	4.146±0.099	25.930±0.845
4-6	2.013±0.022	55.901±1.640	1.459±0.031	7.894±0.018	4.477±0.340	28.256±2.893
7-9	1.802±0.116	49.983±0.459	1.603±0.002	7.952±0.033	4.895±0.091	33.765±0.717
10-12	1.580±0.166	49.831±0.061	1.945±0.031	8.461±0.248	4.999±0.060	33.184±0.578
13-15	1.332±0.124	48.828±0.368	2.117±0.054	8.611±0.123	5.305±0.195	33.807±0.985
P. Value	**0.007**	**0.001**	**0.001**	**0.004**	**0.011**	**0.001**
L.S.D	**0.376**	**2.561**	**0.098**	**0.404**	**0.590**	**2.687**

Field Data, 2016

The proximate analysis of the Shea latex from the various age categories of shea trees indicated considerable variations. The crude fat and the moisture content of the shea latex were found to be slightly higher in the younger trees than the mature ones (Table 2). This may be due to the fact that the younger trees are more efficient in water usage and may therefore resist water shortage than the mature trees. However, percentage crude protein, crude fibre, ash content and carbohydrate content increased with the age of the shea tree (Table 2). This conform with the finding of Akoto *et al.,* (2008), who reported that the percentage crude protein, crude fibre, ash content and carbohydrate content were found to be lower in younger trees of cashew gum than the mature ones. The higher fibre content in the mature trees may be due to the high amount of lignin and cellulose content which increases with age. Figure 1 shows tapping and collection of shea latex.

Figure 1: Tapping and collection of shea latex ***(A) Shea Latex (Tapping)*** ***(B) Shea Latex (Unrefine***

Conclusion

In conclusion, the flow rate of shea latex was significantly higher in younger trees than the mature ones. The proximate analysis also revealed higher percentage of moisture and crude fat in the younger trees. However, crude fibre, crude protein, ash and carbohydrate were found to be higher in the mature trees.

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