Free amino acid profiles of *Caryota urens* L. (Kithul palm) sap, treacle and jaggery

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Introduction

The sap of *Caryota urens* commonly referred to as Kithul palm is very rich in simple sugars and therefore used to manufacture treacle and jaggery that are used as substitutes for sugar and sweeteners (Thevendirarajah *et al* 1977). All these products have a very high demand due to their natural origin, and as an almost organic food product. However, these products are highly priced due to the scarcity in production and are of high demand due to the uniqueness in taste and aroma, as well as due to traditional claims on health benefits.

It is traditionally considered that the products of *C. urens* have anti-diabetic, anti-ageing and anti- rheumatic properties. Recent scientific investigation has shown that sap and treacle of *C. urens* have α-glucosidase inhibition activity and thus proves that traditional claims on anti-diabetic properties are correct indeed (Ranasinghe *et al* 2010). However, scientific validation of the folkloric claims or the identification of the chemical constituent responsible for these properties has not been attempted so far. Some of the amino acids from *C. urens* products may be the responsible chemical components for biological activities as amino acids have a variety of roles in metabolism, as building blocks of proteins, growth factors, metabolic regulators, secondary messengers and nutrients. Thus, analysis of amino acids is essential for metabolic studies.

The main objective of this study was the determination and comparison of the free amino acid profiles of *C. urens* sap, treacle and jaggery and to find out the relationship of amino acid profiles and the traditional claims on health benefits of these products.

Materials and Methods

Sap samples collected from three different sites were stored at 4 ^{0}C during transportation and they were divided in to 1.0 ml aliquots and stored at -40 ^{0}C until analysis. Original sap was evaporated at the site for the production of Kithul treacle and jaggery using a domestic gas burner and a stainless steel pan.

5.0 g of treacle and jaggery samples were weighed into a 50.0 mL volumetric flask and dissolved in deionized water, and made up to the mark, filtered through 0.45 µm nylon syringe filter before HPLC analysis. An Agilent 1100 HPLC system was used for individual free amino acid analysis. Each individual amino acid was determined with an external calibration.

Results and Discussion

Representative HPLC chromatograms of *C. urens***,** treacle is given in Figure 1

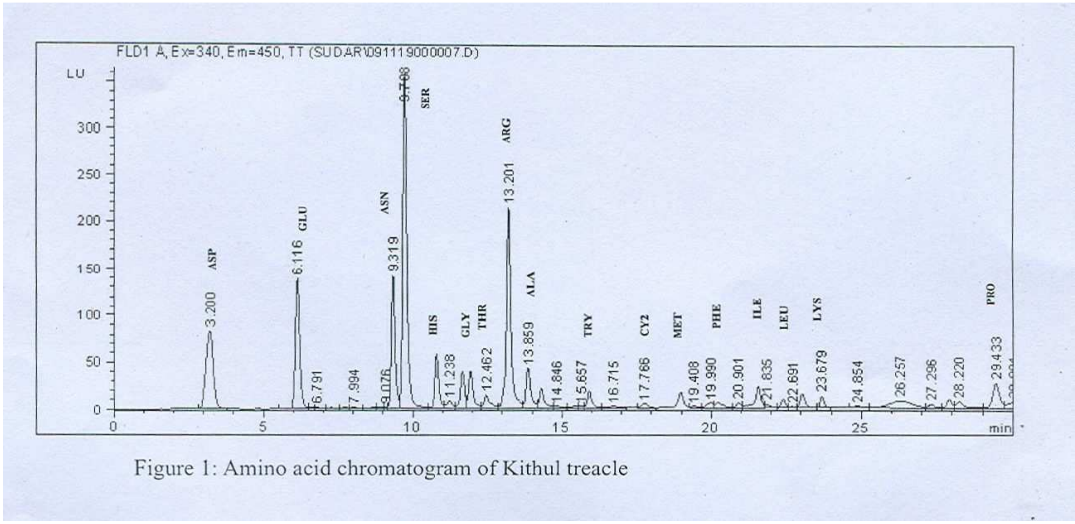

Figure 1: Amino acid chromatogram of Kithul treacle

Table 1, Free Amino Acid Content (mg/100g) of Kithul sap, treacle, and jaggery

Amino acid	Product type		
	Sap (n=20)	Treacle (n=17)[4]	Jaggery (n=6)
Aspartate	8 ± 1.5	38 ± 6	43 ± 6
Glutamate	16 ± 3.2	73 ± 12	93 ± 12
Asparagine	11 ± 2.3	54 ± 5	59 ± 6
Serine	14 ± 2.8	71 ± 8	84 ± 8
Histidine	6 ± 1.3	28 ± 3	32 ± 3
Glycine	2 ± 0.3	8 ± 1	10 ± 1
Threonine	1.5 ± 0.3	4 ± 0.5	6 ± 0.5
Arginine	10 ± 1.5	50 ± 7	54 ± 6
Alanine	4 ± 1.3	18 ± 3	23 ± 3
Tryrosine	2 ± 0.4	8 ± 1	10 ± 1
Cystine	4 ± 1.2	17 ± 2	19 ± 2
Valine	ND	ND	ND
Methionine	2 ± 0.3	7 ± 1	9 ± 1
Phenylalanine	2 ± 0.2	5 ± 1	8 ± 1
Isoleucine	4 ± 0.4	15 ± 2	20 ± 2
Leucine	1 ± 0.3	3 ± 0.5	5 ± 0.7
Lysine	1± 0.2	3 ± 0.2	3 ± 0.2
Proline	3 ± 0.7	12 ± 1.5	15 ± 2.4

ND = Not Detected

Quantitative results of each amino acid in sap, treacle and jaggery are summarized in Table 1. Results are expressed as the mean and the respective standard error of mean (SEM).

Results showed that *C. urens* sap, treacle and jaggery contain glutamate, serine, asparagine arginine, and aspartate as the major amino acids in mg /100g and valine was absent.

Relatively high amount of glutamate in the *C. urens* sap, treacle and jaggery, which is a known flavor enhancer, could be the main contributor for the unique flavour of the Kithul products (Belitz and Grosch, 1999). None of the other treacle types has glutamate levels

similar to Kithul treacle (Somasiri *et al* 2011). Folkloric claim of Kithul products having the potential of sexual arousal on consumption may be due to arginine which is considered as "The Natural Viagra" that increases the libido and potency confirms the chemical responsible for the effect. The effect may be further enhanced by the presence of histidine, and tyrosine which are known for contribute in reproduction (Balch 2005). The presence of methionine and cystine suggest very high antioxidant activity. Cystine has also been identified as a treatment for rheumatoid arthritis and hardening of the arteries. The traditional claim that Kithul sap is good for arthritis is supported due to the presence of considerable amount of histidine. Furthermore, the presence of proline improves skin texture by aiding the production of collagen and reducing the loss of collagen in the aging process.

Conclusion

This report is the first study on the amino acid profile of *C. urens* sap and jaggery. Free amino acid profiles of Kithul sap, treacle and jaggery can be used to explain some of the traditional claims on the health benefits of these products and is also useful for nutrition labeling of these products.

References

Balch, P. and James Balch, M.D. (2000), Prescription For Nutritional Healing, Avery Books.

Belitz, H. D. and Grosch, W. (1999). Fruits and fruit products. In Food Chemistry. Berlin: Springer (pp. 748–757).

Ranasinghe, P., Premakumara G.A.S, Wijeyarathna C.D., Ratnasooriya, W.D. 2010. Antioxident avctivity of *Caryota urens* L. treacle. Annual Sessions, University of Colombo.

Somasiri H.P.P.S, Premakumara G.A.S, Mahanama K.R.R. (2011), Free amino acid profile of Kithul palm *Caryota urens* L. treacle and its potential application in authentication of treacle types, Proceeding of the 12th Government Food Analysts Conference.

Thevendirarajah K., Dassanayake M.D., and Jeyaseelan K. Ceylon J. Sci. (Bio.Sci.) Vol 12, No.2, 146-150, November 1977.

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