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Determining nutritional facts of Palmyrah(*Borassusflabellifer*) sap based products existing in the market of Jaffna district

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ABSTRACT: A study was carried out to determine the nutritional composition of Plamyrahsap based products (jiggery, treacle and sugar candy) existing in the market. The study was done at Palmyrah Research Institute with the aim offind out the nutritional variation in such products and introducing nutrient and proximate composition of Palmyrah products in the labels. Five Palm Development Co-operative Societies in Jaffna district were randomly selected for the study. The experiment was assigned in Randomized Complete Block Design (RCBD). Protein, fat, carbohydrate (total sugar and reducing sugar), phosphorous, calcium, magnesium and iron contents were determined in AOAC method. All results were analyzed in SAS software and the mean separation was done by LSD at p=0.05. Protein content of the sap based products has ranged from 0.62% to 0.86%. Wide variation in fat content of the jaggery was observed among areas and it varied from 0.056% to 0.52%. Percentage of fat in treacle and sugar candy was found as 0.012% to 0.018%. Total sugar content varied differently in sap based products and for jaggery 78% to 94.6%, for treacle 62% to 67%, and for sugar candy 85% to 95%. Reducing sugar content of the products was found in very trace amount. Among mineral composition analyzed for the products, calcium content was higher both in jaggery and treacle and phosphorous content (0.1% to 0.13%) was higher in sugarcandy. Among three products magnesium content (0.04% to 0.06) % also higher in jiggery. Iron content ranges from 0.007 to 0.025%, 0.021% to 0.035% and 0.008 to 0.017% in jaggery treacle and sugar candy respectively.

KEYWORDS: Palmyrah, Nutrient, Proximate, Mineral, Sap

I. INTRODUCTION

Palmyrah based production is carried out by three different groups as Palmyrah Development Board, Palm Development Co-operative Societies (PDCS) and private owners. Palmyrah products available in the market are not in uniform quality even from same manufacturer. Though proximate analysis of Palmyrah products have already been conducted, nutritional labeling for Palmyrah products was not performed separately and still it is not practiced in market for existing products. Mohanajayaluxmi, 1986 has carried out a chemical analysis of palmyrah products to determine the nutritive value and the chemical compounds present in them. Chemical analysis of tuber and tuber based products is also performed by K. Theivendirarajah, 2008. Proximate analysis of many of the Palmyrah products have been done by many authors to get a complete profile of composition and mineral content. Proximate values of the samples depend on method of processing, location, and environmental conditions. The previous studies have not shown any of these aspects in sample collection. The data already available are composed in the year of 1986, 2008 and likewise. Concerns about the effect of diet on health have resulted in the legislation of the Nutrition labeling and Education Act (NLEA) and its implementation. The most commonly used method for food labeling is to determine the amount of each component in the food and add up the amounts of each component. Nutritional labeling will be an added aspect in marketing of Palmyrah products, which enhance the consumer's awareness about nutrient content and medicinal value of these products. Nutrient composition of Palmyrah products can be introduced into packing. This can be used to enhance new customer acquisition. In this background this study was done to initiate a study on nutrition labeling of selected samples of Palmyrah based products by analyzing the nutritive contents and to determine the amount of proximate composition and mineral content in selected products of Palmyrah.

II. METHODOLOGY

Five sample collection areas in Jaffna district were randomly selected to conduct the study. Accordingly, Manipay, Kondavil, Tellipalai, Pointpedro and Chavakachcheri were selected for collection of products. Palmyrah Sap based (jaggery, treacle and sugar candy) products were collected from Palm Development Corporative societies in respective areas. In each product same pack size of same batch was bought. The study was done in Randomized Complete Block Design. Three replicates were done for each study area. Jaggery and sugar candy were ground and were kept in capped glass bottles. Methods which have been described in Asean Manual of Food Analysis, 2011 and Food analysis (S, Nielsen., 2010) were followed for analysis. Kjeldahl method was followed to find

crude protein content. Total fat was determined by solvent (Diethyl ether boiling point 40 to 60ºC) extraction method. Total sugar and reducing sugar were quantified by Lane and Enon method (SLS..). Mineral content of the products was determined after the dry ashing procedure. Samples were ashed in 550ºC for 5hours. Calcium and magnesium was quantified by EDTA titration method. Spectrophotometric methods were followed to find phosphorous and iron content. Phosphorous was determined by vanadomolyb date colour development and iron content was determined by 1-10 pheonthrolinecolour development. All results were analyzed in SAS software package and the mean separation was done by LSD at p=0.05

III. RESULTS AND DISCUSSION

Table1: Nutritional composition of Palmyrah Jaggery from different places of Jaffna district

Nutrient composition % by mass	Tellipalai	Kondavil	Manipay	Singanagar	Chavakachcheri
Protein	0.86^{a}	0.65^{d}	0.77^{b}	0.75^{c}	0.62^{e}
Fat	0.125^{d}	0.516^{a}	0.466^{b}	0.056^{e}	0.138^{c}
Reducing sugar	0.00	0.00	0.00	0.00	0.00
Total sugar	91.65^{b}	79.29^{d}	78.10^{e}	94.69^{a}	87.00^{c}
Calcium	0.448^{e}	0.473^{d}	0.640^{c}	1.022^{a}	0.912^{b}
Magnesium	0.052^{bc}	0.063^{a}	0.044^{d}	0.057^{ab}	0.045^{cd}
Phosphorous	0.024^{c}	0.019^{d}	0.013^{e}	0.06^{b}	0.914^{a}
Iron	0.015^{b}	0.007^{d}	0.007^{d}	0.025^{a}	0.011^{c}

Table1 shows that protein, fat and total sugar contents of palmyrahjaggery have significantly varied among five areas. Protein content of jaggery ranges from 0.62% (in Chavakachcheri) to 0.86% (in Tellipallai). During the molding of jaggery coconut oil is added for easy separation of jaggery cubes from the mold. This may be the reason for wide variation in fat content of jaggery. Reducing sugar content was found as very trace amount which could not be determined by Lane and Eynon method. Significantly higher (94.69%) and lower (78.10%) total sugar content was found in Singanagar and Manipay respectively. Generally Calcium oxide is used for liming of sweet sap for the prevention of fermentation and phosphoric acid is used for precipitate the liming material and to bring the suitable pH for the jaggery production. Amount of using liming material and acidifier vary to producer to producer. Using of these two chemicals also influence the significant difference of the calcium and phosphorous content of jaggery in different areas. Significantly higher iron content was observed in Singanagar. Jaggery from Manipay and Kondavil has significantly lower iron content compared to others.

Table2: Nutritional composition of Palmyrah Treacle from different places of Jaffna district

Nutrient composition % by mass	Tellipalai	Kondavil	Manipay	Singanagar	Chavakachcheri
Protein	0.825^{b}	0.822^{bc}	0.831^{a}	0.819^{c}	0.782^{d}
Fat	0.011^{d}	0.019^{a}	0.016^{b}	0.016^{b}	0.014^{c}
Reducing sugar	0.00	0.00	0.00	0.00	0.00
Total sugar	67.13^{a}	65.70^{b}	62.65^{c}	62.54^{c}	60.53^{d}
Calcium	0.340^{c}	0.305^{d}	0.280^{e}	0.416^{b}	0.434^{a}
Magnesium	0.019^{c}	0.022^{b}	0.016^{d}	0.026^{a}	0.006^{e}
Phosphorous	0.039^{c}	0.063^{a}	0.057^{b}	0.025^{d}	0.019^{e}
Iron	0.025^{b}	0.021^{c}	0.022^{c}	0.035^{a}	0.024^{b}

According to the results, although significant difference was observed in protein content of the treacle to different areas it varied from 0.782% to 0.825%. In all five areas reducing sugar content of the treacle was not found in three decimel point. There was significant difference found in total sugar content of treacle among Manipay, Singanagar and Chavakachcheri. Mineral composition was found to significantly vary among five places. However the deviation was small. (Calcium: 0.28% to 0.434%, Magnesium: 0.006% to 0.026%, Iron: 0.021% to 0.035%).

Table3: Nutritional composition of Palmyrahsugarcandy from different places of Jaffna district

Nutrient composition % by mass	Tellipalai	Kondavil	Manipay	Singanagar	Chavakachcheri
Protein	0.771^{c}	0.859^{a}	0.727^{e}	0.841^{b}	0.749^{d}
Fat	0.012^{d}	0.018^{a}	0.014^{c}	0.014^{c}	0.016^{b}
Reducing sugar	0.00	0.00	0.00	0.00	0.00
Total sugar	88.08^{c}	86.27^{d}	91.88^{b}	84.76^{e}	94.81^{a}
Calcium	0.088^{b}	0.090^{a}	0.086^{c}	0.075^{d}	0.009^{e}
Magnesium	0.011^{d}	0.020^{c}	0.058^{a}	0.035^{b}	0.002^{e}
Phosphorous	0.132^{b}	0.098^{d}	0.117^{c}	0.104^{d}	0.143^{a}
Iron	0.017^{a}	0.013^{c}	0.008^{d}	0.015^{b}	0.017^{a}

Protein content of sugar candy had varied significantly among different places and it ranges from 0.727% to 0.859%. Little deviation in values obtained for fat content of sugar candy was found as 0.012% to 0.018%. Significantly lowest calcium and magnesium content was observed in sugar candy from chavakachcheri (0.009% and 0.002% respectively). Although significant difference was observed in phosphorous and iron content the different range was found small. (Phosphorous: 0.098% to 0.132%% and Iron: 0.008% to 0.017%)

IV. CONCLUSION

Results of the study give variation in nutritional composition of palmyrah sap based products as jaggery, treacle and sugarcandy. However we can find the percentage range for each component of nutritional composition. According to that protein content of the sap based products has ranged from 0.62% to 0.86%. Fat content of the jaggery was varied from 0.056% to 0.52%. Percentage of fat in treacle and sugar candy was found as 0.012% to 0.018%. Total sugar content varied differently in sap based products and for jaggery 78% to 94.6%, for treacle 62% to 67%, and for sugarcandy 85% to 95%. Reducing sugar content of the products was found in very trace amount. Among mineral composition analyzed for the products, calcium content was higher both in jaggery and treacle and phosphorous content (0.1% to 0.13%) was higher in sugarcandy. Among three products magnesium content (0.04% to 0.06) % also higher in jaggery. Iron content ranges from 0.007 to 0.025%, 0.021% to 0.035% and 0.008 to 0.017% in jaggery treacle and sugarcandy respectively.

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