Formulation of Seaweed based Jam as sources of nutrition

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Abstract

The present study was focused to introduce seaweed extract as thickening agent replacing pectin which is normally used as a binding agent of fruit jams and also to increase nutritional quality. The studywas conducted to select the best composition of jam containing fruit pulps such as wood apple, orange, and mango; sugar; citric acid; and seaweed extracts (agar agar or carrageenan) with most acceptable organoleptic qualities. The analysis of jam samples revealed that the best jam mixture contained about 40, 18.5, 35, 6 and 0.6 % (w/w) of fruits, sugar, water, agar agar and additives (sodium benzoate and citric acid); respectively. This study also found that 3% (w/w) of carrageenan could be used instead of 6% (w/w) of agar agar as binding agent. Developed jam mixtures (wood apple, mango, ulva powder, orange) were compared with a commercial orange jam product. The viscosity of all five jam mixtures were 144, 76.4, 251,57, and 78cp respectively. Five jam mixtures had water activity values of about 0.823, 0.803, 0.888, 0.847 and 0.834; respectively. Crude protein contents of jam mixtures were 5.698, 6.3, 9.6,5.92 and 3.26 (%, wet weight basis), Iodine content of above jam types were found as 0.35, 0.32, 0.56 and 0.24, 0.mg/L) while potassium contents were reported as 49947, 15397, 24371,12538 and 13456 mg/kg; respectively. The Total Bacterial Counts were at the recommended level and ranged from $2.3x10^1$ to $6x10^1$ CFU/g over a six month period at 30°C. The yeast and mould counts weren't detected during six month shelf life studies.

Keywords: fruit pulps, Agar agar, carrageenan, dehydrated seaweeds, powder

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Introduction

Seaweed is known as a source of minerals, protein, vitamins and dietary iodine. Previous studies have shown that iodine content in breast milk of lactating mothers has a strong correlation with the frequency and quantity of seaweed consumption (David, 1982). Iodine is an essential element required for thyroid hormone synthesis and imparts some effect on prevention of cardiovascular disease and cancer. Seaweed has a unique ability to concentrate minerals, vitamins and essential element iodine from the ocean. Seaweed jam which can be considered as a nutritive source of minerals, vitamins and amino acids in health diets can be produced at a low cost. There is no scientific data on the nutritional content of locally produced seaweed jams. Therefore,

present study was focused on utilization of seaweed extract as a thickening agent of the jam recipes.

Materials and Methods

The fruits: wood apple, orange and mango, and sugar, citric acid and sodium bezoate were purchased from a Super Market at Mattakkuliya in Colombo.The citric acid and sodium benzoate were purchased from a Food Ingredient shop in Colombo.The fresh *Gracilaria* species and *Kappaphycus alverezi* were collected from North Western and South West coastal belt of Sri Lanka, respectively, kept in insulated boxes, and transported to the laboratory within same day. In addition to that *Ulva lactuca* were collected from South West coastal belt of Sri Lanka. The collected each seaweed species were washed, cleaned and epiphytes were removed . The washed and cleaned seaweeds were dried well at 45 °C in an electrical oven for 1-2 days.

The dehydrated seaweed species were powdered and kept in air tight containers and stored at 4 °C and each batch was used up in jam formulations within one month. The dried and ground seaweed powder of *Gracilaria verucosa (agrophyta)* and *Kappaphycus alevazia* (carrageenophyta) were used to extract agar agar (SOS, 1983) and Carrageenan (FAO, 1990). The *Ulva* species powder were manufactured (Anon, 1985). The jam recipe formula were done (Anon, 1995). Four different jam types were prepared using wood apple, orange, mango and *Ulva* species powder. Each jam prepared with fruits, sugar, other chemical additives (citric acid and sodium benzoate) and different levels of agar agar or carrageenan percentages [6 ,5, 4, 3, 2, and 1% (w/w)], were used to evaluate sensory quality parameters, colour, aroma, taste, consistency using trained panelists. The spreadability of the jam was evaluated by sensory assessments and improved to market standards by incorporating varied level of agar agar and carrageenan. In addition, ulva containing jam type was developed by adding ulva powder to boiling sugar syrup. Each jam sample was filled in galss jars to contain 250 g and tightly capped with lid. The shelf life studies were carried out for different fruit jams and ulva jam developed in this study over a six month period. The highest spreadability of each jam was evaluated with agar agar or carrageenan by sensory evaluation (Hedonic scale,1983). Seaweed jam types developed in this study together with commercial available orange jam (containing pectin) were analysed for nutritionally important element (potassium and iodine content) (AOAC, 1983) and proximate composition (AOAC, 1983), as well as physical properties such as viscosity(Brook field viscosity meter), water activity (water activity meter), shelf life

of jam types were assessed over a six month period for overall sensory quality and microbiology (total bacterial Count and Mould count).

Results and Discussion

All jam types containg 6% agar agar or 3% carageenan as a gelling agent showed highest acceptable spreadability. The pectin content in commercially available jam was 2%. The 6% agar incorporated jams recorded viscosities of 144, 76.4, 251, 57.7 171cp. Values respectively for wood apple, orange, ulva, mango were high but lower than that of commercial available market jam sample (171cp). It was found that maximum percentages of agar and carrageenan are the best levelsto maintain standard spreadability of jam in the commercial market. The most acceptable selected compositions consisted of crude protein (5.698%, 6.3%, 9.6%,5.92%, 3.26%: iodine value 0.35, 0.32, 0.56 ,0.24,0.mg/L: in wood apple, orange, Ulva, mango jam respectively. The commercial market jam showed zero iodine content and the lowest protein value (3.26%). The nutritional content is higher in agar or carrageenan mixed jam sample than that of commercial market orange jam. The water activity values were 0.823, 0.803, 0.888, 0.847, 0.834. There were no significant difference among water activity percentages of laboratory prepared and commercial market samples. The and total plate counts were in the range of 2.3x101-6.3x101 and below in the rejected levels. The macro and micro elements are highest in the sample of the present study than market samples. The yeast and mold were not present during six month period of shelf life. All the samples showed more than six month shelf life

Conclusion

The two seaweed extracts of carrageenan and agar were most suitable nutritive thickener agents of the food substitute industry. The texture and spreadability can be also improved by addition of agar agar or carrageenan powder and sugar in the standard ratio. It can be concluded that the consumptionof Ulva jam is healthy and the nutritional value is five times higher than that of the presently improved seaweed based jam than that of commercially available jam in the market. The shelf life of the different jam concentrations was valid for more than six months. The keeping quality and nutrition values showed highest and same levels until six months storage.

The agar-agar 6% and carrageenan 3% content were recommended for jam recipes. This can be recommended as a medicinal health food of high nutritional value.

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