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# Development of a low calorie beverage with *Phyllanthus emblica* (Linn.)

By
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## Declaration

The work described in this thesis was carried out by me under the supervision of Dr. (Ms.) I.G.N. Hewajulige, Dr. K.K.D.S. Ranaweera and Mr. J. Wansapala and a report on this thesis has not been submitted in whole or in part to any University or any other institution for another degree.

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We certify that the above statement made by the candidate is true and that this thesis is suitable for submission to the University for the purpose of evaluation.

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*Affectionately dedicated*

*To*

*My husband Isuru*

*And*

*My parents*

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**List of abbreviations**

LM- Low methoxy

HM- High methoxy

DE- Degree of esterification

SMS- Sodium metabisulphite

KMS- Potassium metabisulphite

TSS- Total soluble solids

NERD- National Engineering Research & Development

DPPH- 2,2-diphenyl-1-picrylhydrazyl

ppm- parts per million

ANOVA- Analysis of variance

SAS- Statistical analysis system

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**Development of a low calorie beverage with amla (*Phyllanthus emblica* Linn.)**

**By A.M.C.U. Silva**

## ABSTRACT

*Phyllanthus emblica* (Linn.), known as amla, Indian gooseberry or nelli, is a hardy tropical crop with many proven medicinal properties. As amla is underutilized in Sri Lanka and due to lack of low calorie functional foods available in the market, a squash type low calorie beverage was formulated and the shelf life was determined. A study was conducted to develop a method to preserve amla juice for minimum three months.

The product development was carried out in two stages. The preliminary study involved in development of a method to reduce high astringency of juice, optimization of level of bulking agent and level of sweetener based on sensory evaluation by a trained and screened sensory panel and a panel of consumers who do not consume sugar. After several trials, treatment with gelatin was found to be the best to reduce the astringency and treatment with 0.025% gelatin for 5 hours at 10 °C ± 2 was identified as the suitable condition. The optimal content of bulking agent was 0.1% and the level of sucralose was 150 ppm, as calculated in the diluted drink. The dilution factor was 1:3.5 and it was accepted by the consumer panel.

The second stage was conducted based on the results of the preliminary study with relevant chemical analysis. Application of gelatin was found to be the best treatment to reduce astringency and parameters were adjusted to 0.045 % for one hour at 10 °C ± 2. The bulking agent was 0.2 % and sweetener was 175 ppm as in the diluted drink. the content of amla juice was 40 %.

The shelf life was determined with samples stored at 10 °C ± 2, 30 °C ± 2, 37 °C ± 2 and 42 °C ± 2. The microbiological, sensory and chemical properties were analyzed at two weeks interval for six weeks storage. Shelf life is 134 days at 28 °C storage. The ascorbic acid content, Anti-oxidant activity and colour reduced significantly ($p<0.05$) throughout the storage period, while pH, TSS and acidity were observed to be unchanged. Storage at 25 °C ±2, 30 °C ±2, and 10 °C ±2 will have shelf lives of 160 days, 119 days and 414 days respectively.

Amla juice was extracted and subjected to eight different treatments. They were stored at 28 °C and 10 °C with or without heating to 85 °C and with or without addition of 2000 ppm $SO_2$. Samples stored without any treatment were unacceptable in quality within six weeks. Heated juices could be kept without spoilage up to the end of the study however, were omitted later due to off taste caused by non enzymatic browning. The samples preserved with $SO_2$ remained of significantly high sensory and chemical qualities. Heating juice has inactivated polyphenol oxidases, SMS has prevented ascorbic acid oxidation and refrigeration has lowered rate of chemical deteriorative processes of the amla juice. Treatment of juice with 2000 ppm $SO_2$ and refrigeration was the best method found to preserve amla juice for minimum of three months.