# Production of Gum from Cashew Tree Latex

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**Abstract**

This research is aimed at producing gum from cashew tree latex, which can act as substitute for gum Arabic. The method used include drying and size reduction of the exudates gum, sieving of the gum to remove impurities, dissolution of the gum in distilled water, filtration to remove polysaccharide waste and finally concentration and stability of the gum. Glycerine, starch and Zinc oxide are some of the additives used in stabilizing the gum. The pH and Viscosity on addition of various percentage concentration of stabilizing agent were determined. Gum of the best quality was obtained with viscosity and pH of 4.52 $Ns/m^2$ and 4.2 respectively; this is because the natural pH of gum from *Acacia Senegal* ranges between 3.9 - 4.9. The gum can be used as an alternative for synthetic adhesive used presently for stamps and envelopes.

**Keywords**

Cashew tree latex, Gum production

## Introduction

Substances frequently called gums are hydrocarbons of high molecular mass; others are petroleum products, synthetic polymeric gums, balms and resins. Recently the term *gum* as technically employed in industry refers to plant or microbial polysaccharides and their

derivations that are capable of forming dispersions in cold or hot water producing viscous mixtures or solutions.

The latter references to the gum mean soluble cellulose derivatives and modifications of other polysaccharides that in their original state would be insoluble. Thus, definition of gum can include mucilaginous polysaccharides.

Cashew tree gum represented non-conventional alternatives; the art began in china centuries ago, reaching its climax of development during the period of 1368 - 1644 AD. The resin is synthesized in the epithelia cells having canals and then secreted into these internal cavities. Synthesis generally occurs in all organs of the plant with different qualitative composition, appearing to be genetically controlled and influenced by environmental condition.

Cashew gum is similar to gum Arabic and can be used as a substitute of liquid glue for paper, in the pharmaceutical and cosmetic industries as agglutinant for capsules and pills and in food industry as a stabilizer of juices. It can also be utilized in the making of cashew wines. Cashew gum extraction represents one more source of revenue for the producer in addition to the cashew nut.

Cashew gum is a complex polysaccharides of high molecular mass, on hydrolysis it yields galactose and galacturonic acid. The variation in acid number is influenced not only by the source of the sample but also by its age. The sticky exudates from this tree darkens and thickens rapidly on exposure to air. When applied as a vanish, provides remarkable protection, as is unchanged by acids, alkalis, alcohols or heat up to $70^{o}$C.

The gum is a complex polysaccharide comprising 61% galactose, 14% arabinose, 7% rhamnose, 8% glucose, 5% glucurine acid and 2% other sugar residues. Elementary analysis revealed water content 7.4%, total protein measured about 0.5%, total lipids 0.06 %, fibres 0.95% and ash 0.95%, the total carbohydrate was 98 %. Hydrolysis of cashew gum yields L-arabinose, L-rhamnose, D-galactose and glucuronic acid (Glicksman and Sand, 1973).

### *Uses of Cashew Gum*

Cashew gum is used primarily in industrial application for binding books, as adhesives for envelopes, label, stamps and posters. It is also used as an additive in the manufacture of chewing gum because of its thickening power. It is used as a jellying agent in canned food and jellies for fruit jam.

Cashew gum has an unlimited application in a wide range of products in the cosmetic industry. It is also used as binder in pharmaceuticals, and as stabilizer and thickner in chocolate, milk and in the manufacture of salad dressing.

### *Properties of Gum*

Physical properties:

- Taste and smell: Generally, gums have no odour and may be tasteless; however, some are slightly sweet because of the presence of glycerine.
- Solubility: Most gums yield some amount of insoluble residue when mixed with water.
- Viscosity: This is the thickness of a gum; it is an important factor in determining the quality of the gum, the higher the viscosity the better the gum.
- Colour and firm: The colour of gums varies due to the presence of impurities and the age of the part of the tree, that is tapped.

## Experimental Work

500g of exudates gum sample was collected and dried to reduce the moisture content, the dried sample was grinding to pass through 2.5mm size mesh sieve. The gum was isolated, that is the separation of the polysaccharides present in the raw gum, and this is done by stirring of the gum sample in distilled water for 6 - 8 hours at room temperature. The sample was centrifuged to remove the impurities and concentrated by heating to a temperature of 10oC.

The sample was then stabilized by the use of additives and the properties of gum as measured, i.e gum viscosity, pH and density. The viscosity was measured by the use of viscometer, pH measured by the use of pH meter and density measured by the use of density bottle. Various concentrations of Zinc oxide, starch and glycerine were produced and used in the stabilization and the optimum that gave the best of the gum was noted.

**Results**

*Table 1. Measurement of pH, Density and Viscosity on 25 ml of raw gum*

| Property | pH | Density | Viscosity |
|---|---|---|---|
| Value | 4.74 | 1.05 | 4.82 |
| Measurement unit | - | g/ml | $Ns/m^2$ |

*Table 2. Variation of different composition of zinc oxide on raw gum*

| Sample | Sample volume | Additive of ZnO | pH | Density | Viscosity |
|---|---|---|---|---|---|
| $V_{11}$ | 25 ml | 3 % | 6.32 | 1.03 | 5.07 |
| $V_{12}$ | 25 ml | 5 % | 6.54 | 1.04 | 5.37 |
| $V_{13}$ | 25 ml | 7 % | 6.68 | 1.04 | 5.54 |
| $V_{14}$ | 25 ml | 10 % | 6.72 | 1.04 | 8.01 |

*Table 3. Variation of different composition of starch on raw gum*

| Sample | Sample volume | Additive of starch | pH | Density | Viscosity |
|---|---|---|---|---|---|
| $V_{21}$ | 25 ml | 3 % | 4.53 | 1.03 | 4.67 |
| $V_{22}$ | 25 ml | 5 % | 4.54 | 1.03 | 5.02 |
| $V_{23}$ | 25 ml | 7 % | 4.56 | 1.03 | 7.38 |
| $V_{24}$ | 25 ml | 10 % | 4.72 | 1.03 | 9.56 |

*Table 4. Variation of different composition of glycerine on raw gum*

| Sample | Sample volume | Additive of glycerine | pH | Density | Viscosity |
|---|---|---|---|---|---|
| $V_{31}$ | 25 ml | 3 % | 4.20 | 1.06 | 5.26 |
| $V_{32}$ | 25 ml | 5 % | 4.38 | 1.06 | 6.68 |
| $V_{33}$ | 25 ml | 7 % | 4.47 | 1.08 | 8.44 |
| $V_{34}$ | 25 ml | 10 % | 4.54 | 1.09 | 10.21 |

*Table 5. Variation of different composition of zinc oxide, starch glycerine on raw gum*

| Sample | Sample volume | Additives of ZnO, starch, glycerine | pH | Density | Viscosity |
|---|---|---|---|---|---|
| $V_{41}$ | 25 ml | 3 %, 3%, 5% | 4.20 | 1.05 | 4.52 |
| $V_{42}$ | 25 ml | 5%, 5%, 5% | 4.50 | 1.06 | 4.73 |
| $V_{43}$ | 25 ml | 7%, 7%, 5% | 4.83 | 1.07 | 5.45 |
| $V_{44}$ | 25 ml | 10%, 10%, 5% | 5.30 | 1.08 | 6.78 |

**Discussions**

The result in table 1 shows that the pH and viscosity of natural cashew exudates are 4.74 and 4.82 $Ns/m^2$ respectively, this fall within the natural pH of Acacia Senegal with range 3.9 - 4.9. (Anderson et al, 1990). It was observed that when Zinc oxide was added to the raw

gum, the pH increased to the range 6.3 - 6.7, as shown in table 2, this shows that zinc oxide essentially controls the acidity of the gum thereby acts as a stabilizer. It was also observed the viscosity of the gum increase in the range of 5.07 - 8.01 $Ns/m^2$, which means that zinc oxide also acts as a filter agent in the gum.

When starch was added to the raw gum, the pH of the gum dropped slightly in the range 4.5 - 4.7, when compared with the original gum exudates, while the viscosity increased to the range of 4.67 - 9.56 $Ns/m^2$. Starch thus acts as a binding agent since it increases the thickness of the gum when added to the gum solution. This can be seen in table 3. It can also be seen that the measured densities remain more or less constant and fall a little below that of the original gum solution.

When glycerine was added to the gum solution, the pH of the gum solution dropped in the range 4.2 - 4.5, but the viscosity of the gum rose to its highest value between the ranges of 5.26 - 10.21 $Ns/m^2$ as shown in table 4. On addition of glycerine, the gum became more slippery which suggest that glycerine aids easy spread of the gum. In the last part of the experiment, combinations of additives were used as shown in table 5. In the table, the pH range of the gum is 4.20 - 5.30 and the viscosities of the gum were in the range 4.52 - 6.78 $Ns/m^2$. The best samples were found to be those of V41 and V42 with pH and viscosity of 4.2 and 4.52 $Ns/m^2$, and 4.50 and 4.73$Ns/m^2$ respectively; this is because the pH of these samples fall within the range of pH of Acacia Senegal i.e. 3.9 - 4.9 (Anderson et al, 1990) and they gave satisfactory viscosities. It was shown in the entire results that increase in pH of gum lead to increase in the viscosity of the gum, and the higher the quantity of the additive, the higher the pH and the higher the viscosity of the gum.

## Conclusion

Gum can be produced from cashew tree latex and the use of additives improves substantially, the quality of the gum. The best qualities of gum were obtained with viscosity and pH of 4.52 $Ns/m^2$ and 4.2, with the following composition of additives: zinc oxide 3%, starch 3% and 5 ml glycerine, and gum with pH and viscosity of 4.5 and 4.73$Ns/m^2$ with the following composition of additives: 5% starch, 5% zinc oxide and 5 ml glycerine.

## Recommendation

The gum should be decolorized so, as to get a better gum in terms of colour, and different additives could be tried for sake of comparison.

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