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# Studies on the Glycemic Response and Glycemic Index of Gum Karaya (*Sterculia urens*) Incorporated Biscuits

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***Abstract:*** *Karaya gum is the dried exudate obtained from trees of Sterculia species. Karaya gum is a versatile product and finds use in several industries. It is used in the food industry (bakery products, jellies & candies, meat products, sweet pickles, ketchups, liquor etc.) It is also widely used in pharmaceutical and dental adhesives preparations. It even finds use in paper, leather, cosmetic and textile industries. In the present study, gum karaya was incorporated into biscuits and organoleptic evaluation was carried out on a five point scale by selected panel members. These biscuits were then given to ten healthy subjects to estimate the gylcemic response and for computing the glycemic index of the selected products.*

***Key Words:*** *Karaya gum, glycemic index, organoleptic evaluation*

**Introduction:** The world is endowed with a wide variety of plants, ranging from small herbs to medium sized shrubs, tall trees to creepers on the terrestrial environment and different algae in the aquatic environment. A large number of these plants have therapeutic property and are hence of great medicinal value. In India, Ayurveda has been practiced for several centuries and is known to be highly effective. Many of these medicinal plants used traditionally have been evaluated scientifically and have shown remarkable curative or disease control capacity[2]. For the validation of any traditionally known medicinal plant, *in vitro* and/or *in vivo* studies are imperative to establish their importance and to develop target drug molecules that can be marketed.

Gum karaya is a dried exudation from the stems and branches of *Sterculia urens* Roxburgh and other species of *Sterculia* (Fam. Sterculiaceae) or from *Cochlospermum gossypium* or other species of *Cochlospermum* (Fam. Bixaceae); consisting mainly of high molecular-weight acetylated polysaccharides, which on hydrolysis yield galactose, rhamnose, and galacturonic acid, together with minor amounts of glucuronic acid. It occurs in tears of variable size and in broken irregular pieces having a characteristic semi-crystalline appearance; pale yellow to pinkish brown; translucent and horny. It is used as an Emulsifier, stabilizer, thickening agent etc[3].

Fig.1: Karaya gum from *Sterculia urens*

Fig.2: Karaya gum incorporated Buiscuits

## Materials and Methods:

### a) Collection of Sample:

Gum karaya sample was procured from Girijan Cooperative Corporation Pvt. Ltd., Visakhapatnam for the purpose of the present study.

### b) Development of Biscuits by Incorporation of Gum Karaya:

Snacks were prepared by incorporation of Gum karaya. The commonly consumed traditional snacks, i.e. biscuits were used as a vehicle for incorporation as they are easy to prepare and widely consumed. The snacks developed are hot biscuits. Simultaneously, standard biscuits were prepared for comparison.

### c) Organoleptic Evaluation of the Developed Products:

The developed product was evaluated for sensory characteristics using a 5 point Hedonic scale with the help of selected panel members.

### d) Selection of Subjects for the Experiment of Glycemic Index:

A total of 10 healthy adults were selected for estimation of glycemic response and for computing the glycemic index of the selected products.

### e) Estimation of the Glycemic Response, Area Under the Curve for Blood Glucose and Glycemic Index Value for the Gum Incorporated Product

The blood glucose levels were estimated by Glucometer. The fasting values were obtained after 12 hours of consumption of food and then the sample was given. Then the blood glucose levels were estimated every half an hour till four hours in each subject to know the blood glucose response. The area under the curve (AUC) for standard and test meal was calculated for each and every subject. For this Trapezoid method was used and the glycemic index was calculated by the formula

**Glycemic index= AUC of test meal/AUC of standard x100**

## Results and Discussion:

The present study aimed to incorporate edible gum Karaya in commonly consumed snacks of India and evaluate its effects on sensory characteristics and also to evaluate the Glycemic response, area under the curve for Glycemic response and Glycemic Index of selected product.

When the individual organoleptic characteristics were compared it was found that standard biscuits scored high on color, texture and flavor. Addition of karaya gum did not affect the taste, however the texture was better and the biscuit was found to be crispier while the color was observed to be darker.

The Glycemic Index of the biscuit incorporated with gum Karaya was lower than that of standard biscuit. It was also observed that the glycemic response, when computed for the ten different subjects, lower levels of blood sugar was observed on consumption of the gum incorporated biscuit when compared to the standard biscuit.

The Glycemic Index of the biscuit added with gum Karaya was lower than that of standard biscuit.

Table 1: Blood Glucose Response observed after consumption of Standard Biscuits

| Samples | Blood Sugar | | | | |
|---|---|---|---|---|---|
| | Fasting | 30 Min. | 60 Min. | 90 Min. | 120 Min. |
| 1 | 82 | 140 | 168 | 125 | 91 |
| 2 | 93 | 101 | 100 | 101 | 94 |
| 3 | 82 | 104 | 105 | 98 | 94 |
| 4 | 82 | 101 | 86 | 93 | 78 |
| 5 | 88 | 91 | 108 | 88 | 93 |
| 6 | 91 | 120 | 107 | 95 | 92 |
| 7 | 84 | 101 | 81 | 108 | 93 |
| 8 | 73 | 90 | 86 | 80 | 84 |
| 9 | 86 | 112 | 98 | 94 | 83 |
| 10 | 85 | 99 | 99 | 87 | 88 |

The area under the curve values of following the consumption of standard and gum incorporated biscuits were calculated. For standard biscuit, the highest value was 5955, found in Subject No.1 while the least value 705, observed in Subject No. 2. The area under the curve values for subjects after consumption of gum incorporated biscuits was much lower than that on consumption of the standard biscuit. The highest value was 1380, seen in Subject No. 1, whereas, the lowest value exhibited by Subject No. 4, was 150.

Table 2: Blood Glucose Response observed after consumption of Gum Incorporated Biscuits

| Samples | Blood Sugar | | | | |
|---|---|---|---|---|---|
| | Fasting | 30 Min. | 60 Min. | 90 Min. | 120 Min. |
| 1 | 76 | 95 | 96 | 80 | 84 |
| 2 | 78 | 87 | 100 | 98 | 91 |
| 3 | 87 | 92 | 103 | 96 | 102 |
| 4 | 88 | 88 | 86 | 82 | 81 |
| 5 | 91 | 92 | 98 | 89 | 88 |
| 6 | 86 | 90 | 89 | 86 | 79 |
| 7 | 83 | 93 | 93 | 100 | 92 |
| 8 | 60 | 80 | 80 | 81 | 78 |
| 9 | 67 | 89 | 87 | 86 | 73 |
| 10 | 112 | 86 | 83 | 86 | 82 |

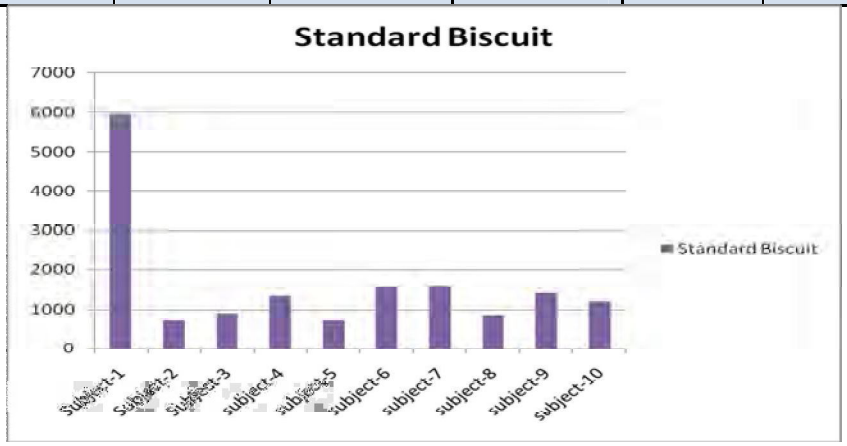


Fig.1: Area Under the Curve Values of all subjects after consumption of Standard Biscuit

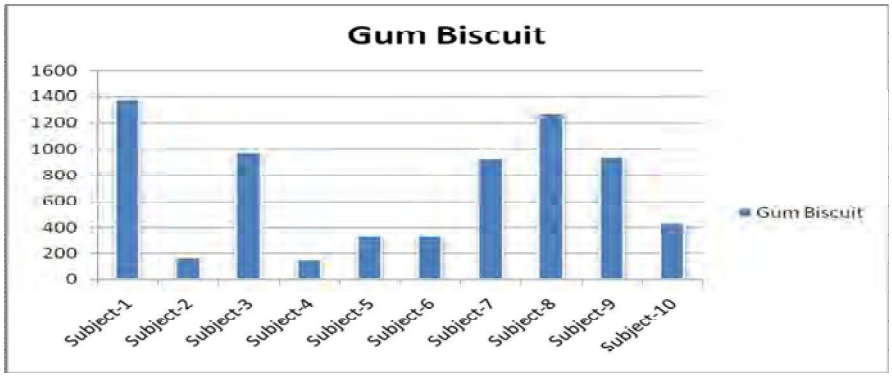


Fig.2: Area Under the Curve Values of all subjects after consumption of Gum Biscuit

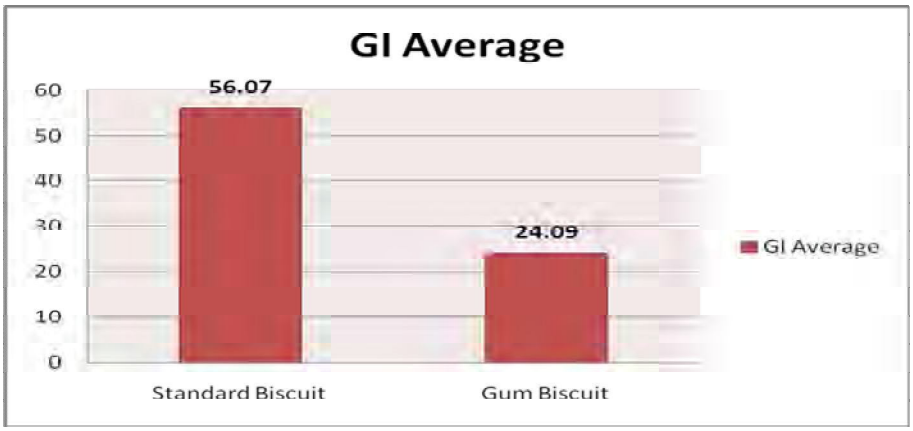


Fig.3: Average Glycemic Index of Standard and Gum Incorporated Biscuits

**Conclusion:** From the present investigation, it can be concluded that incorporation of edible gums like karaya is an innovative option for incorporation into snacks as it causes a marked decrease in the blood glucose levels. In view of the marked decrease in the glycemic response and low Glycemic Index values when compared to the standard products, they can be included in the diets of all the age groups. They can also be included in the diets of juvenile diabetes patients, as addition of purified fiber to carbohydrate test meals has been shown to flatten the Glycemic response in both normal and diabetic volunteers, reduce the insulin requirement in patients on the artificial pancreas and in the longer term reduce urinary glucose lose and improve diabetes control. The mechanism of action appears in part to be due to affect of fiber in slowing absorption rather than by increasing colonic losses of carbohydrate. However, further studies are essential in order to establish the exact mechanism for this glycemic control exhibited.

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