Jackfruit seed powder supplementation attenuates high sugar diet-induced hyperphagia and hyperglycemia in mice

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Introduction

- Jackfruit ranks third in area of cultivation and second in production among the fruits of Bangladesh.

- Jackfruit seeds are normally discarded or sometimes kept for consumption. As jackfruit is highly seasonal and seeds have a shorter shelf life, hence go waste during the seasonal glut.

- Jackfruit seeds are a rich source of carbohydrates, protein, fat, vitamins, minerals, and fiber (Goswami et al., 2010).

- High sugar diets consumption and sedentary lifestyle may induce an excessive body weight gain which accelerates the obesity development (Torres-Villalobos et al., 2015).

- Consuming high-sugar drinks and fast foods frequently could increase the risk of having obesity and diabetes in humans (Oo et al., 2017, El-Wakkad et al., 2012).

- Resistant starch present in jackfruit seeds may control blood sugar and keep the gut healthy (Waghmare et al., 2019).
The present study was conducted-

• to evaluate the potential benefits of jackfruit seed powder (JSP) supplementation to maintain glucose and lipid homeostasis.

• to reveal whether the jackfruit seed powder could prevent the development of metabolic dysregulation caused by high-sugar diet.
Materials and Methods

1. Jackfruit seed powder preparation: Jackfruit seeds were cleaned, dried and ground to prepare jackfruit seed powder (JSP).

2. Experimental animal: 4/5 weeks old healthy adult male mice from ICDDR,B.
3. **Formulation of different types of food:** The following food groups were employed for feeding trial (8 weeks).

| i) Normal Diet (ND) Control Group (Ulla et al., 2016) |
| ii) High sugar diet (HSD) with 30% sucrose |
| iii) High sugar diet (HSD) + 20% Jackfruit seed powder (JSP) |

4. **Data collection:** Body weight, food and water intake, blood glucose, glucose tolerance test (GTT), organ weight and blood parameters were measured.

5. **Data analysis:** Statistical analysis was performed by using unpaired Student’s t-test using Graphpad Prism Software (Graph Pad Software, San Diego, CA, USA).
Mice were allowed to ad libitum access to food. Food intake by mice was measured weekly for a period of 8 weeks. ND: Normal Diet; HSD: High Sugar Diet and JSP: Jackfruit Seed Powder.

* p < 0.05 vs ND; # p < 0.05 vs HSD by one way ANOVA followed by Tukey’s post-hoc test. Bars represent mean ± SEM. n ≥ 3 for each group.

Effect of JSP on food intake of HSD-fed mice

JSP supplementation attenuated HSD-induced hyperphagia.
Effect of JSP on body weight gain of HSD-fed mice

JSP supplementation counteracted the body weight gain in HSD-fed mice
After i.p. administration of glucose (2 mg/kg BW), glucose tolerance test was performed at 55th day of the treatment. Blood glucose content was measured at 0, 15, 30, 60, and 120 min after i.p. glucose administration. The area under the curve (AUC) for glucose tolerance test was quantified.

ND: Normal Diet; HSD: High Sugar Diet; JSP: Jackfruit Seed Powder.

*p < 0.05 vs ND; #p < 0.05 vs HSD by one way ANOVA followed by Tukey’s post hoc test. Bars represent mean ± SEM. n ≥ 3 for each group.

JSP supplementation with HSD improved glucose tolerance.
After 8 weeks of feeding experiment, animals were sacrificed and organs such as (A) Liver, Heart and Kidney, (B) White and Brown adipose tissues were isolated and weighed. ND: Normal Diet; HSD: High Sugar Diet and JSP: Jackfruit Seed Powder.

Effect of JSP on organ weight of HSD-fed mice

JSP supplementation significantly reduced the weight of WAT and liver weight.
JSP supplementation significantly decreased total cholesterol and triglycerides in HSD-fed mice.
Important Findings

JSP supplementation in high sugar diet-fed mice-
✓ significantly reduced food intake and body weight
✓ improved glucose tolerance
✓ significantly decreased the weight of liver and WAT, and
✓ decreased total cholesterol and triglyceride concentration significantly
The jackfruit seed powder could effectively sustain a normoglycemic state against the development of diabetes and obesity.

Jackfruit seed powder can be an alternative or complementary for wheat flour to prepare ready-made food.

Thus, jackfruit seed powder could be potentially used as a supplemental diet to overcome the metabolic dysregulation in addition to achieve food security.