EFFECT OF CARICA PAPAYA SEED EXTRACT ON INTESTINAL METABOLIC CHANGES IN MALE ALBINO RAT

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ABSTRACT:
The administration of Carica papaya seed extraction does not shows much influence on the structural composition of the intestine. The accumulation of carbohydrates and lipids indicate reduced absorption in intestine and suggest that the Carica papaya seed extraction as an antioxidant effect, it also improved the lipid profiles. The elevated lactic acid and pyruvic acid suggest the accumulation and inhibition of stepped-up mobilization of lactic acid into citric acid cycle, the elevated pyruvic acid probably due to higher glycolysis. The enhanced G-6-PDH levels thus denote the probable elevation in the rate of lipogenesis and nucleic acid synthesis.

Key words: Small intestine, Carbohydrates, Proteins, Lipids, Dehydrogenases, Metabolism.

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INTRODUCTION:
Carica papaya is largely used in tropical folk medicines [1,2,3]. The ripe fruit is edible and unripe (which is a rich source of vitamin A) can be eaten cooked [4]. It contains bioactive compounds, namely, Papain, chymopapain, alkaloids, flavonoids, benzyl isothiocyanate and phenolic [1,5]. C. papaya fruits consist mostly of water and carbohydrate, low in calories and rich in natural vitamins and minerals, particularly vitamins A and C, ascorbic acid and potassium [1].

Its seeds also have contraceptive effects in adult male Langur Monkeys, possibly in adult male humans [6,7,8]. The seed of papaya has antimicrobial activity against Trichomonas vaginalis trophozoites. It could also be used in urinogenital disorder like trichomoniasis with care to avoid toxicity [9]. The papaya seed macerate has a clinical potential on conjugal R plasmid transfer from Salmonella typhimurium to Escherichia coli in vitro and in the digestive tract of genotobiotic mice [10]. The seed being consumed offers a cheap, natural, harmless, readily available mono therapy and preventive strategy against intestinal parasitosis [11].

Scientific evidences have shown that C. papaya has the following activities: anti-diabetes [12], diuretic [13], antihyperlipidemic [14], antihelminthic, anti-amoebic [11], contraceptive in mice and rats rats [15,16], hypoglycemic [17], nephroprotective [18], bactericidal [19], wound and burn healing [20], anti-oxidant [21], anti-nociceptive, anti-inflammatory [7] and anti-ulcer [22,23]
The seeds contain sinigrin and caricin, both glycosides, and the enzyme myrosin [24]. Hence, it is necessary to know the biochemical changes in intestine while administering the Carica papaya seed extraction.

MATERIALS AND METHODS:
Healthy adult male Wister strain albino rats (90 days old, weight 180±10g) were administered with 100 mg/kg body wt/day of alcoholic extract of Carica papaya seed through oral route for 15 days by Gavages method. The alcoholic extract was prepared according to WHO protocol CG-04 [25], the seeds were shed-dried, powdered and extracted with 95% ethanol (v/v) at 55-60ºC for 3h. The solvent was distilled under reduced pressure; the resulting mass was dried under vacuum and kept at 24ºC until use. The control animals were given normal saline or sterile distilled water. Both control and experimental rats were maintained under standard animal house facilities, with a temperature of 25±2ºC, and 12-14 h day light, and fed on standard rat feed obtained from Hindustan Lever Ltd., Mumbai, India. Twenty four hours after the last dose, the animals were autopsied and intestine was isolated, chilled immediately and used for biochemical analysis. The dry mater & water content were analyzed gravimetrically. The total proteins [26], Total carbohydrates [27], total lipids [28], glucose [29], glycogen [30], lactic acid [31], Pyruvic acid [32], Succinate dehydrogenase (SDH) [33], Glucose-6-phosphate dehydrogenase [34], Lactate dehydrogenase (LDH) [35,36] were estimated biochemically both in control and experimental rat tissues.

RESULTS AND DISCUSSION:
The administration of Carica papaya seed extraction decreases (-15.44%, P<0.01) the dry mater while increases water content (+7.16%, P<0.05) in intestine. These observations revealed that there was not much influence on the structural composition of the intestine.

Table: 1. Effect of Carica Papaya Seed Extract on Proximate Analysis in Intestine over Control Rats.

<table>
<thead>
<tr>
<th>S.No</th>
<th>Parameter</th>
<th>Control</th>
<th>Papaya seed extract treated</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Dry matter (mg/g wet wt.)</td>
<td>358.70 ±29.51</td>
<td>303.30 ±21.41</td>
<td>-15.44**</td>
</tr>
<tr>
<td>2.</td>
<td>Water content (mg/g wet wt.)</td>
<td>650.43 ±61.29</td>
<td>696.71 ±54.28</td>
<td>+7.16***</td>
</tr>
<tr>
<td>3.</td>
<td>Total Proteins (mg/g wet wt.)</td>
<td>152.75 ±12.01</td>
<td>145.57 ±10.92</td>
<td>-4.70</td>
</tr>
<tr>
<td>4.</td>
<td>Total Carbohydrates (mg/g wet wt.)</td>
<td>84.48 ±0.57</td>
<td>118.77 ±20.08</td>
<td>+40.59*</td>
</tr>
<tr>
<td>5.</td>
<td>Total Lipids (mg/g wet wt.)</td>
<td>30.01 ±2.42</td>
<td>36.66 ±3.21</td>
<td>+22.16*</td>
</tr>
</tbody>
</table>

Mean ± SD of six individual observations.
+ and – indicates percent increase and decrease respectively over control.
* indicates P<0.001, **indicates P<0.01, ***indicates P<0.05 the level of significance.
NS indicates non significant changes.
Most absorption of nutrients and water happen in the intestines. Digested food is now able to pass into the blood vessels in the wall of the intestine through the process of diffusion. The small intestine is the site where most of the nutrients from ingested food are absorbed. Proteins are absorbed in the form of amino acids, carbohydrates are in the form of glucose and glycogen and lipids in the form of fatty acids and glycerol [37]. In the present study accumulation of carbohydrates and lipids indicate reduced absorption in intestine. It was suggested that the Carica papaya seed extract as an antioxidant effect it also improved the lipid profiles [38].

However, no significant changes were noticed in glucose and glycogen. The lactic acid and pyruvic acid contents were significantly elevated. The increased levels of lactic acid over control suggest the accumulation and inhibition of stepped-up mobilization of lactic acid into citric acid cycle. The elevated pyruvic acid concentration probably due to higher Glycolysis [39].

Table: 2. Effect of Carica Papaya Seed extract on the levels of Glucose, Glycogen, Lactic acid and Pyruvic acid in Intestine over Control.

<table>
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</thead>
<tbody>
<tr>
<td>1.</td>
<td>Glucose (mg/g wet wt.)</td>
<td>4.951 ±0.412</td>
<td>4.984 ±0.499</td>
<td>+0.66 NS</td>
</tr>
<tr>
<td>2.</td>
<td>Glycogen (mg/g wet wt.)</td>
<td>4.948 ±0.372</td>
<td>5.065 ±0.478</td>
<td>+2.36 NS</td>
</tr>
<tr>
<td>3.</td>
<td>Lactic acid (mg/g wet wt.)</td>
<td>14.279 ±1.178</td>
<td>15.771 ±1.269</td>
<td>+10.45**</td>
</tr>
<tr>
<td>4.</td>
<td>Pyruvic acid (mg/g wet wt.)</td>
<td>8.225 ±0.781</td>
<td>10.875 ±0.926</td>
<td>+32.22*</td>
</tr>
</tbody>
</table>

Mean ± SD of six individual observations.
+ and − indicates percent increase and decrease respectively over control.
* indicates P<0.001, **indicates P<0.01 the level of significance.
NS indicates non significant changes.

Lactate dehydrogenase (LDH) catalyzes the reduction of Pyruvate to lactate with the concomitant oxidation of NADH to NAD. The intestinal enzymes LDH & SDH were significantly reduced, the reduction is more in LDH, while G-6-PDH was elevated. SDH catalyses the reversible dehydrogenation of Succinate to fumarate. Succinate dehydrogenase is a mitochondrial marker enzyme which links the Krebs’s cycle with the electron transport chain and oxidative phosphorylation. Hence, the assay of SDH would give an indirect idea of the oxygen consumption by mitochondria [40].
Table: 3. Effect of *Carica Papaya* seed extract on the levels of SDH, LDH and G-6-PDH in Intestine over Control.

<table>
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<tr>
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</tr>
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<tbody>
<tr>
<td>1.</td>
<td>Succinate Dehydrogenase (µ moles of formazan formed/mg Protein /hr )</td>
<td>0.347 ±0.025</td>
<td>0.239 ±0.017</td>
<td>-31.12*</td>
</tr>
<tr>
<td>2.</td>
<td>Lactate Dehydrogenase (µ moles of formazan formed/mg Protein /hr )</td>
<td>0.400 ±0.031</td>
<td>0.204 ±0.019</td>
<td>-49.00*</td>
</tr>
<tr>
<td>3.</td>
<td>Glucose-6-Phosphate Dehydrogenase (µ moles of formazan formed/mg Protein /hr )</td>
<td>0.106 ±0.010</td>
<td>0.119 ±0.011</td>
<td>+12.26*</td>
</tr>
</tbody>
</table>

Mean ± SD of six individual observations.
+ and – indicates percent increase and decrease respectively over control.
* indicates P<0.001 the level of significance.

There was enhanced activity of G-6-PDH indicating increased mobilization. This was the first enzyme studied, to find out the extent of mobilization of carbohydrates in the HMP pathway [41]. The elevated levels of this enzyme suggest the possibility of higher rate of operation of hexose mono phosphate pathway which might be due to the increased diversion of hexoses in response to *Carica papaya* seed extract [42]. This increased G-6-PDH thus denotes the probable elevation in the rate of lipogenesis and nucleic acid synthesis. However, the observed increase in the concentration of total lipids in the present study supports the elevation in the rate of lipogenesis.

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http://www.rain-tree.com/papaya.htm


