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Studies on the Impact of Semi-ripe along with Seedless Papaya (*Carica papaya*) Fruits Pulp and Seeds Extract on the Level of Sialic acid in male Albino Rat Reproductive tissue

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The present research investigation intends at investigating the effect of on Sialic acid components in male albino rats of an aqueous extract of seeded papaya fruit pulp and seed extract specified as a combined dose and seedless variety papaya fruit pulp extract. The primary objective of the current research investigation was to evaluate the effects that occurred on male albino Wistar rats of semi-ripe fruit pulp extract from *Carica papaya* (fruits with and without seeds). The development of spermatozoa's ability to fertilise, the coating of spermatozoa with specific antigens, and changes in their membrane surface are all related to Sialic acid. Less spermatozoa cells in the testicular compartments and fewer of these cells are indicated by the decrease in Sialic acid contents in the testis and epididymis of both experimental groups.

Key words: Extracts, Carica papaya, Albino Rat, Testis, Epididymis, Sialic acid

India and other nations have a long history of using medicinal plant products for traditional purposes (Govil, 1998). Papaya seed as well as peel–pulp has a potential for pharmacological raw materials. The data would provide fundamental data for the use of papayas for natural antioxidants also (Yoon *et al*., 2022). Crude extracts from seeds of *Carica papaya* have been shown to induce variable responses depending on the dose duration and route of administration in laboratory animals (Udoh and Kehinde, 1999; Kamal *et al.,* 2003; Verma and Chinoy, 2002). Papaya seeds have a long history of traditional use in various cultures for their medicinal properties (Sharma *et al.*, 2022).

While there is a lengthy history of phytotherapy, a proper scientific explanation is relatively recent. Numerous medicinal herbs both domestically and abroad are linked to antifertility effects (Duke, 1985). Papaya seed n-hexane fraction has potential as a male contraceptive by reducing spermatogenesis activity and decreasing sperm quality in white rats (Sri Nita *et al.,* 2019). Epididymis plays a very important role in male reproduction. The epididymis brings the sperms to maturity since the sperms that emerge from the testes are immature and are incapable of fertilization (Rajalakshmi, 1992). Since the epididymal epithelium is in charge of producing Sialic acid and proteins that are poured straight into the lumen, it is essential that the spermatozoa in the epididymis be exposed to the microenvironment of the organ in order for them to acquire the ability to fertilise and is an active process (Chinoy *et al*., 1995; Johnson *et al*., 2000).

Sialic acid, which covers some antigenic markers and makes sperm negatively charged to prevent aggregation, is directly linked to sperm maturation, capacitation, and sperm-egg identification. These processes boost the survival rate of sperm in the female reproductive canal. It is commonly known that the seeds of the *Carica papaya* plant contain substances that may regulate fertility. Testicular secretory components like glycogen, protein, cholesterol and Sialic acid can be used to determine the functional capacity of the testes (Kamatchouing *et al.,* 2002, Watcho *et al.,* 2004) In rats, rabbits, and langur monkeys, a preclinical, brief assessment employing a range of extraction techniques on the seeds of *C. papaya* demonstrated spermatogenic arrest, resulting in azoospermia, or complete suppression of sperm motility (Lohiya *et al*., 1994, 2006).

MATERIALS AND METHODS

Carica papaya fruits, both seedless and semi-ripe, were purchased commercially from Chennai's wholesale fruit market. The fruit's outer skin and interior seeds were removed and they were then cleaned in double-distilled water. Fruit pulp was cut into slices. Separately, the sliced fruit pulp and seeds were air dried in the shade. Using an electronic blender, the dried chunks of fruit pulp and seeds from the seeded variety and the fruit pulp from the seedless variety were separately ground into a coarse texture. After being macerated in cold water, the pulped fruit was filtered through a fine muslin cloth.

After being collected, the filtrate was dried. The dehydrated substance was stored in a plastic container that sealed tightly. For later usage, the dried fruit pulp and seed fractions were stored in a refrigerator at 40^{o}C. Aqueous extracts of two distinct kinds were made. The required amount of distilled water was used to prepare the fruit pulp of the seedless variety after the fruit pulp and seed of the seeded variety were combined. Before the animals were given the extracts, a new sample of the necessary quantities was taken from the stock.

The King Institute of Preventive Medicine and Research, Guindy, Chennai, was the source of healthy male and female albino Wistar strain rats (*Rattus norvegicus*). In this investigation, rats weighing 155 ± 25g were employed. The animals were kept in regular environmental conditions with adequate ventilation and a temperature of 25±20^{o} C in polypropylene cages with a metal grill top. They received water on demand and were subjected to a 12-hour light–dark cycle.

A regular pelleted meal that was balanced was fed to the animals. Animals received humane treatment. Care and oversight were given during the course of the investigation. Acute oral toxicity studies were conducted in accordance with the CPCSES recommendations to evaluate the harmful effects, establish a tolerance limit,

and establish a safe dosage. Before the rats were given the extracts, they were fasted for three hours. Gastric intubation was used to give the extracts as a single dosage. For every group, there were three sets of six rats. For oral delivery equal parts of fruit pulp power and seeded variety powered seed were removed, blended, and well mixed in distilled water. The extract mixture was administered at doses of 1000mg, 2000mg, 3000mg, 4000mg, and 5000mg / kg bw. The LD_{50} was calculated after 96 hours of observation of mortality (Weis, 1952).

Every day at 9.00 am, the test dose was administered. After dosing, animals were first inspected at least once in the first thirty minutes and then again on occasion in the first twenty-four hours. The fatality rates for dosages of 5000mg, 4000mg, 3000mg, and 2000mg were 100%, 67%, 50%, and 33%, respectively. At a dosage of 1000mg, no mortality was noted. A 50% death rate was noted at 3000mg/kg bw. The mixed preparation was given orally to the rats in experimental group I for duration of 60 days, after which a third of the safe dose for the animals was ascertained.

Testing for toxicity and tolerance limits was also done on rats given papaya fruit pulp of the seedless kind. A dosage of 1000mg, 2000mg, 3000mg, 4000mg, and 5000mg/kg bw was applied to the pulp extract. Mortality rates for 5000mg, 4000mg, 3000mg, and 2000mg dosages were 83%, 67%, 50%, and 17%, respectively. At a dosage of 1000mg, no mortality was noted. There was a 50% death rate reported in 3000mg/kg bw. Rats in the experimental group II were given the aqueous preparation orally for duration of 60 days, with a third of the safe dose being fixed from this. Before mending, the animals were watched for indicators of toxicity and death for 48 hours after treatment.

After determining the tolerance limit for both types of extracts, the experiment's final doses were decided. For the animals in experimental group I, 500mg of dried fruit pulp powder and 500mg of powdered seed from semi-ripe papaya fruit seeds (a total of 1000mg) were dissolved in water (1.0gm dissolved in 1.0ml distilled water). For the animals in experimental group II, 1000mg of fruit pulp powder from seedless papayas was dissolved in water (1.0gm dissolved in 1.0ml distilled water). Throughout the course of the treatment, the animals in each group were given the same dose.

The synthesized extracts were given orally through stomach intonation through the use of an orogastric tube that included a 16-G polyethylene catheter that was equipped with a 10-ml hypodermic syringe. For sixty days in a row, extracts were administered every morning following a 24-hour gap.

Experimental design

Whenever the animals were weighed, they were categorized into three groups on the basis of their weight. Each group featured six animals that were kept in a variety of cages.

Group I: Control: Male animals which got nourishment and hydrated appropriately.

Group II: Experimental group-I: For an entire period of 60 days, oral administration of seeded semi-ripe papaya fruit pulp and seed extract (1000mg/kg body weight/day) has been given to experimental male animals, in conjunction with their usual diet of food and water.

Group III: Experimental group-II: For an entire period of 60 days, oral administration of seedless, semi-ripe papaya fruit pulp extract (1000mg/kg body weight/day) has been given to experimental male animals, in conjunction with their usual diet of food and water.

Before the trial began, the animals were given regular meal and water for 15 days to help them get used to the lab environment. The starting body weights were noted both before and after the intervention. Every day at 9.00 a.m., the semi-ripe papaya fruit pulp and seed extract with seeds and the seedless variety's semi-ripe papaya fruit pulp extract were administered orally via stomach intubation. 24 hours after the final dose was administered, on the 61st day, the animals were sacrificed by cervical dislocation.

The Warren (1959) method was used to estimate the amount of Sialic acid. The data was presented as Mean ± SD and analysed using one way analysis of variance (ANOVA), multiple range tests, and Duncan's test. Using SPSS version 6.0, the statistical significance was tested

at 1% and 5% levels.

RESULTS AND DISCUSSION

The concentrations of Sialic acid in the testis and epididymal tissues of male rats provided papaya fruit pulp and seed extracts are shown in the given Table and Fig. The first experimental group's testis and epididymis Sialic acid contents exhibited a substantial decline ($p < 0.001$). When compared to control animals, the second experimental group's testis revealed a drop, but its epididymis did not change markedly.

Table 1: Effect of Papaya semi-ripe fruit pulp and seed extracts on Sialic acid content in male albino rats.

Tissues	Control - Normal feed and water	Experimental Group – I Seeded papaya - Fruit pulp and seed extract combined	Experimental Group - II Seedless papaya- Fruit pulp extract	F- value	P- value
Testis	7.04 ^{c} ± 0.25	5.80 ^{a} ± 0.26	6.35 ^{b} ± 0.22	969.159	< 0.001**
Epididymis	8.69 ^{b} ± 0.18	6.72 ^{a} ± 0.01	8.21 ^{b} ± 0.17	25.681	< 0.001**

Values are expressed as mg/gm wet tissue; Values are Mean ± SD (n=6) observations; ** denotes significance at 1% level; Different alphabets between groups denotes significance at 5% level using Duncan multiple range test (DMRT); Means carrying at least one common superscript between groups do not differ significantly.

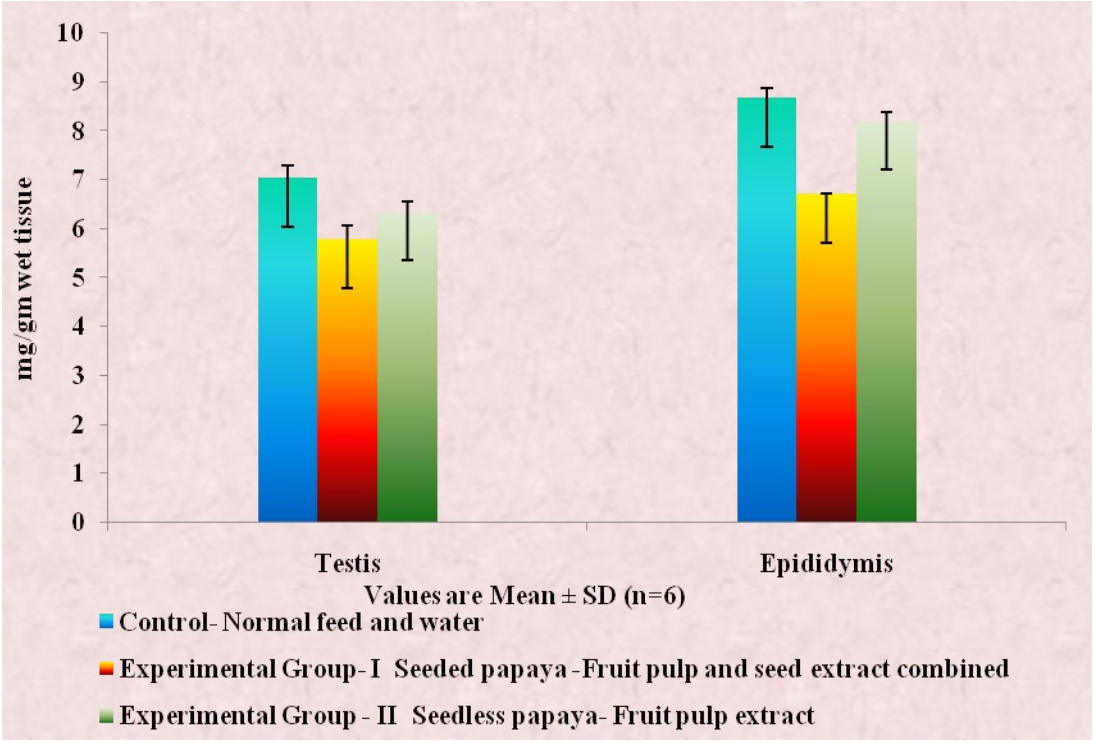

Figure 1. Effect of Carica papaya semi-ripe fruit pulp and seed extract on sialic acid content in male albino rats.

Sialic acid has roles in the development of spermatozoa's propensity to fertilise, the alteration of their membrane surface when they mature and and the coating of spermatozoa with specific antigens (Chauhan and Agarwal, 2009). Less spermatozoa cells in the testicular compartments and fewer male reproductive cells in the epididymal lumen have been shown by the decrease in Sialic acid contents in the testis and epididymis of both experimental groups. In order to enhance the mobility of sperm and diminish friction

between spermatozoa, Sialic acid performs as a lubricant (Riar *et al.,* 1973).

The result are in agreement with those of Riar *et al,* (1973) they also founded similar result. The non-maturing of the sperm is triggered by perturbations in the biochemical mileu of the epididymis (Verma and Chinoy, 2002). There have been no obvious alterations revealed in the epididymis about the animals in Second experimental group.

CONCLUSION

The present study was investigated at the effect of on Sialic acid components in male albino rats of an aqueous extract of seeded papaya fruit pulp and seedless papaya fruit pulp.

The main objective of the current research was to evaluate the effects that occurred on male Albino Wistar rats of semi-ripe fruit pulp extract from *Carica papaya.*

The development of spermatozoa's ability to fertilise, the coating of spermatozoa with specific antigens, and changes in their membrane surface are all related to Sialic acid.

Less spermatozoa cells in the testicular compartments and fewer of these cells are indicated by the decrease in Sialic acid contents in the testis and epididymis of both experimental groups.

CONFLICTS OF INTEREST

The authors declare that they have no potential conflicts of interest.

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