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# *JUSTICIA CARNEA* LEAF EXTRACT IMPROVES INTESTINAL TRANSIT IN HIGH-FAT DIET INDUCED DELAYED GUT MOTILITY IN WISTAR RATS

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**ABSTRACT**

The composition of a diet largely affects the motility and secretory activities of the gastrointestinal tract. The aim of this study was to determine the effect of *Justicia carnea* (JC) leaf extract on percentage intestinal transit in high-fat diet fed wistar rats. The study involved a total of twenty-five wistar rats separated into five groups of five rats each. Group 1 served as control while groups 2 to 5 were fed with high-fat diet (HFD) throughout the period of the experiment. Group 2 remained untreated, Groups 3, 4 and 5 received respectively 200mg/kg, 500mg/kg and 1000mg/kg of JC extract. The animals were fed with the extract for twenty-eight days and thereafter intestinal transit was measured using standard protocols. Results showed that HFD caused significant reduction in intestinal transit. However, all the concentrations of JC significantly improved intestinal motility in a dose-dependent fashion such that the lowest dose had better outcome than the higher doses (i.e. 200mg/kg>500mg/kg>1000mg/kg). Conclusively, the present study suggests that moderate consumption of JC could improve intestinal transit and thus ameliorate the delayed intestinal motility associated with HFD. Our findings provide a reference for the use of *Justicia carnea* in management of constipation-associated medical disorders.

**KEYWORDS:** *Justicia carnea*, high-fat diet, intestinal transit delayed gut motility.

## INTRODUCTION

In many food cultures, lipids are commonly added to food either during preparation or when serving. These can erroneously be added in very large amounts or in some forms regarded as high-fat diet. The high-fat diets are mainly flour or margarine-based highly processed foods[1] sold in many fast-food restaurants. Gastrointestinal motility is usually described in terms of regional transit times or as intraluminal pressure changes. Dietary habits and food preparation methods may influence both motility and secretory activities of the gastrointestinal tract.[2,3] The transit of food through the stomach, small intestine and colon is essential for digestion and absorption of nutrients as well as excretion of waste products in faeces. Intestinal transit time is an important factor to consider when determining the amount of nutrients absorbed throughout the intestine.[4,5,6] Prolonged transit time will increase the duration of exposure of the chyme to the absorptive surfaces and therefore more absorption will occur[7] leading to weight gain. When the transit time is rapid (as may occur in diarrhoea), there will be less time allowed for absorption and consequently weight loss. Despite the activities of several physiologic systems involved in body weight homeostasis, consumption of large amounts of dietary fats increases the storage of fats in fat depots in the body.[8]

Transit time is measured by different techniques, including the ingestion of a substance that can be tracked as it travels along the gastrointestinal tract or seen upon elimination from the body.[9,10,11,12] The measurement of intestinal transit time is dependent on the frequency of bowel movements as well as the composition and other characteristics of the meal ingested.[11,13] Another indirect method of assessing transit time is the Bristol stool chart, which describes the different types of stool shapes.[14] Using this chart, some studies have shown a correlation between stool shape, consistency and transit time.[15,16,17] The implication of this is that people with more prolonged transit time will tend to pass hard, lumpy stools while persons with shorter or more rapid transit time will tend to pass loose stools.

Studies have shown that consumption of a diet with high concentration of fats has the capacity to modulate the gastrointestinal responses to the ingested fat and ultimately alter the appetite regulation mechanisms

resulting in obesity.[18,19,20] Upper intestinal transit consists of gastric emptying and small intestinal motility. These play primary role in satiety, appetite regulation, glycaemic control and intestine hormone signalling.[21,22] Gastroparesis, constipation, irritable bowel syndrome, and functional dyspepsia are associated with alterations in gastrointestinal transit of food, chyme, and residue. Assessment of regional (e.g., gastric, small intestinal, or colonic) transit or whole intestinal transit time may be useful in the diagnosis and management of these disorders.[23]

The use of medicinal plants for the treatment of induced fat disturbances remains greatly unexplored and might be a strategic key in the development of effective drugs safe for human consumption. Extracts of plants which are defined as raw or refined products gotten from parts of plants (such as tubers, stems, roots, leaves, flowers, buds) are used frequently in the management of diseases.[24] The plant, *Justicia carnea* is endowed with many beneficial effects as it has often been described as a 'wonder' plant.[25]

The aim of this research is to evaluate the effect of the hydro-methanolic leaf extract of J*usticia carnea* on intestinal transit in high-fat diet fed wistar rats.

## MATERIALS AND METHODS

The study involved 25 male wistar rats weighing 200 to 240g and separated into five groups of five rats each. Ethical approval was obtained from the university of Port Harcourt Ethics committee (UPH/CEREMAD/REC/MM82/030). The leaves of *Justicia carnea* used in this study were identified and authenticated in the Plant Science and Biotechnology department, University of Port Harcourt. Thereafter the leaves were processed to prepare the extract used for the study. High-fat diet was used to induce delayed motility in groups 2 to 5. The groups include.

Group 1 served as control (Normal animal feed and water).
Group 2 (High fat diet and water)
Group 3 (High fat diet + 200mg/kg of body weight of extract)
Group 4 (High fat diet + 500mg/kg body weight of extract)
Group 5 (High fat diet + 1000mg /kg body weight of extract).

The animals were fed with the extract for 28 days and thereafter intestinal transit was measured using standard protocols. Intestinal motility was determined according to the method adopted by Charles *et al*., 2024[26] on the 28th day as follows; For each experimental group, the extract was administered together with a mixture of Evans blue dye and Arabic gum and allowed for one hour. Each animal was thereafter, anesthetized and the intestines dissected out. The total length of the intestine as well as the distance travelled by the test meal from the pyloric sphincter was measured and recorded. Intestinal transit in one hour was expressed as the percentage of the distance travelled by the test meal to the total length of the intestine.

Statistical package for social sciences (SPSS) version 22.0 was used for data analysis. Results were presented in a graph. Variables were expressed as percentages. Statistical difference was determined using analysis of variance (ANOVA) and at $p < 0.05$.

## RESULTS AND DISCUSSION

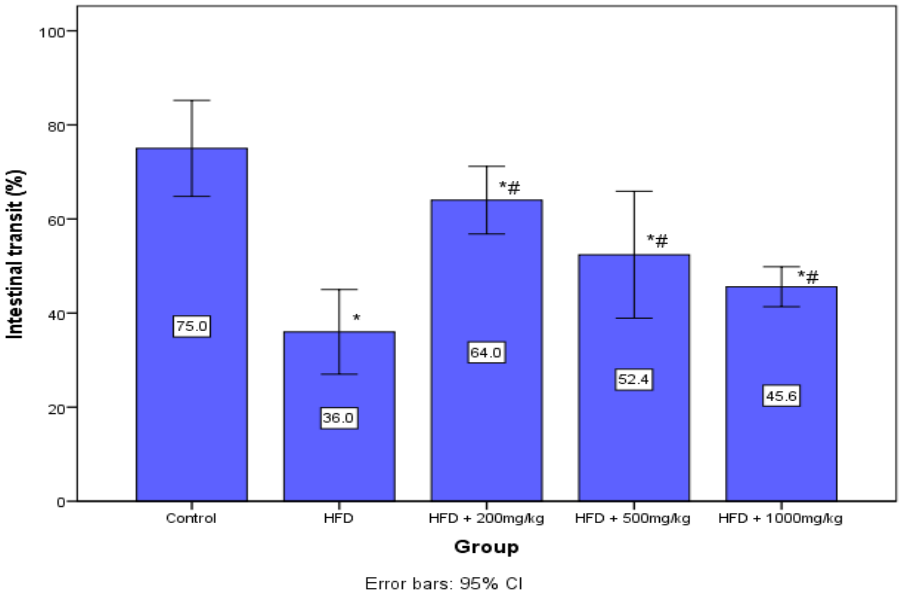


**Fig. 1: Effect of *Justicia carnea* leaf extract on percentage intestinal transit (in one hour) of rats fed with high-fat diet.**

Results showed that High-fat diet (HFD) induced delayed intestinal motility in the experimental groups. As shown in Fig. 1, there was significant reduction in the percentage intestinal transit in all the groups that received HFD compared to their control. Our findings agree with other studies which demonstrated reduced intestinal motility following administration of high fat diet.[27,28,29] Studies suggest that HFD can cause increased stimulation of cholecystokinin (CCK) release.[30,31,32] CCK is involved in the physiologic regulation of gastric emptying and gastric motility[33,34] and mediates inhibition of food intake. In HFD-induced obesity, there is reduced number of enterochromaffin cells resulting in less availability of serotonin in the colon[35,36,37] and thus reduced motility which is partly responsible for the constipation often associated with consumption of HFD.

In the present study, different concentrations (200mg/kg, 500mg/kg and 1000mg/kg) of the leaf extract of *Justicia carnea* (JC) were respectively added to HFD feeding in wistar rats. All the concentrations given (as in groups 3, 4 and 5) caused significant increase in the percentage intestinal transit compared to group 2 (high-fat diet only group). A dose-dependent pattern is noted in the JC effect on intestinal transit such that the animals fed with the lowest dose had better outcome than the higher doses (i.e. 200mg/kg > 500mg/kg > 1000mg/kg) suggesting a possible laxative effect at low doses. Therefore, moderate consumption of JC would improve the intestinal transit and thus ameliorate the delayed intestinal motility associated with HFD. This effect of JC on intestinal transit is beneficial in the management of constipation-related medical conditions. The mechanism by which JC improves intestinal transit has not been well studied. However, the plant is endowed with numerous phytochemical components.[38,39] The alkaloids and flavonoids components of the extract may stimulate intestinal motility by influencing the electrical activity of intestinal smooth muscles.[40,41]

Conclusively, the results from the present study suggest that moderate consumption of JC could improve intestinal motility in HFD fed wistar rats. Our findings provide a reference for the use of *Justicia carnea* in management of constipation-associated medical disorders.

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