LC50 of *Carica papaya* on Continuous Utilization of Pawpaw Leaf in *Drosophila melanogaster*

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ABSTRACT

This study evaluated the LC_{50} and long-term effects of *Carica papaya* (pawpaw) leaf ethanolic extract on *Drosophila melanogaster*. Fresh leaves were collected from the University of Jos, Plateau State, Nigeria, identified in the Department of Plant Science, air-dried, pulverized, and extracted by maceration in distilled water. The extract was concentrated to dryness and incorporated into standard cornmeal diet. Adult *D. melanogaster* (Harwich strain) were reared at 25 °C under a 12 h light/dark cycle and exposed to experimental diets containing graded concentrations of *C. papaya* extract. Pilot assays were conducted to establish non-lethal concentrations before survival and toxicity tests. At 168 hours, the ethanolic leaf extract caused 100% mortality at concentrations of 250–1000 mg/10 g diet, with an LC_{50} determined at 108.3 mg/10 g diet. Prolonged exposure for 28 days at sub-lethal doses significantly ($p < 0.05$) reduced the lifespan of flies compared to the control. Although the extract exhibited a moderately high LC_{50}, suggesting limited acute toxicity, continuous utilization revealed dose-dependent negative effects on longevity. The findings indicate that pawpaw leaf ethanolic extract is not acutely toxic to *D. melanogaster*.

DESCRIPTION OF PROBLEM

Tenderness is an important determinant of meat quality and consumer acceptance [1]. Since aging meat to improve tenderness adds cost to the industry, natural proteolytic enzymes such as turmeric, pineapple, ginger, and pawpaw leaves have been suggested as effective tenderizers [2]. *Carica papaya* Linn. (Caricaceae) is widely cultivated for its fruit, while its leaves, seeds, roots, and bark are traditionally used in medicine to treat various ailments, including digestive disorders, malaria, urinary tract issues, and parasitic infections [3]. Given its wide dietary and medicinal use, toxicity evaluation of *C. papaya* leaves is necessary. *Drosophila melanogaster* (fruit flies), a well-established model organism with genetic similarities to humans [4 & 5] provides an effective platform for studying phytochemicals, disease processes, and toxicity. This study therefore investigates toxicity (LC50) responses on *D. melanogaster* exposed to crude ethanol extracts of *C. papaya*.

MATERIALS AND METHOD

Collection of plant material

Carica papaya leaves were collected from Senior Staff Quarters, University of Jos Plateau State, Nigeria. The plant was taken to the Department of Plant Science, University of Jos for proper identification.

Extraction of Plant material

Method of Extraction: Collected flesh leaves of *Carica papaya* was weighed and allowed to dry in normal room temperature (to avoid denaturation of active elements). The dry weight was recorded and used for Moisture content estimation. The surface area of dried Leave *C. papaya* was reduced to fine powder by grinding or pounding using mortar, pestle and sieve. The weight of the fine powdered leave and bark was scored and taken for maceration in distilled water for 72hrs. The Mixture was then filtered and the filtrate was concentrated to dryness. The dried extract was weighed and used for total yield estimation.

Fly culture and strain: Flies were obtained from the Drosophila research laboratory of the Africa Centre of Excellence in Phytomedicine Research and Development (ACEPRD), University of Jos, Plateau state. The flies are of the Harwich strain.

All flies were maintained at 25 °C with 12 hour on/off light cycle in vials containing standard cornmeal medium.

Fly stock diet preparation: Flies were maintained on standard fly diet containing corn meal, yeast, agar-agar, methylparaben, and water. To prepare corn meal diet for culture bottles; a total of 1700ml of water is required. 1000ml is measured into a cooking pot and allowed to boil for ten minutes. Agar (10g) was then added to the boiling water and stirred for ten minutes. The corn meal powder (100g) was dissolved in water. The yeast (20g) was dissolved in warm water. The Methylparaben was dissolved in ethanol. The dissolved corn meal was then added to the boiling agar and stirred for ten minutes. The solution containing the dissolved yeast was also added to the mixture of corn meal and agar and was stirred for ten minutes. After which the solution was allowed to boil. Methylparaben was later added when the diet became lukewarm. On completion of diet preparation, the diet is poured into the culture or treatment bottles as required.

Experimental Conditions: 2-3 days adult flies were collected under mild ice anesthesia from stock vials and distributed in groups of 25 onto experimental food conditions. Each experimental vial contained 50 flies and approximately l0mL of the appropriate food. The flies were passed to vials containing new food approximately every 48 hours to ensure consistent food quality.

Pilot Assay: Pilot Assay was conducted to determine the suitable concentration *Carica papaya* leaf extract that would not result to outright mortality of Drosophila melanogaster within a specified period of time; etc. L.C obtained was used for the survival assay and treatment [6].

RESULTS AND DISCUSSIONS

168 Hours LC50 of *C. papaya* in *D. melanogaster*

168 hours LC50 of *C. papaya* ethanolic leaf extract showed 100% mortality of *D. melanogaster* treated with 250 mg, 500 mg and 1000 mg/10 g diet. The 168 hours LC50, the concentration that can kill 50% was determined to be 108.3 mg/10 g diet as shown in Figure 1.

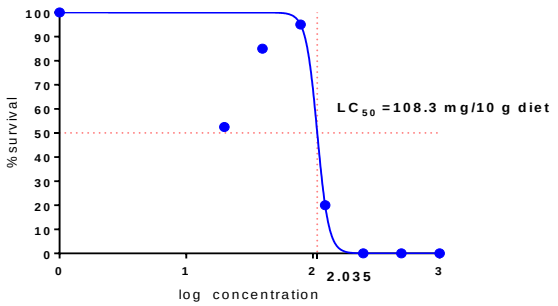

Figure 1: 168 hours LC50 of *Carica papaya* Ethanolic Leaf Extract (168hrs LC_{50}=108.3mg/10g diet).

168 Hours LC_{50} and 28 Days Survival Assay

Plant extract can be beneficial or detrimental to a living organism either by ingestion, inhalation or contact; the detriments of ingesting toxic plants are many ranging from malfunctioning of the system, immune-suppression and short life span while benefits of some plant extracts ranged from being protective, medicinal (preventive and curative activity) to longevity activity [7]. A plant extract with low LC_{50} is known to be very toxic while that with high LC_{50} is known to be less or non-toxic. From this study, 168 hour LC_{50} of *Carica papaya* ethanolic leaf extract was determined to 108.3 mg/10 g diet, which is a concentration that can kill 50% of test organisms. This high LC_{50} might suggest low toxic activity of this extract. To further establish the safety of this extract, flies were exposed to concentrations far below the LC50 for 28 days and our result revealed the significant decrease ($p<0.05$) on life expectancy. The extract significantly decreases ($P<0.05$) the life span of flies with increase in concentration compared to the control group.

Conclusion and Application

The ethanolic leaf extract of *Carica papaya* exhibited a relatively high LC_{50} value (108.3 mg/10 g diet over 168 hours), suggesting low acute toxicity. However, prolonged exposure to sub-lethal concentrations significantly reduced the life span of test flies in a dose-dependent manner. This indicates that while the extract may be considered safe in terms of immediate toxicity, it possesses potential chronic toxic effects that could compromise long-term survival.

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