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Effect of *Croton penduliflorus* on Intestinal Enzymes Activities

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Nutrients are the chemical substances required for proper metabolism, they protect the body from number of disease probably via preventing the damages to lipids, proteins, DNA, amino acids etc. (Fang *et al*., 2002). These can act as antioxidants and should be included in diet to ensure good health; some of these nutrients are arginine, citrulline, phenols, selenium, zinc, vitamins etc. Nutrients play an essential role in immunity; they start the immunity responses and end them appropriately after completing the task (Percival, 2009, 2011; Soliman and El-Shenawy, 2003). As gamma delta T cells are important part of first line defense action against pathogens, their activity enhances when the plant-derived nutrients are used. These nutrients also reduce the flu and cold severity, hence played multiple roles in enhancing immunity. But improper nutrition results in obesity and several cognitive disorders, they can be treated through properly following the nutrition rules (Morris, 2011). Hence a good nutrition is necessary to well maintain the body health. Usually the metabolism of lipids and proteins changes with age; oxidative stress increases and enzymes activity declines in elders (Lawton *et al*., 2008). The decreased enzyme activity may have caused these changes in metabolism and lowered the availability of energy. As in mice various gut enzymes e.g., lactase, sucrase, and maltase were less active in mature gut, these activities decreased with the age of gut (Batcic *et al*., 2008). This can affect the energy transduction in rats as these enzymes metabolize various disaccharides of body. These enzymatic activities are dependent on the type of nutrition and their lower activity can cause severe gastrointestinal disease in infants (Thymann *et al*., 2009). The preterm pigs (model for human diseases) fed with maltodextrin have lower activities of lactase, maltase and aminopeptidase enzymes, which increases the chances of gastrointestinal disorder. Moreover bad nutrition (high fat) during pregnancy lowers the activity of disaccharidase in intestine associated with increased membrane permeability, which results in the birth of fatty infants (Fak *et al*., 2011). This fat diet also results in increased inflammation of infants due to high production of acute-phase proteins and haptoglobin. As nutrition plays a major role in determining the health status, hence nutritional plans should be properly planned, necessarily at critical stages of growth.

Plants are rich source of antioxidants which can act as enzyme regulators and can increase or decrease enzyme's activity to protect the body from metabolic imbalance (Baramisrinivasan *et al*., 2009). According to Oyesola *et al*. (2009) *Croton penduliflorus* implementation was helpful in maintaining the gut's enzymatic activities during pregnancy. Its methanolic extracts (550 mg kg^{-1} b.wt.) upon oral induction reduced the sucrase and lactase activity in non pregnant rat's gut, while lactase activity remained unchanged. Whereas in pregnant rats it showed a different mode of action; it regulated the enzymes activity differently at different stages of pregnancy. As its implementation at early and later stages reduced the sucrase activity with increased maltase and lactase activity, when compared to non plant treated pregnant animals. While, at mid stage these extracts increased the sucrase and maltase activity with reduced lactase activity. These enzymatic activities in particular stage were different from non plant treated animals of relative stage pregnancy. Throughout pregnancy the enzymes activities were increased, but the rate of increment was different at different stage. These different activities may be due to varying food digestion requirements and plant derived increased or decreased enzymatic activities maintained these digestions. These regulatory effects enhanced the gut growth as high enzymatic activities were the characteristics of growing gut. Moreover total protein and albumin contents were changed during pregnancy and high protein contents were observed at mid stage while highest albumin contents were observable during late stage. Plants extracts changed these concentrations and in non pregnant rats it decreased the protein levels with unchanged albumin contents. While in pregnant rats these extracts caused a significant increase in protein contents during late stage and albumin concentration were raised during early and mid stages. Thus *C. penduliflorus* methanolic extracts showed the enzymes, proteins and albumin regulatory activity to modulate the metabolism of rats, associated with increased growth of intestine. Its increased enzymatic activities might be responsible for the increased nutrient availability to rats and fetuses.

Nutrients play a crucial role in proper functioning of body's metabolism; they are important regulators of

immunity and growth. Some of these nutrients are obtained from food, which help in determining the healthy and non healthy condition of an individual. As poor nourishment severely affects the health of newborn and one can get various ailments. Plants being the part of nutrition serve as protective shield of human body and regulate the enzymes activity (Karim *et al*., 2011; Sohail *et al*., 2011). As Oyesola *et al*. (2009) through their experiments proposed that *C. penduliflorus* could act as regulator of gut enzymes. Its application increased the enzymes levels in pregnant rats depending of the stage of pregnancy, which could help in maintaining the nutrient supply to rats and fetuses. More research on *C. penduliflorus* caused enzyme regulation will help in understanding its role in pregnant rats.

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