



COMPARATIVE NEPHROPROTECTIVE EFFECT OF CINNAMOMUM CASSIA AND ZINGIBER OFFICINAL ON DIABETIC RAT

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ABSTRACT Diabetes is exponentially growing disease in developed and developing country in last few decades. Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycaemia. Alloxan were introduced intra-peritoneally @ 125 mg/kg/b.w to prepare diabetic model. Diabetic control group rat were treated with distilled water while diabetic rat were treated with *Cinnamomum cassia* @ 50 mg/kg/b.w and *Zingiber officinale* @ 200 mg/kg/b.w separately for 8 weeks. Glucose level was increased many folds in diabetic rat. Urea, uric acid, creatinine and LPO were increased in diabetic group of rat. Cinnamon and ginger restores urea, uric acid, creatinine and LPO effectively after 8 weeks of administration. It is concluded from entire study that cinnamon and ginger both acts very effectively against diabetes on biochemical parameters of rat. Both restore glucose level to normal level. Cinnamon effectively restores KFT and LPO very well in comparison to ginger administered group. It was evident from study that cinnamon causes more effective restoration in biochemical parameters of rat.

KEYWORDS : Lpo, Metabolic Disorders, Hyperglycemia, alloxan

1. INTRODUCTION

Diabetes is exponentially increases in developed and developing country and increased exponentially in last few decades. It is a global health problem. Diabetes mellitus is a metabolic disorder characterized by chronic hyperglycaemia with disturbances of carbohydrate, fat and protein metabolism resulting from defects in insulin secretion, insulin action, or both (WHO, 1999). Macroangiopathy is more characteristic of diabetes mellitus. Diabetes has defecting consequences on male reproductive system including testicular function, sperm maturation and sexual hormone alteration (Arikawe et al., 2012, Trindade et al. 2013).

Medicinal plants have potential to treat many diseases. Cinnamon has contained pharmacological properties such as antioxidant and antibacterial effects and cinnamon enhance the production of insulin (Lopez P et al., 2005). Cinnamon has potent neuroprotective, hepatoprotective, cardioprotective and gastroprotective effects due to its potent antioxidant and anti-inflammatory properties (Alqasoumi, et al).

Ginger enhances resistance to infectious disease by increasing non-specific and specific immune mechanisms (Harikrishnan et al., 2011). Ginger is used for reweaving pain and an anti-inflammatory agent. It is also useful in curing ulcer and preventing heart attack and stroke. (Shubha, 2015). Ginger provides direct adaptogenic effect by preventing oxidative stress on smooth muscles of intestine (Banji, 2014). Thus the present study is designed to illustrate comparative nephroprotective effect of *Cinnamomum cassia* and *Zingiber officinale* on diabetic rat

2. MATERIAL AND METHOD

2.1: ANIMAL; -

The rat (*Charls foster*) were reared in animal house. The rat selected for the study was 12 weeks old with 30±2 gm body weight. The rat was housed at controlled environmental conditions i.e. at 22±2°C temperature, 50±10% relative humidity and 12h dark-light cycle. All experiments were conducted as per the guidelines of CPCSEA (Committee for the Purpose of Control and Supervision of Experiments on Animals).

2.2: CHEMICAL; -

Alloxan, purchased by Loba chem Pvt. Ltd., Mumbai was utilized for the experimental design and preparation of diabetic model.

2.3: MEDICINAL PLANT USED; -

Aqueous bark extract of *Cinnamomum cassia* @ 50 mg/kg b.w. and aqueous rhizome extract of *Zingiber officinale* @ 200 mg/kg b.w. were orally administered to diabetic group of rat for 8 weeks. Fresh barks of *Cinnamomum cassia* and rhizome of *Zingiber officinale* were purchased from herbal store in Patna, India and identified by botanist.

Diabetic control group rat were treated with distilled water while diabetic rat were treated with *Cinnamomum cassia* and *Zingiber officinale* separately for 8 weeks. Animals were sacrificed on 4th and 8th week of *Cinnamomum cassia* and *Zingiber officinale* administration. Blood were collected for biochemical analysis of glucose, urea, uric acid, creatinine and LPO.

3. RESULTS

3.1: BIOCHEMICAL ANALYSIS

In control group glucose level was 99 ± 4.93 while in diabetic group it was 482 ± 47.51. In *Zingiber officinale* 4 weeks and 8 weeks administrated groups it was 115.3 ± 9.01 mg/dl and 96.33 ± 3.84 mg/dl respectively. *Cinnamomum Cassia* 4 weeks and 8 weeks administrated group it was 108.7 ± 6.36 mg/dl and 91 ± 1.73 mg/dl (Graph-1).

In control group urea level was 18 ± 1.73 mg/dl while in diabetic groups it was 40.33 ± 2.64 mg/dl. *Zingiber officinale* 4 weeks and 8 weeks administrated groups it was 44 ± 2.64 mg/dl and 34.33 ± 3.83 mg/dl. *Cinnamomum cassia* 4 weeks and 8 weeks administrated groups it was 33.33 ± 1.85 mg/dl and 19 ± 2.08 mg/dl respectively (Graph-2).

In control group uric acid level was 3.90 ± 0.52 while in diabetic group it was 10.32 ± 1.28 mg/dl. *Zingiber officinale* 4 weeks and 8 weeks administrated groups it was 5.20 ± 0.20 mg/dl and 4.16 ± 0.21 mg/dl respectively. *Cinnamomum cassia* 4 weeks and 8 weeks administrated groups it was 5.06 ± 0.08 mg/dl and 4.16 ± 0.14 mg/dl respectively (Graph-3).

In control group creatinine level was 0.80 ± 0.05 mg/dl while in diabetic group it was 2.15 ± 0.08 mg/dl. *Zingiber officinale* 4 weeks and 8 weeks administrated groups it was 2.01 ± 0.06 mg/dl and 4.16 ± 0.21 mg/dl respectively. *Cinnamomum cassia* 4 weeks and 8 weeks administrated groups it was 5.06 ± 0.08 mg/dl and 4.16 ± 0.14 mg/dl respectively (Graph-4).

In control group lipid peroxidation (melanoaldehyde) level was 2.43 ±

0.37 while in diabetic group it was 41 ± 2.30 . *Zingiber officinale* 4 weeks and 8 weeks administrated groups it was 8.16 ± 0.44 mg/dl and 7.10 ± 0.50 mg/dl respectively. *Cinnamomum cassia* 4 weeks and 8 weeks administrated groups it was 8.33 ± 0.33 mg/dl and 5.06 ± 0.08 respectively (Graph - 5).

4. DISCUSSION

Cinnamon extract caused marked decrease in degenerated parts of liver with significant reduction in levels of AST, ALT, and total bilirubin (Moselhy, and Junbi, 2011). Methanolic extract of cinnamon showed a significant decrease in serum urea, creatinine, uric acid, and urine albumin and increase in urine creatinine (Kumar et al 2014). Cinnamon extract also shows a slight, insignificant rise in SGPT, SGOT and ALP. The renal function showed that an increase in serum urea, creatinine, uric acid, and urine albumin was disrupted by diabetes. In our present study cinnamon causes effective restoration in biochemical parameters of kidney of rat. It restores lipid peroxidation level very effectively.

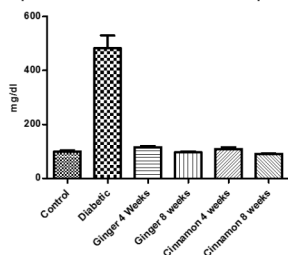
Pathological changes in kidney and pancreas as a result of diabetes were reported while treatment with methanolic extract restored the altered tissues nearly to the normal conditions. (Ullah et al.2012). Cinnamon protects the renal tubular cells injuries and blood glucose regulating property. While nephropathy complications were also reduced in cinnamon treated group (Hyeon et al, 2006). In our study urea, uric acid and creatinine were restored significantly after cinnamon administration.

Ginger significant lowering of serum AST, ALT, ALP and tissue lipid peroxide levels. Ginger administration reduces blood glucose level, reduction of serum urea and creatinine level (Srinivasan, 2014). In our study we have observed very effective restoration in glucose level after 8 weeks of ginger administration. Ginger was proved more potent nephroprotective agent in both acute and chronic renal failure (Mahmoud et al., 2012; Swaroopa, 2013). In our present study urea, uric acid and creatinine were restored very effectively in ginger administered group. The decrease in GPX (Glutathione peroxidase) activity was due to lead toxicity. Ginger extract treated groups showed a significant increase of kidney GPX activity (Shalaby and Hamowieh, 2010). We also observed effective restoration in LPO in ginger administered group. In the gingerol treated cells, insulin-sensitive glucose uptake was increased. It is expected that ginger enhances the insulin-sensitivity, and improves chronic disease, such as diabetes (Ghayar et al., 2005)

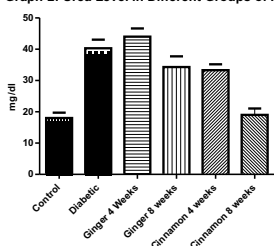
5. CONCLUSIONS:

It is concluded from entire study that cinnamon and ginger both acts very effectively against diabetes on biochemical parameters of kidney of rat. Both restore glucose level up to normal. Cinnamon acts effectively on urea, uric acid and creatinine while ginger does more effectively restoration in creatinine and LPO. It was evident from study that *Cinnamomum cassia* causes more effective restoration in kidney function test of rat and reduces nephrotoxicity more effectively in comparison to *Zingiber officinale*.

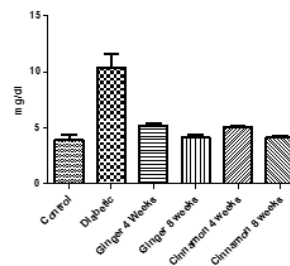
Graph-1: Glucose Level in Different Groups of Rat



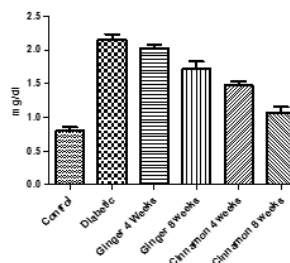
Graph-2: Urea Level in Different Groups of Rat



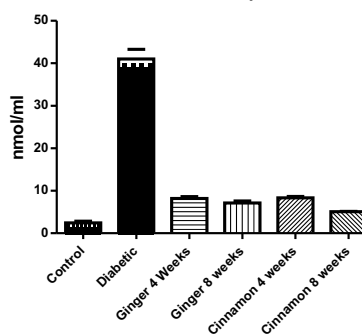
Graph-3: Uric Acid Level in Different Groups of Rat



Graph-4: Creatinine Level in Different Groups of Rat



Graph-5: Lipid peroxidation Level in Different Groups of Rat



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