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Effects of Trigonella foenum graecum and sodium orthovanadate on Altered Renal Membrane Functions in Alloxan Diabetic Rats

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Objectives: The present study was carried out to observe, the antihyperglycemic and renoprotective effect of sodium orthovanadate (SOV) and *Trigonella foenum graecum* seed powder (TSP) administration on blood glucose, renal functions, expression of glucose transporter , DNA fragmentation, inflammatory cytokines and oxidative stress markers in kidney tissues and to see whether the treatment with SOV and TSP was capable of reversing the diabetic effects.

Methods: Diabetes was induced by administration of alloxan monohydrate (15 mg/100 g body weight.) and rats were treated with 2 IU insulin, 0.6mg/ml SOV, 5% TSP in the diet and a combination of 0.2 mg/ml SOV and 5% TSP separately for three weeks. Renal damage was assessed by measuring proteinuria, enzymuria, expression of glucose transporters, renin-angiotensin system, and activities of polyol pathway enzymes.

Results: Diabetic rats showed hyperglycemia with almost four fold high blood glucose levels. Activity of Na^+K^+ATPase decreased in diabetic kidney. Diabetic rats exhibited an increased level of lipid peroxidation, intracellular Ca^{2+} levels, and decreased membrane fluidity. Combined therapy of lower dose of SOV with TSP significantly reduced metabolites of polyol pathway, oxidative stress , nitric oxide, and N-acetyl-β-d-glucosaminidase activity with glucose transporter in kidney of alloxan diabetic rats. Markers of podocyte damage in kidney (nephrin, podocin, and podocalyxin) and their urinary excretion were normalized along with downregulation of the expression of kidney injury molecule-1 by SOV and TSP treatment. TSP treatment alone is partially effective in restoring the above diabetes induced alterations. Dietary combined SOV and TSP effectively countered the diabetes-induced structural abnormalities of renal tissue.

Conclusions: Our results showed that lower doses of SOV (0.2mg/ml) could be used in combination with TSP to effectively in normalization of altered metabolic parameters and membrane linked enzymes without any harmful side effect and renoprotective actions.