

## **Conclusion**

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- *E. littorale* aqueous extract administration (5 g aqueous extract per single dose, twice a day half an hour before meal, self administered) for a period of 5 months to IDDM patients, who were on other conventional therapies did not show any significant decrease in glycaemic parameters, whereas in two groups of NIDDM patients who were on OHDs and other alternative remedies respectively, showed significant decrease in glycaemic parameters and in all the groups (IDDM & NIDDM) extract treatment demonstrated significant antioxidant activity with no alteration in toxic parameters.
  
- *E. littorale* aqueous extract administration with the above mentioned dose to newly diagnosed NIDDM patients, who were not taking any other drugs or remedies for a period of 2 months, showed significant decrease in glycaemic parameters along with increase in serum insulin levels and the extract also showed good antioxidant and hypolipidaemic activity with no alteration in toxic parameters and no significant effect in normal volunteers in any of the parameters. Thus, the extract treatment was very effective in recently diagnosed NIDDM patients.
  
- Comparing short term treatment with aqueous extracts of *E. littorale* (1.5 g dry plant equivalent extract/100g body weight) and herbal combination (*C. longa*, *E. officinalis*, *T. foenum-graecum*, *E. littorale*) at the same dose to alloxan-induced diabetic rats; *E. littorale* showed a delayed glucose lowering action at 4 and 8 hrs

but herbal combination showed the response from 2<sup>nd</sup> hr itself along with significant increase in serum insulin levels.

- Comparing long term treatment with *E. littorale* and herbal combination to alloxan-induced diabetic rats; herbal combination showed a better efficacy as a hypoglycemic, antioxidant and hypolipidaemic agent with no alteration in any of the toxicity parameters. Hypoglycemic effect seems to be due to an increased glucose induced insulin release by both *E. littorale* and herbal combination as demonstrated in the *ex-vivo* experiments.
- *In-vitro* experiments showed DPPH free radical, hydroxyl radical and nitric oxide radical scavenging activity by *E. littorale*, whereas herbal combination apart from these free radicals also showed superoxide radical scavenging properties and the ED<sub>50</sub> was much decreased than the former. The degree of depletion of induced LPO in liver homogenates and protection against GSH auto-oxidation was also more with the combination extract. Similarly, inhibition of LPO and NO production and GSH oxidation has been demonstrated in isolated rat pancreatic islets when pre-incubated with the extracts.
- Aqueous extracts of *E. littorale* and herbal combination to cholesterol fed rats demonstrated hypolipidaemic and antioxidant activity, where the combinatorial extract showed better efficacy.

- Thus, the present study has proved the increased efficacy of glucose lowering, antioxidant and hypolipidaemic potential of herbal combination (*C. longa*, *E. officinalis*, *T. foenum-graecum*, *E. littorale*) as against the monotherapy using *E. littorale* alone. Combination therapy might be a new therapeutic approach for the treatment against diabetes mellitus.

*Increased efficacy of the hypoglycemic, hypolipidaemic and antioxidative property of the herbal combination against the monoherbal therapy for diabetes may enhance therapeutic effect and shorten therapeutic course. This in turn, increases patient compliance and efficacy when compared to single therapies for various manifestations. But, care and systematic studies must be carried out to rule out any possible herb-herb or herb-drug interactions.*