The methanolic extract of Thymus praecox subsp. skorpilii var. skorpilii restores glucose homeostasis and ameliorates insulin resistance on streptozotocin/nicotinamide-induced type 2 diabetic rats

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Background
Thymus praecox subsp. skorpilii (TPS) is a medical plant having strong antioxidant activity and the leaves of the plant have been utilized for the treatment of diabetes as the decoction in Turkey. In the present study, we aimed to investigate the potential antidiabetic actions of Thymus praecox subsp. skorpilii extract (TPSE) on streptozotocin (STZ)/nicotinamide (NA)-induced type 2 diabetic rats and to clarify the mechanisms accompanied by the related effects.

Material and methods
Sprague Dawley rats were randomly divided into 4 groups as to be 6 animals for each group; control group, diabetes group, TPSE group (diabetic rats treated with 100 mg/kg, once a day) and positive control group (diabetic rats treated with 400 mg/kg metformin, once a day). Diabetes was established by 55 mg/kg STZ (i.p.) for once after 100 mg/kg NA injection. Following 3 weeks, after decapitation, tissue and blood samples were obtained for analysis of glucose transporters (both GLUTs and sodium glucose co-transporters (SGLTs)), enzymes relevant to glucose (Hexokinase (HK), phosphoenolpyruvate carboxykinase (PEPCK)) and lipid metabolism (Acetyl-coenzyme carboxylase (ACC)), AST, ALT, creatinine (CR), insulin, anti-inflammatory (IL-10) and proinflammatory (TNF-alpha, IL-1beta, IL-6) cytokines, AMP-activated protein kinase (AMPK), peroxisome proliferator-activated receptor gamma (PPAR-gamma), glucagon like peptide-1 (GLP-1), alpha-glucosidase levels were measured by ELISA.

Results
TPSE has exhibited an anti-inflammatory effect by lowering the levels of inflammatory cytokines. Administration of TPSE helped to recover the decreased insulin levels. Moreover, it improved the values of AMPK in liver, GLP-1 in pancreas. In STZ/NA-induced diabetic rats; alpha-glucosidase, PEPCK, GLUT-2 and SGLTs were found to increase. However, TPSE dropped the level of alpha-glucosidase and also severely inhibited GLUT-2, SGLT-1, SGLT-2, PEPCK levels. Especially on SGLT-2, TPSE achieved a more prominent fall.

Conclusions
Based on the findings presented here, it has been concluded that TPSE has potent antidiabetic effects on STZ/NA-induced diabetic rats by affecting different pathways and processes in the development of T2DM.