

**EFFECTS OF *SALVIA OFFICINALIS* L. AND *PUNICA GRANATUM*
L. PEEL EXTRACTS ON ERYTHROCYTE INTEGRITY IN RATS
WITH TYPE 2 DIABETES MELLITUS**

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Annotation

This thesis evaluates changes in erythrocyte hypoosmotic and nystatin-induced colloid-osmotic resistance in experimental type 2 diabetes mellitus and the corrective effects of sage and pomegranate peel extracts. The results showed that pomegranate peel was more effective in correcting colloid-osmotic resistance, whereas sage produced a stronger glucose-lowering effect.

Keywords

*T2DM, erythrocytes, hemolysis, *Salvia officinalis* L., *Punica granatum* L.*

Introduction: *Type 2 diabetes mellitus (T2DM) is a metabolic disease characterized by chronic hyperglycemia and accompanied by structural and functional alterations of cell membranes [1]. The osmotic stability of erythrocytes is an important biophysical indicator of their functional state. Therefore, assessment of erythrocyte osmotic properties and the possibility of correcting these alterations using natural modulators is of considerable interest in T2DM.*

The aim of the study was to determine changes in the hypoosmotic and nystatin-induced colloid-osmotic resistance of erythrocytes under experimental T2DM conditions and to evaluate the corrective effects of sage (*Salvia officinalis* L.) and pomegranate peel (*Punica granatum* L.) extracts.

T2DM was induced in rats by administration of nicotinamide (200 mg/kg), followed 15 min later by streptozotocin (50 mg/kg) [2]. The animals were divided into control, T2DM, T2DM + sage, and T2DM + pomegranate peel groups. Starting from day 10, the extracts were administered orally once daily at a dose of 100 mg/kg. Hypoosmotic resistance of erythrocytes was assessed in solutions of different osmolality, whereas colloid-osmotic resistance was evaluated using nystatin-induced hemolysis. Hemoglobin release was measured at 540 nm [3].

Results: In the T2DM group, blood glucose increased from 5.8 to 9.5 mmol/L. Sage extract reduced glucose to 5.4 mmol/L, whereas pomegranate peel extract reduced it to 6.3 mmol/L. Both extracts attenuated hyperglycemia, with a more pronounced effect observed for sage.

During hypoosmotic hemolysis, the P_{50} value decreased from 92.8 ± 1.4 mOsm/kg H_2O in the control group to 78.8 ± 2.2 mOsm/kg H_2O in T2DM, indicating increased erythrocyte resistance to hypoosmotic lysis. Treatment with sage and pomegranate peel extracts increased P_{50} to 83.6 ± 0.8 and 84.7 ± 0.8 mOsm/kg H_2O , respectively, partially shifting the values toward the control level.

In nystatin-induced colloid-osmotic hemolysis, C_{50} increased from 107.1 ± 4.0 μM in the control group to 186.7 ± 15.7 μM in T2DM. Sage reduced this value to 156.7 ± 6.1 μM , whereas pomegranate peel reduced it to 92.6 ± 1.4 μM . These findings indicate a stronger corrective effect of pomegranate peel extract on colloid-osmotic resistance.

Conclusion. Experimental T2DM increased both hypoosmotic and colloid-osmotic resistance of erythrocytes. Sage and pomegranate peel extracts reduced blood glucose

and partially corrected the altered osmotic properties of erythrocytes. Sage was more effective in lowering hyperglycemia, whereas pomegranate peel showed a more pronounced effect on normalization of colloid-osmotic resistance.

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