Anti-glycation Effect and Advanced Glycation End-products Cross-link Breaking Ability of Sclerocarya birrea (Marula) Stembark Extracts

Oluwaseyefunmi I. Adeniran* and M. Alfred Mogale
Department of Biochemistry, School of Science and Technology, Sefako Makgatho Health Sciences University, Pretoria, Gauteng, South Africa
Email: seyeugeniamdiren@gmail.com

INTRODUCTION

Advanced glycation end-products (AGEs) are products of the non-enzymatic reaction between reducing sugars and free amino terminals on proteins, lipoproteins and nucleic acids, Figure 1. AGEs are implicated in the pathogenesis of vascular complications of diabetes mellitus (DM) and age-related diseases.1-3 Anti-glycation agents such as aminoguanidine which inhibit the formation of AGEs are currently available.4-6 Although some are still undergoing clinical trials, aminoguanidine has failed clinical trials due to side effects.7-8 There is therefore a need for new non-enzymatic anti-glycation natural products.

Sclerocarya birrea commonly known as ‘cider tree’ or ‘Marula’ belongs to the family Anacardiaceae and is indigenous to sub-Saharan Africa.9 The stembark is widely used across the African continent to manage a plethora of ailments such as malaria, dysentery and diabetes mellitus.10,11 Crude extracts of the stembark of Sclerocarya birrea have been shown to have blood glucose lowering effect in both animal and human studies.12 As such it is possible that in addition to its blood glucose lowering effect, S. birrea could inhibit the formation of AGEs and/or break the cross-links formed with proteins.

AIMS

To investigate the inhibitory effects of Sclerocarya birrea (Marula) stembark extracts on the formation of AGEs in vitro, compare their effect with that of aminoguanidine and also assess the AGE-protein cross-link breaking ability of the extracts.

METHODOLOGY

The results of the anti-glycation effects of Sclerocarya birrea (S. birrea) stembark against BSA-fructose derived fluorescent AGEs (FAGEs), total immunogenic AGEs (TIAGEs) and N-carboxyallyllysine (CML) AGEs are shown in Figures 3, 4, 5 and 6. Their AGE-protein cross-link breaking activities are shown in Figure 7.

RESULTS

The results of the anti-glycation effects of Sclerocarya birrea (S. birrea) stembark against BSA-fructose derived fluorescent AGEs (FAGEs), total immunogenic AGEs (TIAGEs) and N-carboxyallyllysine (CML) AGEs are shown in Figures 3, 4, 5 and 6. Their AGE-protein cross-link breaking activities are shown in Figure 7.

CONCLUSIONS

The results of the study suggest that Sclerocarya birrea stembark extracts have anti-glycation effect against both fluorescent and immunogenic AGEs and also the ability to break AGE-protein cross-links. For FAGEs, ethyl acetate, methanol and water extracts exerted significantly higher anti-glycation effect than aminoguanidine (p < 0.001). With IC50 of 0.139 mg mL-1 and 0.141 mg mL-1 respectively both the methanol and water extracts displayed higher anti-glycation effect than the hexane and ethyl acetate extracts. All the extracts showed significantly higher AGE-protein cross-link breaking abilities than aminoguanidine (p < 0.001).

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