

Newly isolated compounds from West African *Sorghum bicolor* leaf sheaths Jobelyn® show potential in cancer immunosurveillance

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Abstract

Jobelyn®, a West African pharmaceutical product derived from *Sorghum bicolor* leaf sheaths has been shown to possess strong anti-tumour and anti-inflammatory properties. This study aims to evaluate the expression of cell surface markers CD69 on activated natural killer (NK) cells; natural killer T (NKT) cells; and T cells from human peripheral blood mononuclear cells (PBMC) upon treatment with Jobelyn® fractions using flow cytometry. Blood was collected from 3 donors, PBMC were isolated and plated with each specific fraction: crude extracts (J); ethyl acetate (JE); n-butanol (JB); secondary compounds from JE (JE5; JE6); purified and semi-purified compounds from JE5 (P8 and P9) at specific concentrations (2.5-500 µg/ml). For the crude extracts, JE was the most active showing significant expression of CD69 on NK- (P < 0.001), T- (P < 0.0001), and NKT- treated cells (P < 0.0001). Secondary compound, JE5, of JE also showed significant CD69 expression on NK- (P < 0.018) and T-treated cells (P < 0.027), but not on NKT-treated cells (P > 0.084). Similarly, the semi-purified compound P8, from JE5 showed increased expression of CD69 on NK- (P=0.023); T- (P < 0.001), and NKT-treated cells (P<0.007). Evidence of innate effector cells activation by ethanolic extracts of Jobelyn® suggests that this variety of *Sorghum* may be able to mediate direct cell cytotoxicity supporting the control and clearance of a number of tumour cells.

Keywords: CD69; NK cells; T cells; NKT cells; innate immunity; flow cytometry

Introduction

Sorghum bicolor is a plant that has been cultivated in southern Africa for over 3000 years. This is a cane like grass, up to 6 m tall with large branched clusters of grains. The individual grains are around 3-4 mm in diameter and vary in colour from pale yellow through reddish brown depending on the soil where it is cultivated. The leaves resemble those of maize, and they sometimes roll over forming sheaths. The West African region is home to a unique variety of *Sorghum bicolor*, which accumulate high levels of 3-deoxyanthocyanin pigments in their non-grain tissue [1]. The intensively colored leaf sheaths of this wild variety of *Sorghum bicolor* are found within the Nigerian flora and have been formulated into a commercial pharmaceutical product under the name Jobelyn®.

Since *Sorghum bicolor* accumulates large quantities of the rare 3-deoxyanthocyanin pigments [2, 3], it has gained interest as potential natural food colorants. However, recent reports demonstrate that the West African *Sorghum* possesses anti-tumour effects [4] as well as chemopreventive [5] and anti-inflammatory properties [6, 7].

Anti-tumour potentials of *Sorghum* were shown through inhibited proliferation of esophageal and colon cancer cell

lines as a result of 3-deoxyanthocyanidins induced activity of the phase II protective enzyme, quinone reductase [5]. Whereas, a study carried out on the aqueous and ethanol extracts of *Sorghum* leaf sheaths from South-West Nigeria has demonstrated activation of human CD3+CD56- T cells through up-regulation of CD69 expression suggesting that *Sorghum* is capable of supporting immune defenses [7].

Separate studies on the structure of 3-deoxyanthocyanidins in the West African *Sorghum* identified several peaks including an unusual fused-ring apigeninidin derivative;

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