Sorghum Phenolic Extracts: Chemical Characterization and Biological Activity Determination
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Introduction

- Sorghum is the fifth most produced cereal in the world and contains bioactive compounds that possess health-promoting properties.
- Anthocyanins are natural pigments responsible for the red, violet, & blue color in fruits and vegetables; they have the potential to be used as a natural food colorants.
- Flavonoids are polyphenolic health-promoting molecules found in many foods; they are known for their ability to modulate cell-signaling pathways.
- Antioxidants are substances that prevent or delay some types of cell damage; their primary purpose is to inhibit oxidation of other molecules.

Objectives

The objectives of this study were:
- To determine the composition of sorghum phenolic extracts: polyphenols, anthocyanins, & flavonoids.
- To analyze the ability of these extracts to modulate the activity of inflammasomes (p57).

Hypothesis

Sorghum phenolic extract will inhibit activation of the inflammasomes in THP-1 human macrophages through its antioxidant property.

Materials & Methods

- Sorghum bicolor (Sorghum bicolor L.)
- Ground sorghum
- Extraction for 24 h at room temperature using the following solvents: 1% HCl in MeOH, EtOH & Water
- Filtration of Extracts
- Freeze drying
- Cell treatment

THP-1 human macrophages

Activation of the inflammasomes was accomplished by 0.5 µg/mL lipopolysaccharide (LPS) and 5 mM adenosine triphosphate in the presence of sorghum phenolic extracts at 25 and 50 µg/mL.

DATA ANALYSIS: Extractions were performed in three independent trials. All assays were done in triplicate. Data were analyzed using SAS Ver 9.4 Proc GLM procedure and Tukey Posthoc Test at P < 0.05.

Results

Table 1. Bioactive components of sorghum phenolic extracts

<table>
<thead>
<tr>
<th>Bioactive</th>
<th>Amount, mg/g</th>
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<tbody>
<tr>
<td>Anthocyanins</td>
<td>0.00024 ± 0.00004</td>
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<tr>
<td>Flavonoids</td>
<td>13.6 ± 10.1</td>
</tr>
<tr>
<td>Polyphenols</td>
<td>102.1 ± 15.8</td>
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Determination of the ability of sorghum extract to modify activation of the inflammasomes

Figure 1. Chromatogram of sorghum phenolics showing the presence of different phytochemicals in the extract. B) Antioxidant activity of sorghum phenolic extract using 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay. As the amount of sorghum phenolic increases, less radical species are evident based on the decreased amount of DPPH present in the sample. Points with different letter are significantly different from each other (P < 0.05, n = 8).

Figure 2. Sorghum phenolics reduced the production of pro-inflammatory cytokines IL-1β and IL-18 in LPS-primed and ATP-activated THP-1 human macrophages. At 50 µg/mL, sorghum phenolics reduced IL-1β production by 59.7% (A) and IL-18 by 32.0%. Bars with different letter(s) are significantly different from each other (P < 0.05, n = 3).

Conclusions

- Sorghum contains phytochemicals with antioxidant activity.
- Sorghum phytochemicals are potential inhibitors of inflammasomes activation associated with different chronic diseases.
- Sorghum phenolics inhibited inflammasomes activation through the following proposed mechanism.

References


FOOD SCIENCE

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Sorghum bicolor with aid in digestion and nutrient absorption.

Figure 3: Sorghum phenolic affected the expressions of pro-IL-1β and caspase-1 without affecting NLRP3-ASC inflammasomes components. Bars with different letter(s) are significantly different from each other (P < 0.05, n = 3).