

Abstract Red sorghum contains phytochemicals such as 3-deoxyanthocyanidins and flavonoids with reported health benefits. The objective was to determine the chemical composition of sorghum phenolic extracts that were extracted with acidified methanol and separated into co-pigments and anthocyanin fraction by chromatographic procedure. In addition, the ability of sorghum extract to modify activation of the inflammasomes, a macromolecular protein complex involved in several malignancies, was evaluated. The total polyphenols, total flavonoids and total anthocyanins of the sorghum phenolic extract was quantified and phenolic profile was determined by high performance liquid chromatography. The ability to modify the inflammasomes was evaluated using THP-1 human macrophages as an *in vitro* model. Treatment of sorghum phenolics in lipopolysaccharide-primed and adenosine triphosphate-activated THP-1 human macrophages resulted in reduction in IL-1 β and IL-18 secretion. Our study showed the potential of sorghum phenolics to serve as a chemopreventive agent against diseases associated with aberrant activation of the inflammasomes.

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 bioactives with potential health-promoting properties¹.
- Anthocyanin are natural pigments responsible for the red, violet, & blue color in fruits and vegetable; they have the potential to be used a natural food colorants².
- Flavonoids are polyphenolic health promoting molecules found in many foods; they are known for their ability to modulate cell-signaling pathways³.
- Antioxidants are substances that prevent or delay some types of cell damage; their primary purpose is to inhibit oxidation of other molecules⁴.

Objectives

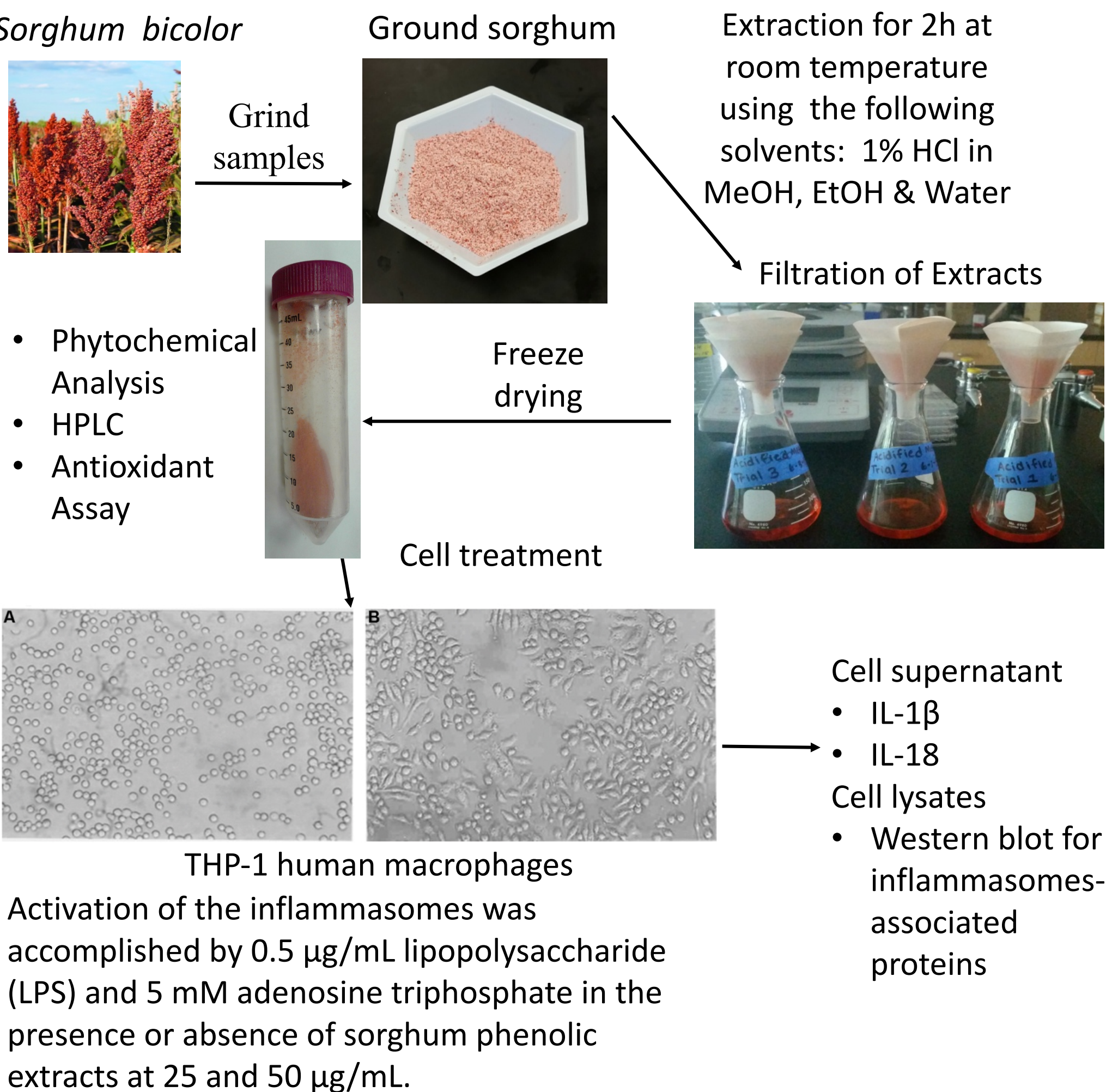
The objectives of this study were:

- To determine the composition of sorghum phenolic extracts: polyphenols, anthocyanins, & flavonoids.
- To analyze the ability if these extracts to modify activation of inflammasomes

Hypothesis

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

Materials & Methods



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 $P < 0.05$.

Table 1. Bioactive components of sorghum phenolic extracts

Bioactive	Amount, mg/g
Anthocyanins	0.00024 \pm 0.00004
Flavonoids	13.6 \pm 10.1
Polyphenols	102.1 \pm 15.8

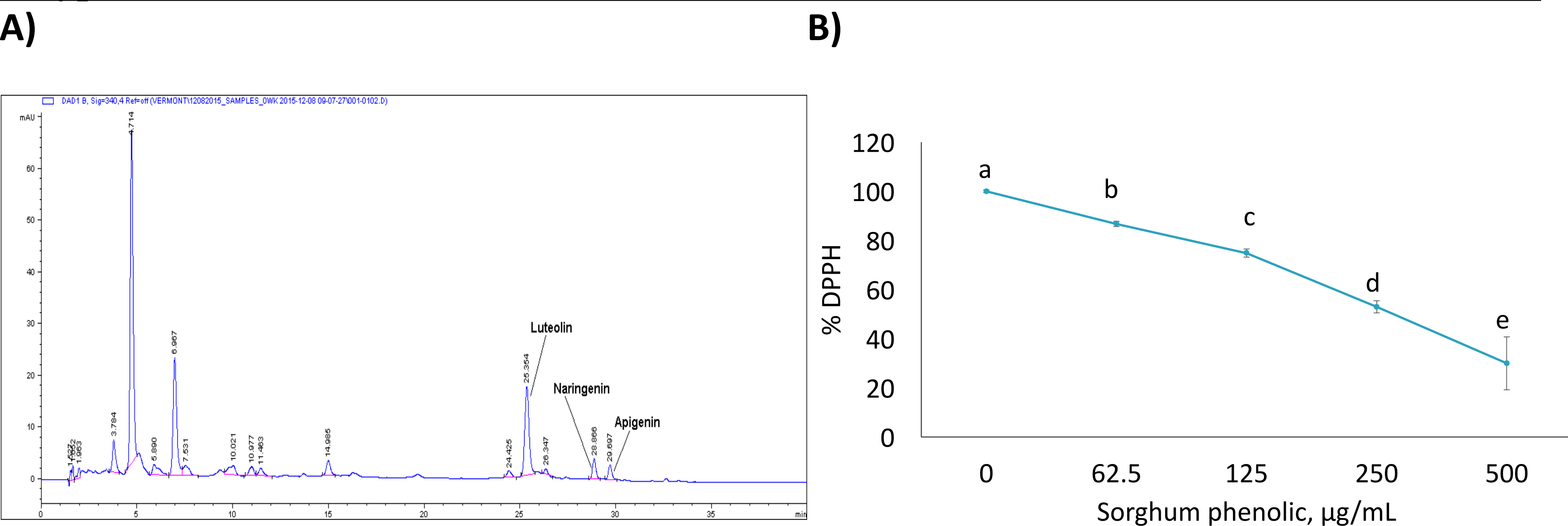


Figure 1. Chromatogram of sorghum phenolics showing the presence of different phytochemicals in the extract. B) Antioxidant activity of sorghum phenolic extract using 2,2-diphenyl-1-picrylhydrazyl (DPPH) assay. As the amount of sorghum phenolic increases, less radical species are evident based on the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

Inflammasomes

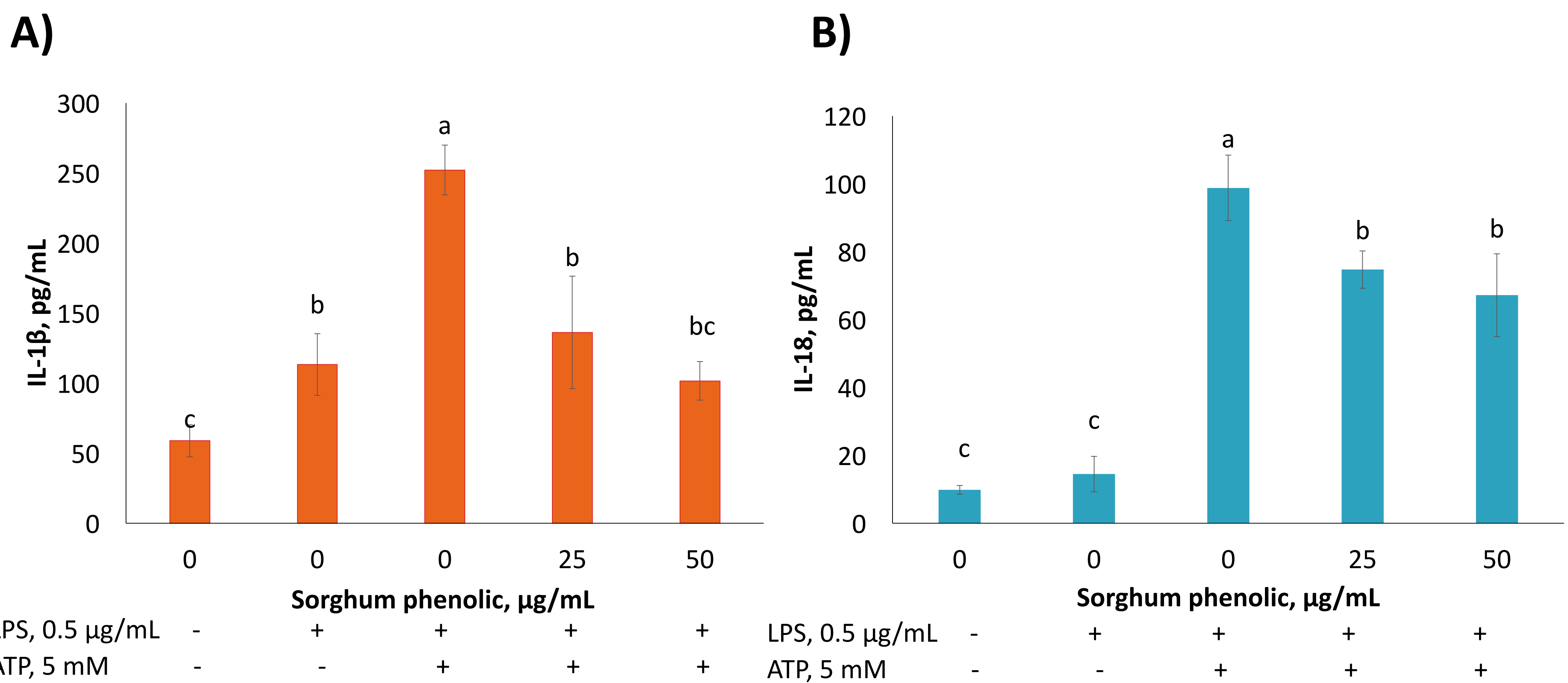


Figure 2. Sorghum phenolics reduced the production of pro-inflammatory cytokines IL-1 β and IL-18 in LPS-primed and ATP-activated THP-1 human macrophages. At 50 μ g/mL, sorghum phenolics reduced IL-1 β production by 59.7% (A) and IL-18 by 32.0%. Bars with different letter(s) are significantly different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

Results

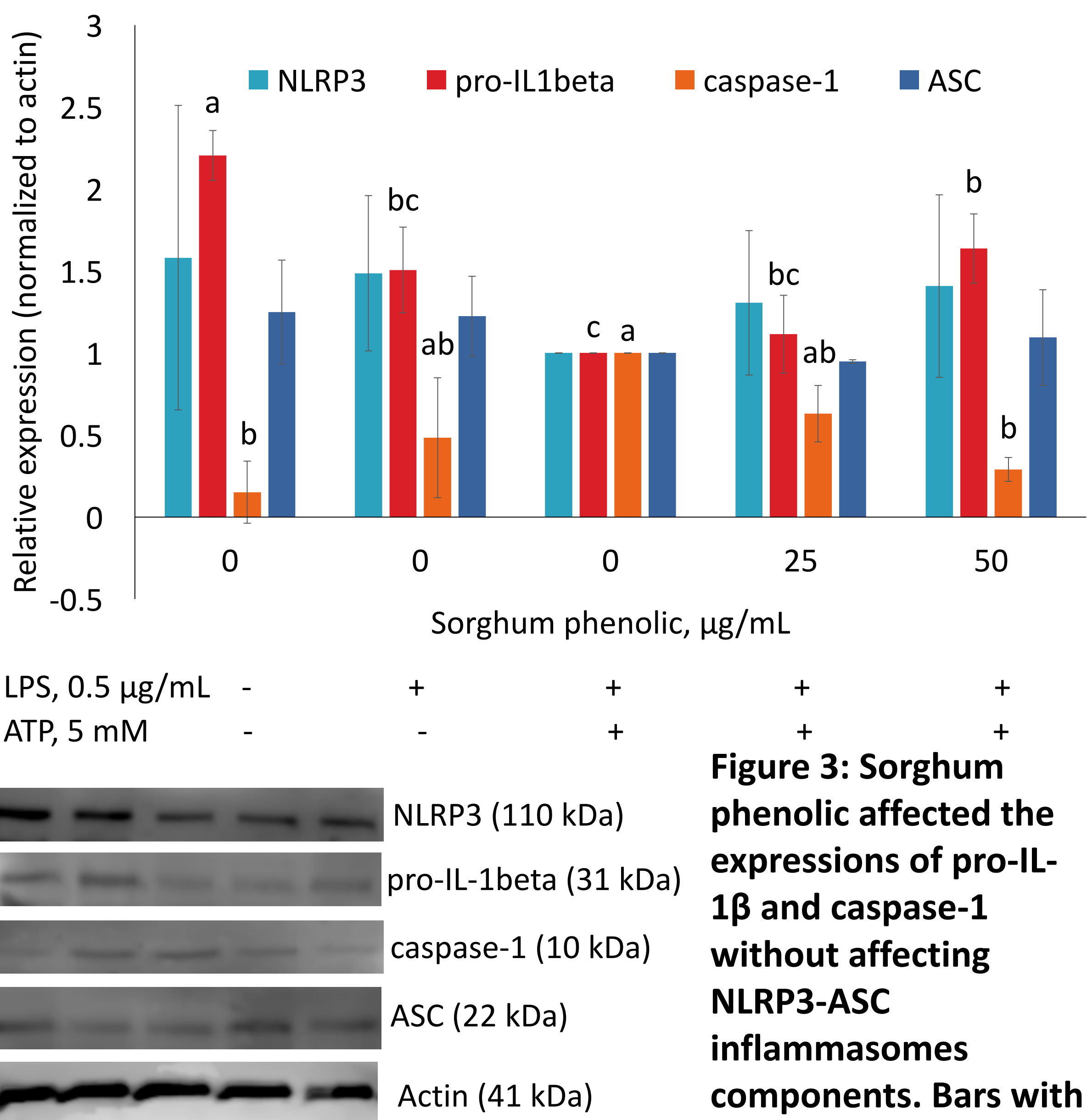
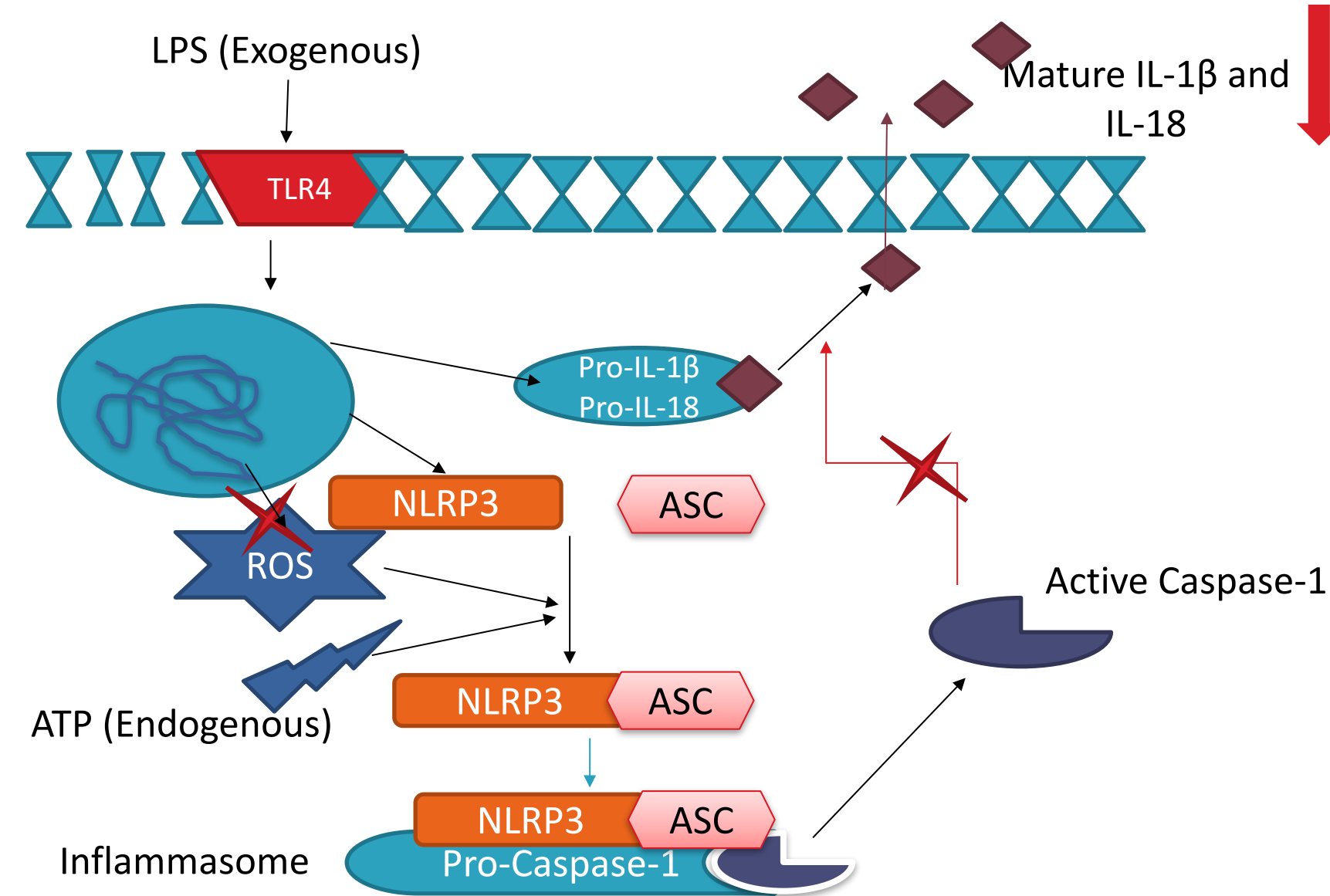


Figure 3: Sorghum phenolic affected the expressions of pro-IL-1 β and caspase-1 without affecting NLRP3-ASC inflammasomes components. Bars with different letter(s) are significantly different from each other ($P < 0.05$, $n = 3$).

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

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Acknowledgements

Dr. Angela McClure for providing sorghum samples.