Effect of commercially available Plant Defence Stimulators (PDS) on human innate immunity

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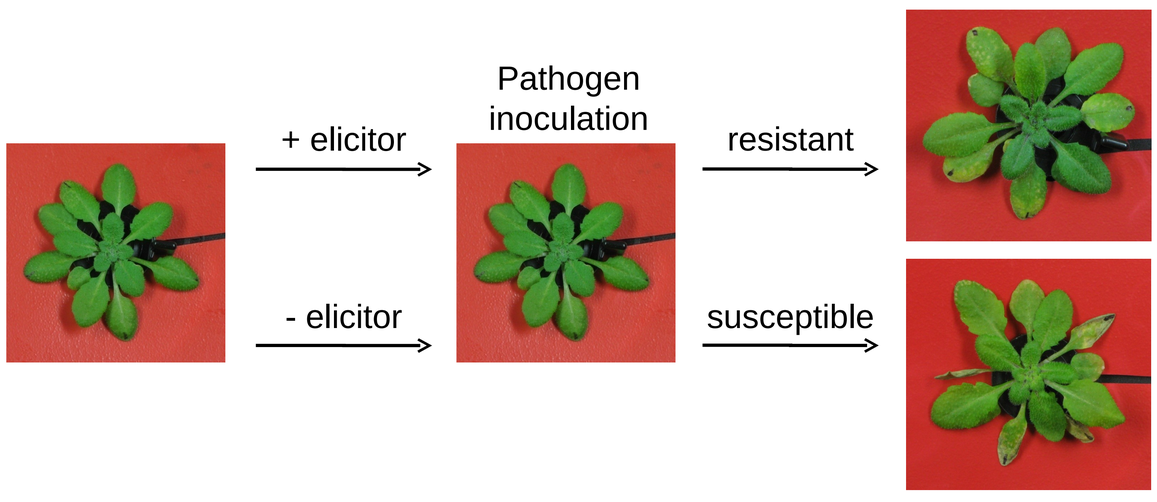
Introduction

PDS (plant defence stimulators) constitute a recent alternative to pesticides used for crop protection. These compounds, also called elicitors, are of diverse nature, but they all act by stimulating innate immune system of plants. So, plants can better fight pathogens.



There are many similarities in pathogen perception systems and cellular signalling in plants and animals. Moreover, it is well established that many elicitors stimulate both human and plant innate immunity (Zipfel and Felix, 2005)1. Therefore, it is likely that human innate immunity could be modulated by PDS.

The aim of this study is to evaluate pro/anti-inflammatory activity of five different commercially available PDS and their respective active molecules on human cell models.

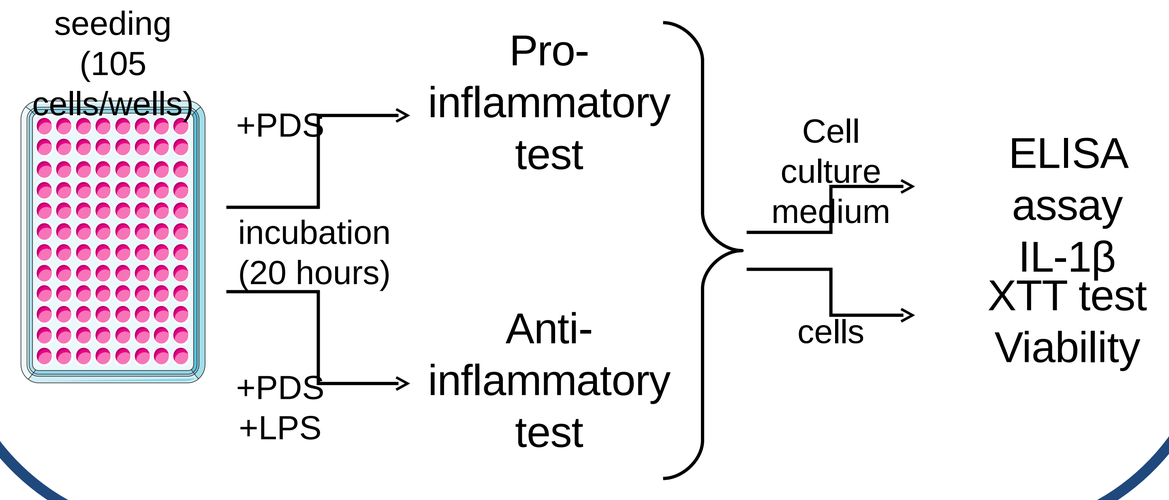
Material and methods

We studied the pro/anti-inflammatory effect on human PBMC (peripheral blood mononuclear cells) of PDS (cf. Table1). Only the soluble fraction of PDS was studied.

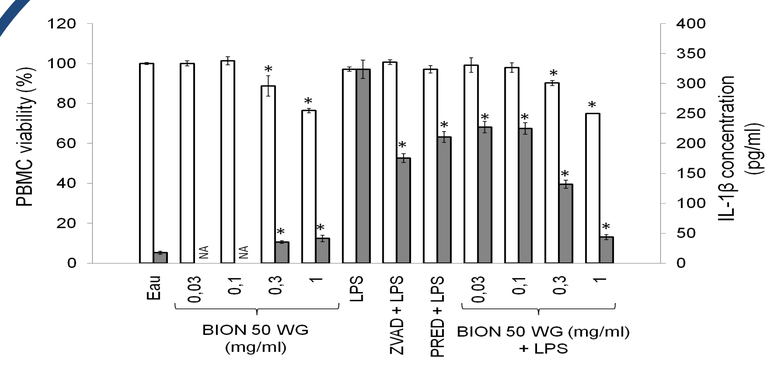
Table 1: List of the commercially available PDS and there respective active molecule

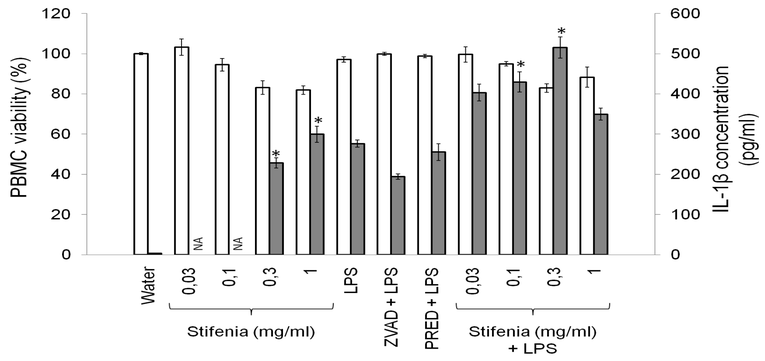
active ingredient	IUPAC name for identified active molecule	commercial formulation name
acibenzolar-S-méthyl	S-methyl 1,2,3-benzothiadiazole-7-carbothioate	Bion® 50 WG
seed extract of fenugreek	not applicable	Stifenia®
phosphonates	potassium dihydrogen phosphate	Etonan®
prohexadione	3,5-dioxo-4-propanoylcyclohexane-1-carboxylic acid	Regalis®
laminarin	not communicated	Vacciplant®

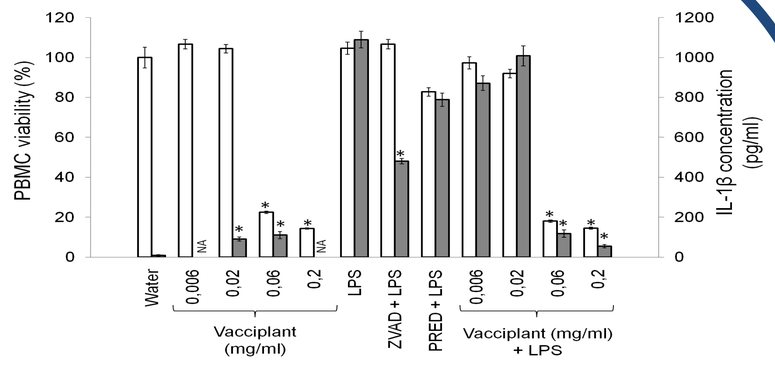
studied to be studied

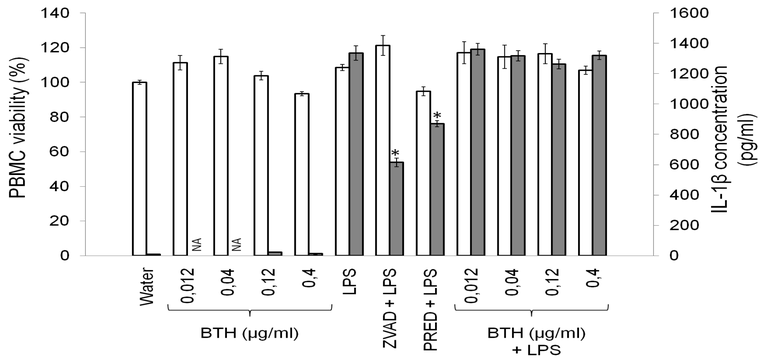


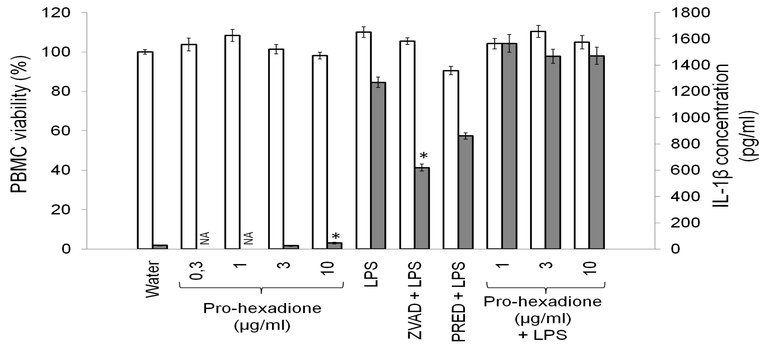
Results

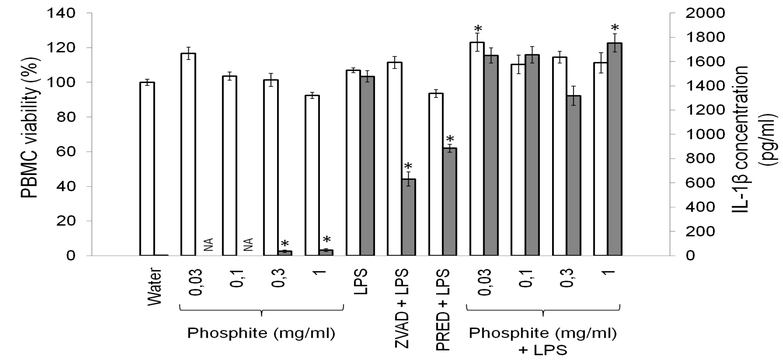










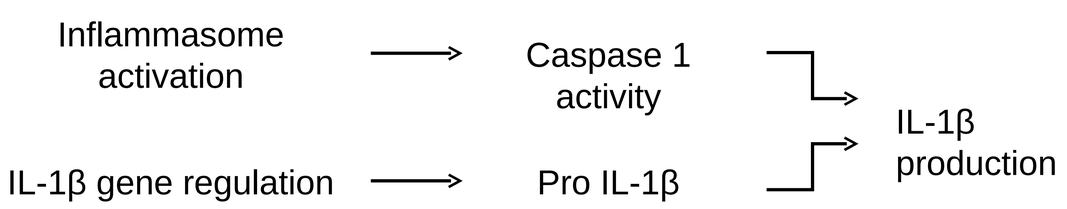


PBMC viability as a percentage of control cells treated with the vehicle (water)
IL-1β concentration in culture medium (pg/mL)

Figure 1: Effect of PDS on PBMC viability and production of IL-1β.
Cells were treated with different concentrations of PDS and stimulated with LPS (10 ng.mL-1) when specified (+ LPS). After treatment, the cells were incubated for 20 hours. The viability values were normalized to 100% with the control treated with the vehicle (water). For each conditions, viability histograms (white) and IL-1β concentration (gray) represent the mean value of 8 technical replications. Error bars represent the standard error of each condition.Statistical analysis of differences between conditions were performed using Dunnett's test with a significance threshold of 5%. Significant differences are indicated with an asterisk (*). For statistical analysis of the viability test, all the conditions were compared with the water control. Concerning ELISA assay statistical analysis, unstimulated PBMC treated with BION 50 WG were compared to the unstimulated control treated with the vehicle (water) whereas PBMC treated with PDS and stimulated with LPS were compared to untreated PBMC stimulated with LPS (LPS).
NA: not available, BTH: S-methyl 1,2,3-benzothiadiazole-7-carbothioate.

Discussion and perspectives

This study shows that some PDS can have cytotoxic or pro/anti-inflammatory effects on human cells. Vacciplant is cytotoxic at 0.06 and 0.2 mg/ml. Bion 50 WG is slightly cytotoxic at 0.3 and 1 mg/ml and have an anti-inflammatory effect on PBMC stimulated with LPS for the same concentrations. Stifenia is pro-inflammatory at 0.1, 0.3 and 1 mg/ml and the pro-inflammatory effect is additive with those of LPS. To further understand the mode of action of PDS that modulate IL-1β production, a caspase 1 activity assay will be used to determine the role of inflammasomes in the induction of IL-1β production in response to PDS.



1) Zipfel, C., and Felix, G. (2005). Plants and animals: a different taste for microbes? Curr. Opin. Plant Biol. *8*, 353–360.

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