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Polyphenolic extracts from *Viola x wittrockiana* reduce fat storages of *Caenorhabditis elegans*

Sonia Núñez [1]*, Cristina Moliner [1], Marta Sofía Valero [2,3], Carlota Gómez-Rincón [1,2], Víctor López [1,2]

[1] Department of Pharmacy, Faculty of Health Sciences, Universidad San Jorge, Villanueva de Gállego, Zaragoza.

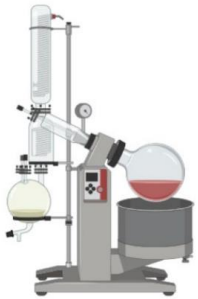
[2] Department of Pharmacology and Physiology, Universidad de Zaragoza.

[3] Instituto Agroalimentario de Aragón, IA2, Universidad de Zaragoza-CITA.

*snunez@usj.es

Polyphenolic extracts from *Viola x wittrockiana* reduce fat storages of *Caenorhabditis elegans*

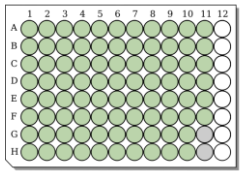
Viola x wittrockiana flowers



Ethanolic soxhlet extraction

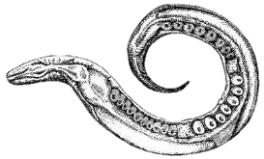
Polyphenolic extract

In vitro



Inhibition
- α-glucosidase
- Lipase
- AGEs

In vivo



C elegans obese model

Abstract:

Diabetes mellitus is an important health problem in our society that can cause severe complications or even death when untreated.

Caenorhabditis elegans is a model organism widely used for the evaluation of functional foods and bioactive compounds that shares 60-80% of its genome with humans.

Edible flowers own interesting properties that could make them suitable for developing new drugs. *Viola x wittrockiana* has proven to be one of them due to its polyphenol-based composition.

The antidiabetic potential of the extract was quantified by in vitro inhibition of lipase and α-glucosidase, and the capacity of the extract to prevent AGEs formation by a non-enzymatic reaction. To furtherly test these antidiabetic properties, an in vivo assay with C. elegans was performed.

V. x wittrockiana showed lower IC_{50} values in the α-glucosidase assay than the reference drug acarbose and higher inhibition AGEs formation potential than the reference substance aminoguanidine, it also obtained important values inhibiting lipase. Moreover, the extract lowered fat storages of C. elegans with no significant differences ($p<0.05$) to positive control orlistat.

The flowers of *Viola x wittrockiana* can be considered as source of polyphenol bioactive compounds with interesting properties as functional foods in the prevention and improvement of chronic diseases such as diabetes.

Keywords: AGEs; C. elegans; Diabetes; Polyphenols

Introduction: Diabetes Mellitus

Metabolic disease characterized by high blood sugar levels.
Can cause severe complications to the organism or even death when no treated.
Worldwide impact.

- Insulin subcutaneous administration

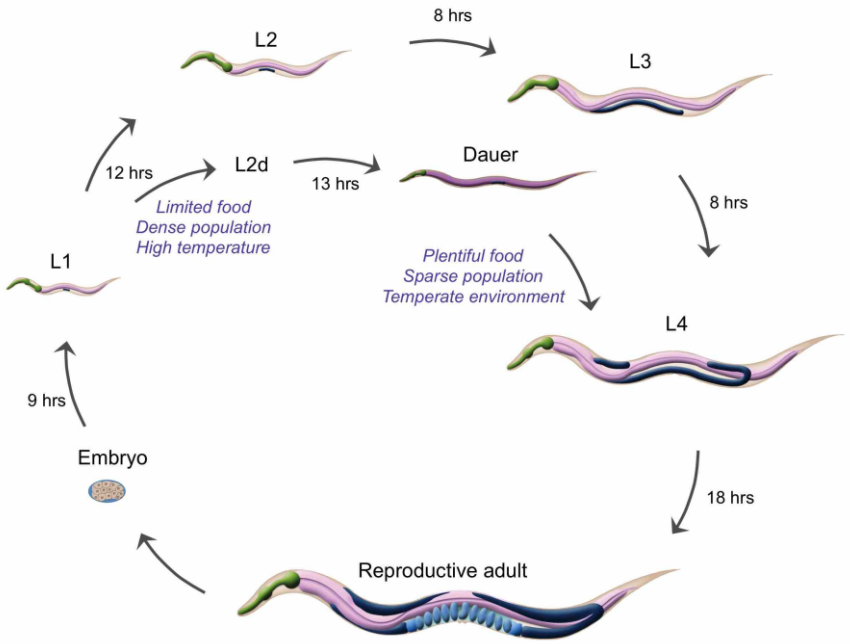
- Oral antidiabetic drugs
- Health dietary habits

Introduction: Edible flowers

Edible flowers have been used through history mainly as traditional medicine, nowdays their use focuses on gastronomy.

Certain flowers such as *Viola x wittrockiana* have shown interesting properties due to its polyphenol-based composition.

Introduction: *Caenorhabditis elegans*



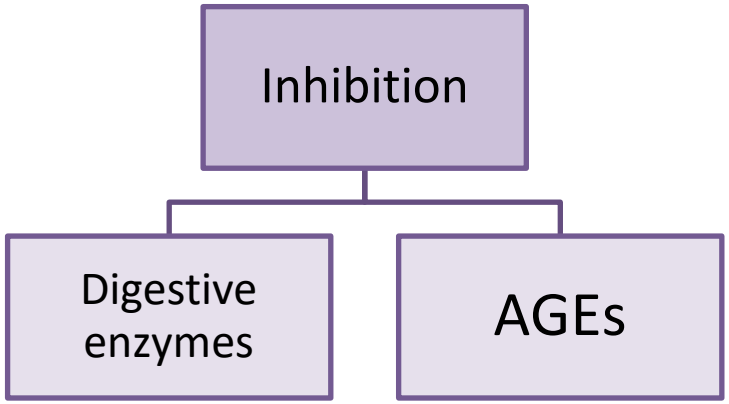
Model organism widely used.

Easy handling, wide mutant library.

60 – 80% homologue genes to humans.

Methodology

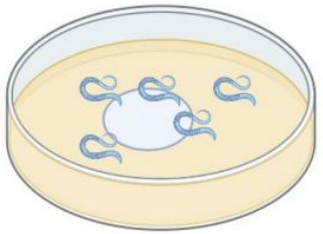
IN VITRO



α-glucosidase
Lipase

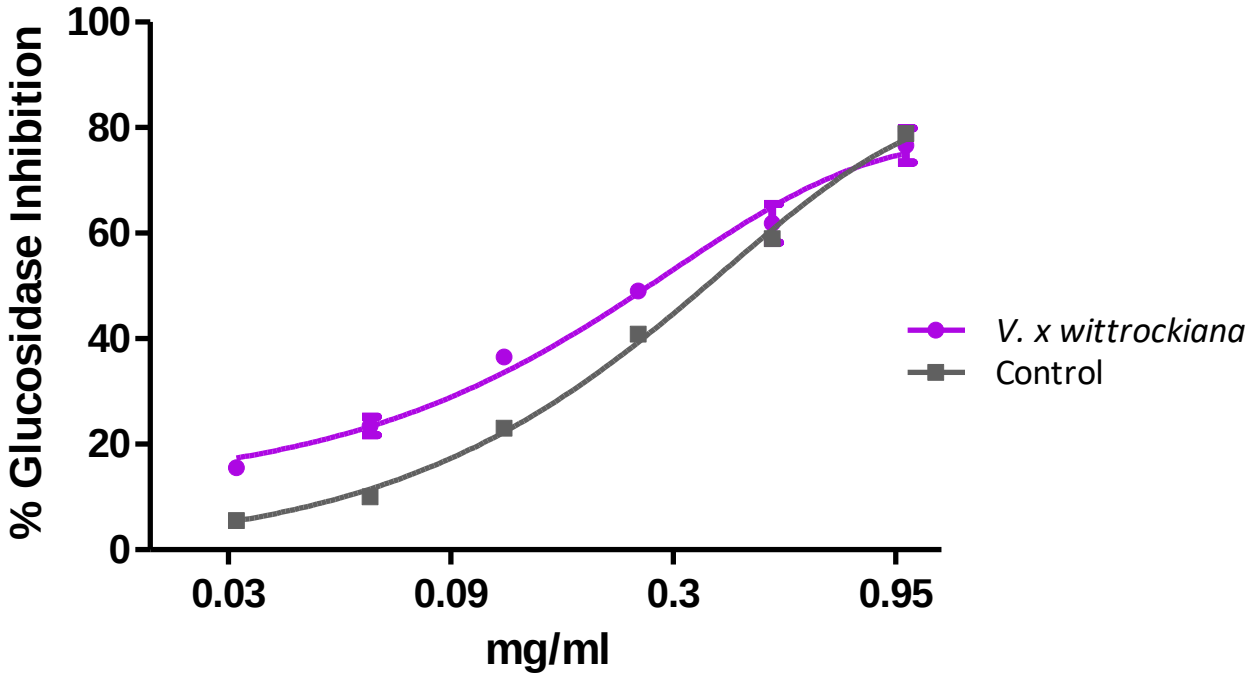
IN VIVO

Control	+ Control	- Control	*Viola x wittrockiana*
No treatment	5% glucose	5% glucose + 6 µg/ml Orlistat	5% Glucose + 500 µg/ml extract



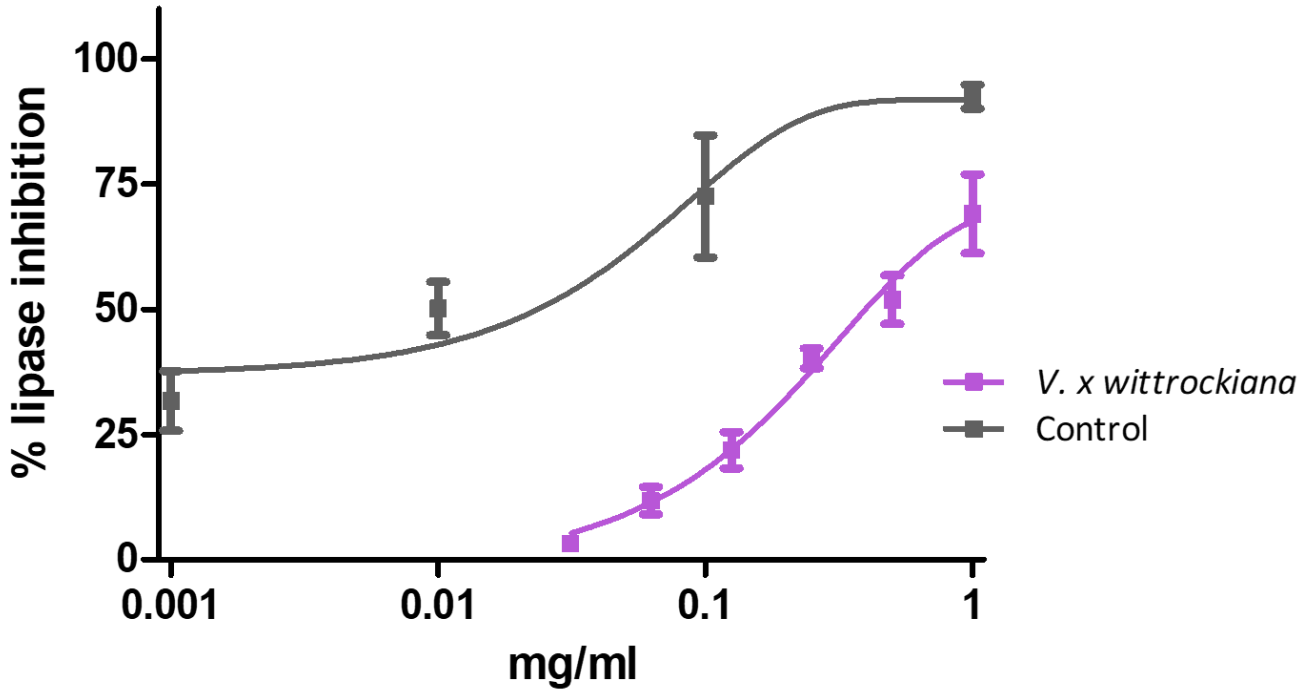
48h exposure → Nile Red straining

Results and discussion: in vitro



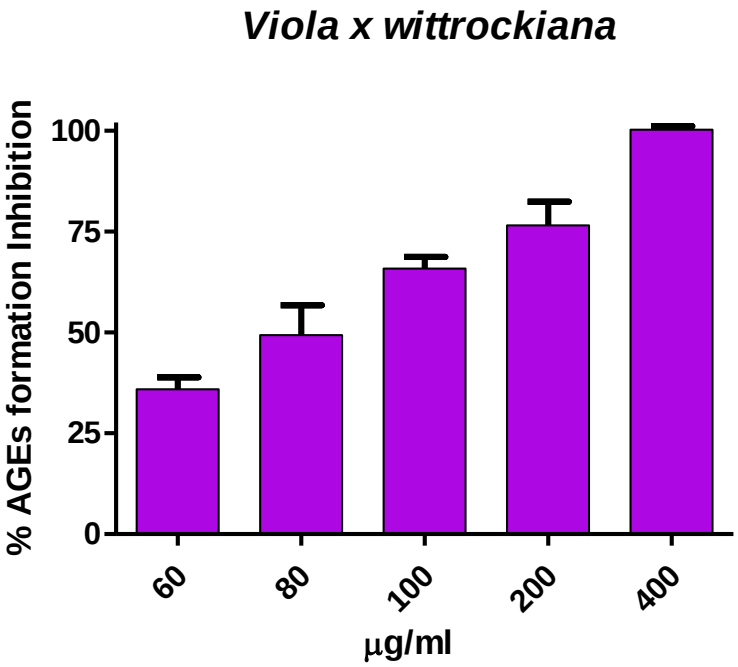
Acarbose used as control (IC_{50} = 425.49 µg/mL).
Viola x wittrockiana calculated IC_{50} = 395.77 µg/mL

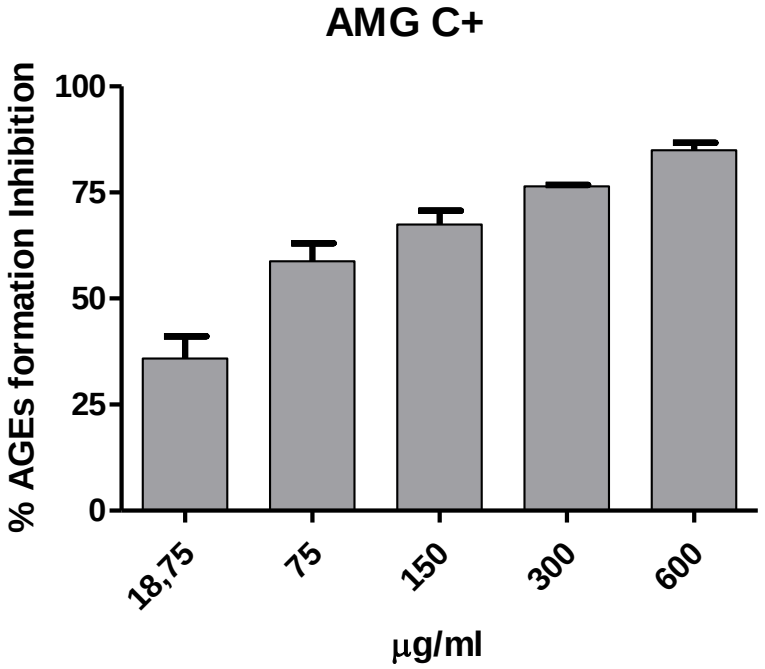
Results and discussion: In vitro



Orlistat used as control (IC_{50} = 35.10 µg/mL)
Viola x wittrockiana IC_{50} = 586.95 µg/mL

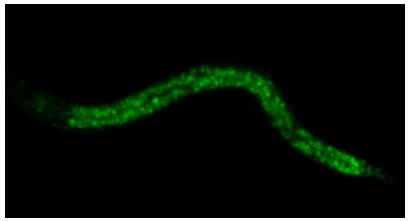
Results and discussion: in vitro



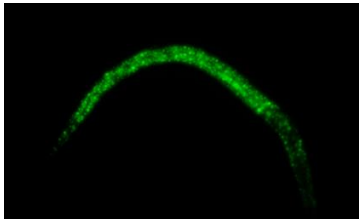


Aminoguanidine used as control (IC_{50} = 81.92 µg/mL)
Viola x wittrockiana IC_{50} = 80.83 µg/mL

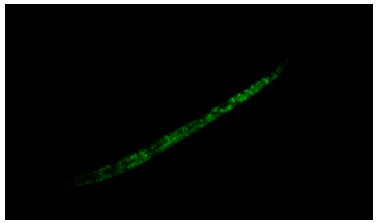
Results and discussion: in vivo



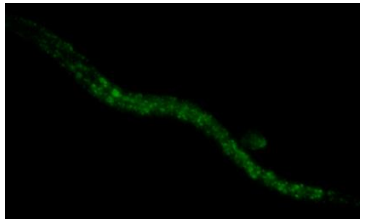
Control
No treatment



Positive Control
5% glucose



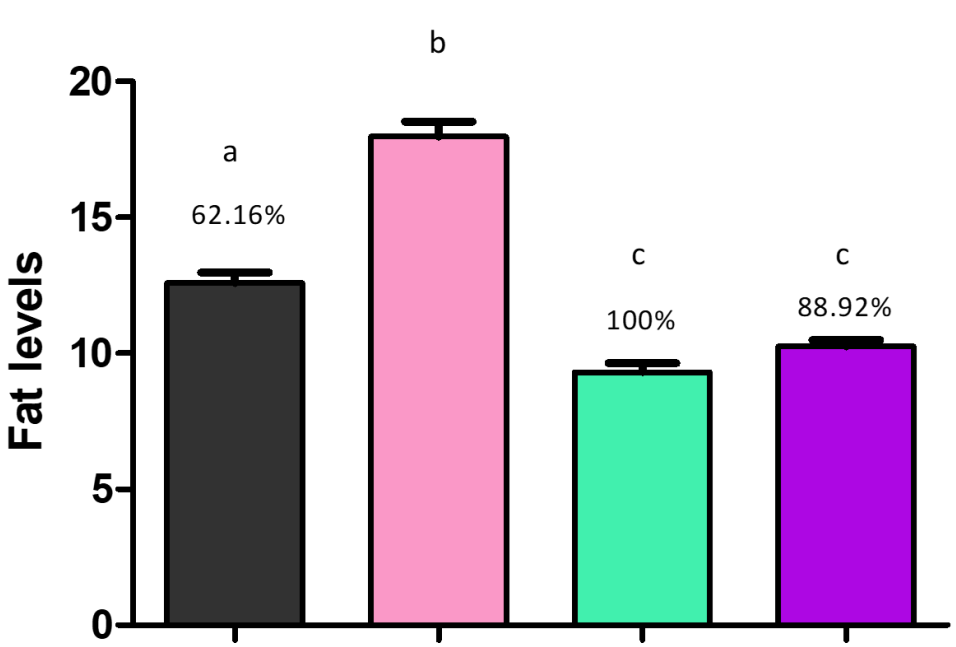
Negative Control
6 µg/mL Orlistat

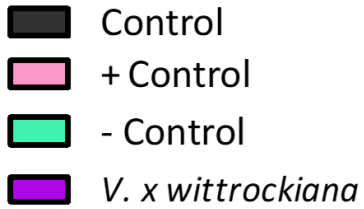


Viola
500 µg/mL extract

Fluorescence images of *C. elegans* after Nile Red straining and ultraviolet light exposure.

Results and discussion: in vivo





Fluorescence/area = fat levels

Reduction compared to obese worm expressed in %.
Same letters show no significant differences $p<0.05$

Conclusions

1. *Viola* extract showed lower IC_{50} values than the reference antidiabetic α-glucosidase inhibitor known as acarbose, and important values inhibiting enzyme lipase.

2. The polyphenolic extract showed higher activity preventing the glycation of proteins than reference substance AMG (aminoguanidine).

3. Viola extract lowered fat storages of C. elegans with no significant difference to negative control Orlistat ($p<0.05$)

4. Flowers from *Viola x wittrockiana* can be considered as a source of bioactive polyphenolic compounds with interesting properties in the field of nutrition.

Acknowledgments

universidad SANJORGE
GRUPO SANVALERO

Phyto-Pharm
Principios Vegetales Bioactivos y Ciencias Farmacéuticas

cita
CENTRO DE INVESTIGACIÓN Y TECNOLOGÍA AGROALIMENTARIA DE ARAGÓN

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