TOMAFFRON

Gordon Research Conferences
Frontiers of Science

A biotechnological tomato platform to produce high levels of saffron apocarotenoids

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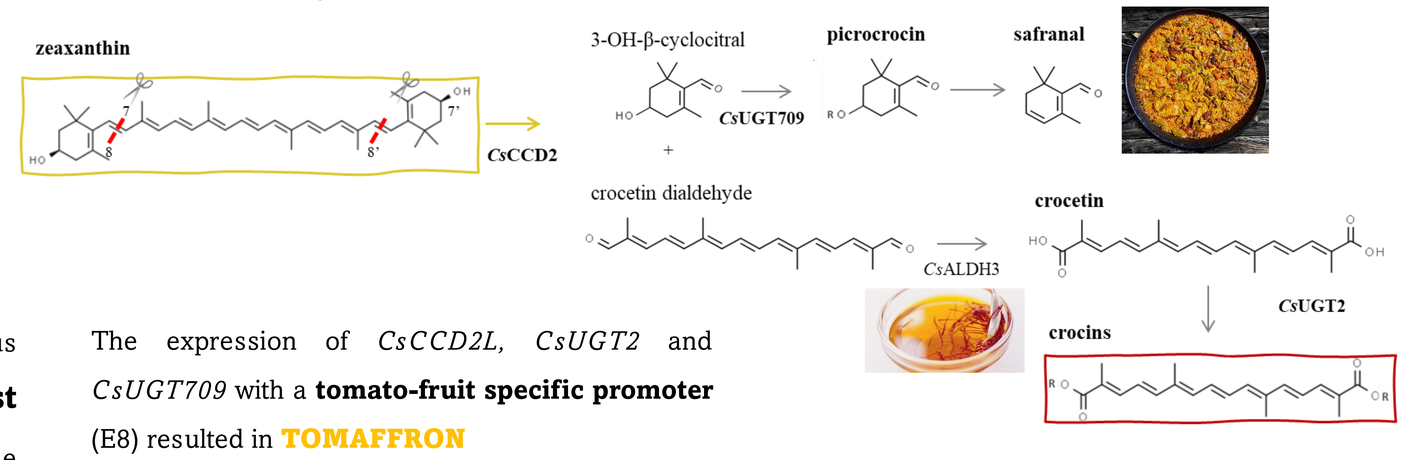
8.000-10.000 $/kg

Saffron apocarotenoids are the responsible for the **organoleptic** and **medical** properties of the spice



MoneyMaker (MM) WT

Tomaffron MM

14.4 mg/g crocins in DW

Tomato fruit is the heterologous platform accumulating **the highest levels of crocins**, despite the traces amount of the direct precursor, zeaxanthin

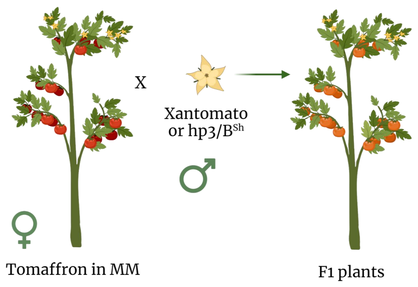
The expression of *CsCCD2L*, *CsUGT2* and *CsUGT709* with a **tomato-fruit specific promoter** (E8) resulted in **TOMAFFRON**

Introducing the saffron cassette in Xantomato

Xantomato carries four mutations (hp3, hp2^{dg}, B^{Sh}, and green stripe) that result in fruits with high levels of zeaxanthin

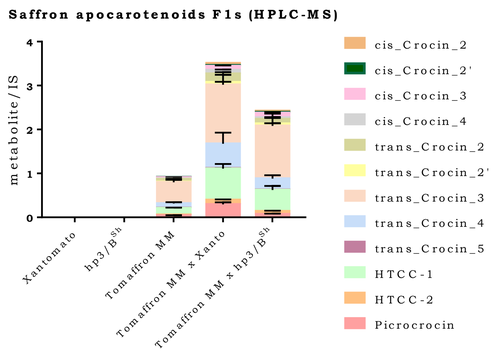
HOW DO WE IMPROVE IT?

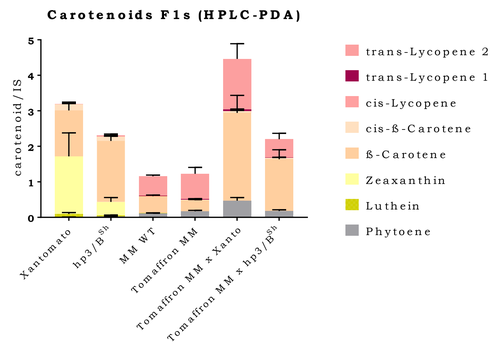
Conventional breeding approach

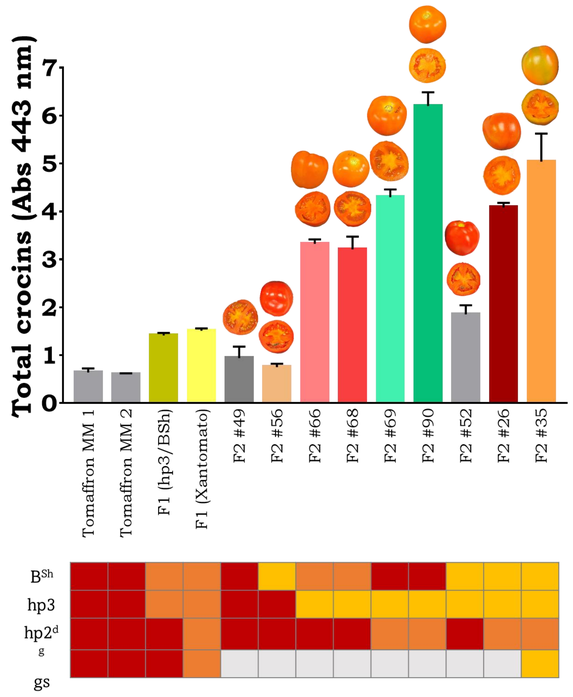


The F1 fruits from the crosses with Xantomato and the intermediate mutant hp3/ B^{Sh} accumulated **2 times more crocins** than transgenic MM

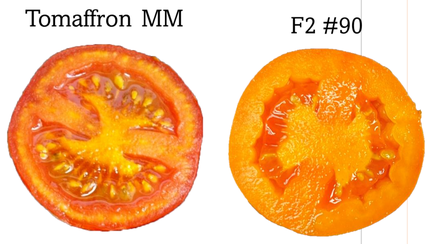
Population of F2 plants carrying different combination of the mutations



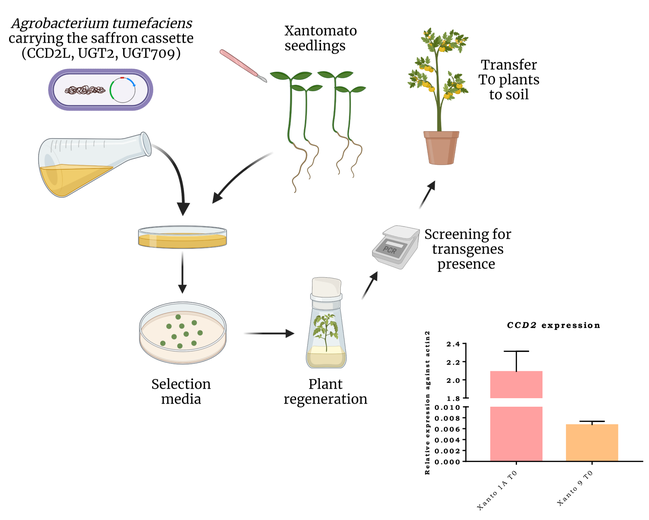


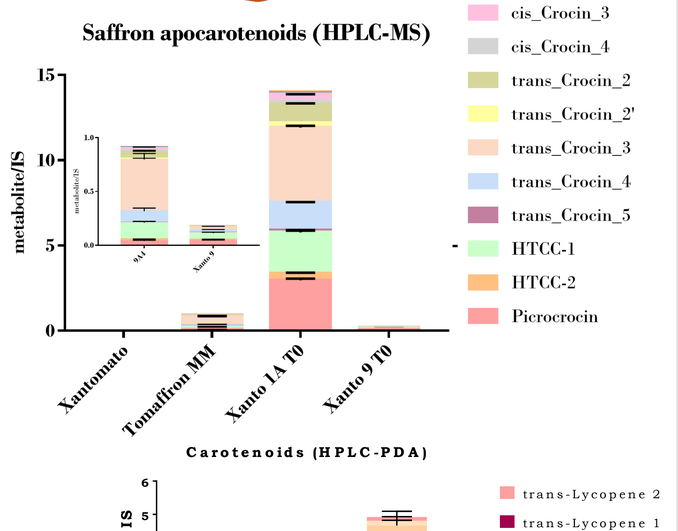


Fruits from **F2 #90** accumulated **10 times more crocins** than tomaffron MM, followed by **F2 #35** fruits accumulating **8 times more crocins**

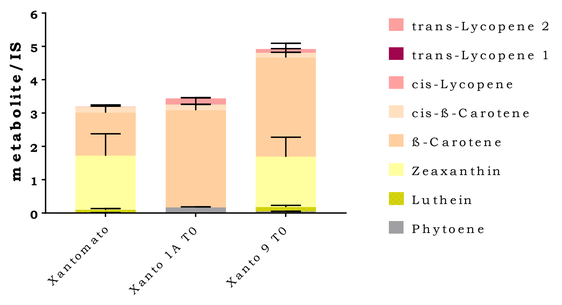


Biotechnological approach



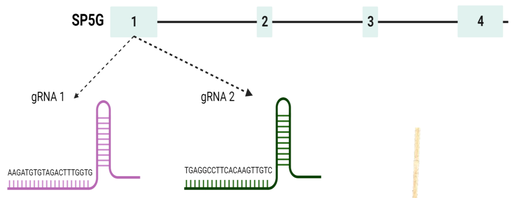


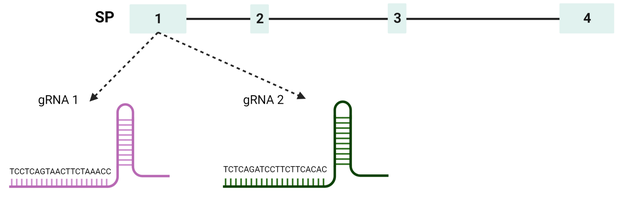
Xanto #1A accumulates **12 times more crocins** than transgenic MM, and both transgenic lines showed a **2-fold increase in β-carotene** compared with Xantomato



Modifying the chassis of the plant

Targeting *SELF-PRUNING* (*SP*) and *SP5G* genes through CRISPR/Cas9 in **tomaffron MM** to accelerate the flowering and concentrate in time the harvesting of the fruits

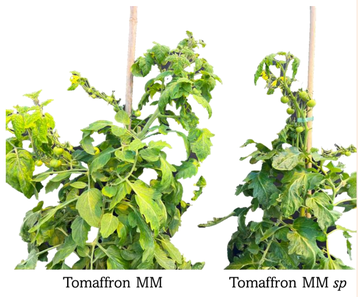




The **leaves to first inflorescence were reduced from 10.58 ± 0.53 to 7.67 ± 0.58** in the T1 generation of *SP5G* knock-out mutants

Tomaffron MM Tomaffron MM *sp5g*

T1 *SP* knock-out mutants showed a compacted phenotype with **determinate growth**



Tomaffron MM Tomaffron MM *sp*

Crosses between *SP5G* and *SP* T1 mutants were performed

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