

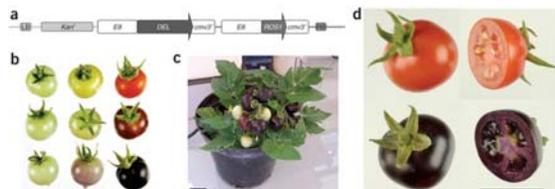
News- Wash Post Nov 3, 2008

- Researchers at the British-government-sponsored John Innes Center announced that they had developed a purple tomato that has high levels of beneficial anthocyanins -- antioxidants known to neutralize potentially harmful oxygen molecules, or free radicals, in the body and reduce the risk of heart disease and cancer. The genes for the purple tomato came from snapdragons.
- Butelli E et al Cathie Martin, Nature Biotechnology 2008
 - **Enrichment of tomato fruit with health-promoting anthocyanins by expression of select transcription factors.**
 - [Butelli E, et al](#)

Anthocyanins

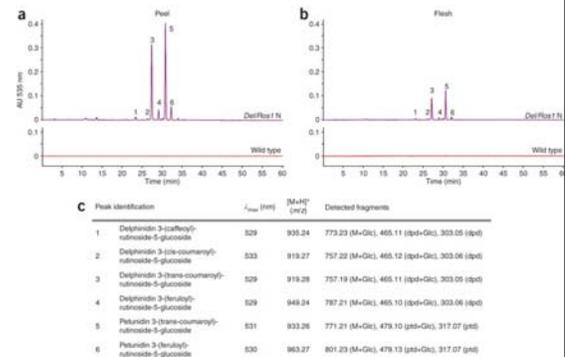
- Polyphenols
- High anti-oxidant activities
- NCI recommends one take 5 portions of fruit and vegetable/day. Most do not reach this.
- Tomato is a great candidate for transgenic enhancement of flavonoids.
- Strategy to increase anthocyanin is to express two transcription factors.
- Del and Ros1 genes interact to induce anthocyanin synthesis in snapdragon.

Figure 1 - Fruit-specific phenotypes of T1 generation tomatoes (cv. MicroTom) expressing both *Del* and *Ros1* under the control of the *E8* promoter.



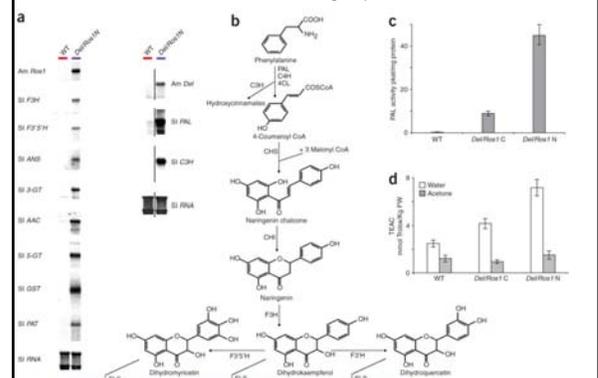
(a) Map of T-DNA region of the binary vector used for transformation. LB, left T-DNA border region; RB, right T-DNA border region; Kanr, *nptII* gene conferring kanamycin resistance under the control of the *nos* promoter; *cmv3'*, terminator region of cauliflower mosaic virus. (b) Phenotypic analysis of wild-type (upper row), *Del/Ros1C* (middle) and *Del/Ros1N* (lower) tomato fruit harvested at the green (left column), breaker (middle) and red (right) ripening stages. (c) *Del/Ros1N* tomato plant showing fruit at different stages of ripening. (d) Whole and cross-section of ripe wild-type and *Del/Ros1N* tomato fruit. All scale bars, 2 cm.

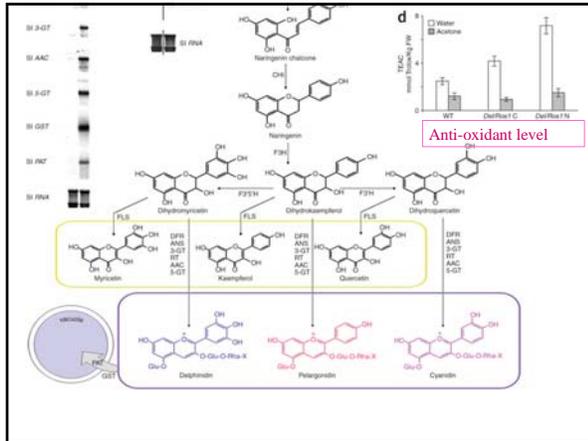
Figure 2 - Comparative analysis of phenylpropanoid content and composition



All genes encoding enzymes for anthocyanin synthesis are induced by *Del* and *Ros1*

Figure 3 - Expression of *Del* and *Ros1* causes the upregulation of genes required for anthocyanin biosynthesis and results in increased PAL activity and higher total antioxidant capacity

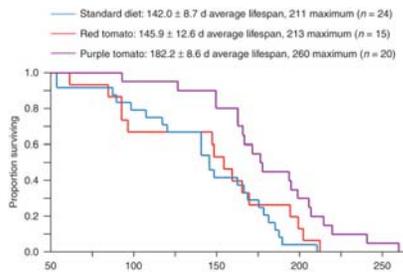




Test if anthocyanin offered health-promoting effect on mice

- Used mouse model
Trp53^{-/-} knockout mice.
Mice spontaneously develop cancers.
Life span ~ 140 d
- Fed them with tomato powder 10%.
- Control treatment??
- Fed tomato- red or purple

Figure 4 - Life expectancy of *Trp53*^{-/-} mice fed the standard diet or diets supplemented with 10% red or purple tomato powder



Conclusions

- Anthocyanins might not be directly beneficial.
- Anthocyanins may activate endogenous defense systems to delay oxidative damage.