

## *Line 2 – Conservation and sustainability*

### **Production of biomolecules in plant cell cultures**

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#### **Project description**

Plant cells can produce a great variety of compounds, many of which are useful as raw materials to produce chemicals, drugs and food additives. Valuable molecules are produced not only by field grown plants, but also by cell or tissue cultures. Frequently, many useful compounds are produced by plants in limited amounts and are the results of complex biochemical pathways, often restricted to peculiar cell compartment(s) and/or cell or tissue types.

The modification of complex biochemical pathways can be achieved not only by altering the expression of structural genes, but also by changing the expression of regulatory genes that control the cascade of regulatory events leading to the production of the desired biomolecules. Such modification can be carried out by modifying the expression of transcription factors (TFs). It is not only possible to change the expression of the endogenous TFs according to the production needs, but only to introduce chimeric regulatory genes. The latter, because of their nature, are not targets of plant regulatory mechanisms, and thus their manipulation can lead to improved yields in the production of valuable biomolecules. Playing with peach TFs, whose expression can be modulated by a two component system, we have recently developed tobacco lines accumulating valuable anthocyanins (Fig. 1). From those lines cell cultures were developed (Fig. 2).



Fig. 1. Tobacco plants overexpressing peach TFs that drive the expression of anthocyanin structural genes, thus leading to pigment accumulation.



Fig. 2. Tobacco cell culture producing anthocyanins developed from tobacco lines plants overexpressing peach TFs.

**Rahim MA, Busatto N, Trainotti L.** 2014. Regulation of anthocyanin biosynthesis in peach fruits. *Planta* **240**, 913–929.