*Proceedings of the XLIX Italian Society of Agricultural Genetics Annual Congress*
*Potenza, Italy – 12/15 September, 2005*
ISBN **88-900622-6-6**

**Oral Communication Abstract – 5.01**

# PLANTS WITH TRANSGENIC PLASTIDS

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*plastid transformation, metabolic engineering, molecular farming, biotechnology, containment*

Plant genetic engineering will likely contribute to the required continued increase in agricultural productivity during the coming decades. Moreover, plants can potentially provide inexpensive production platforms for pharmaceuticals and nutraceuticals. With the advent of technologies to alter the genetic information inside plastids (chloroplasts), a new attractive target for genetic engineering has become available to biotechnologists. There are considerable attractions of the plastid genome as a target for the expression of foreign genes. These include (i) the plastids' potential for high-level foreign protein expression, (ii) the possibility of transgene stacking through expression of multiple genes from operons, and (iii) the absence of position effects and epigenetic gene silencing mechanisms (Bock, 2001; Khan and Bock, 2004). From the biosafety perspective, the major attraction is the exclusively or predominantly maternal inheritance of the plastid genome in most crop plants, greatly reducing the risk of uncontrolled pollen spread of transgenes and thus allaying concerns over environmental consequences of GM crop cultivation.

Biotechnological applications of plastid genome engineering have long been hampered by the lack of workable plastid transformation systems for major crops. We have recently developed a plastid transformation system for tomato, a food crop with an edible fruit (Ruf et al., 2001). Transplastomic tomato plants are fertile and express foreign genes to high levels even in non-green plastids (chromoplasts) of the ripe tomato fruit. This system facilitates safe metabolic engineering and efficient production of nutraceuticals and biopharmaceuticals in consumable plant organs. The state of the art in plastid transformation technology, newly developed tools for transgene expression in plastids and selected applications in metabolic engineering, resistance management and molecular farming will be discussed.

**References:**

Bock, R. (2001). Transgenic chloroplasts in basic research and plant biotechnology. ***J. Mol. Biol.***, 312, 425-438.

Ruf, S., Hermann, M., Berger, I. J., Carrer, H. and Bock, R. (2001). Stable genetic transformation of tomato plastids: expression of a foreign protein in fruits. ***Nature Biotechnol.***, 19, 870-875.

Bock, R. and Khan, M. S. (2004). Taming plastids for a green future. ***Trends Biotechnol.***, 22, 311-318.