

Expression of Malaria Antigens in Transgenic Tomatoes

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SUMMARY

Humanities' inability to fully eradicate several deadly diseases in the 21st century, in spite of all the new discoveries and advances in technologies, still plagues billions of people from developing countries across the world. One of these diseases, malaria, caused by *Plasmodium sp.* and transmitted through the Anofel vector, is found mainly in tropical countries, especially in the sub-Saharan and East Asian subregions, and predominantly affects children. Due to a series of reasons, a significant number of people in these areas are poor and cannot afford expensive medication to cure diseases. The present study conducted since 2008 was aimed to develop vaccines against malaria by expressing its antigens in tomato plants. The main goal was to obtain a low-cost affordable edible vaccine that would be easily and efficiently made available to the affected populations from underdeveloped countries and, more importantly, a vaccine that would treat malaria through a more accessible, self-sustaining, and healthier manner. Therefore, in order to obtain transgenic tomatoes using *Agrobacterium tumefaciens*, seven day-old tomato cotyledons were transformed with the malaria antigens PfCP-2.9 (a combination of parts of MSP 1 and AMA 1) and PfCSP-RC (largely consisting of CSP aminoacids). A total number of thirteen transformed plants resulted after transformation with malaria antigens. Transgene expression in the T1 (first generation transformed plants) was verified at the DNA, RNA, and protein levels. DNA, RNA and protein were extracted from the leaves and fruits of all transformed plants. The presence of the gene of interest in transgenic plants DNA extracts was demonstrated through PCR analysis. Reverse Transcriptase PCR was performed for the RNA analysis, while Western Blot analysis and ELISA method were used to identify the presence of the protein of interest in the T1 transgenic plants. Transgene expression at the DNA and RNA levels was then confirmed in ten plants. However, the protein expression was observed in only two of the four transgenic plants transformed with PfCP -2.9 gene and in four out of seven plants transformed with PfCSP-RC. Finally, the gene of interest was also identified when DNA and RNA from the second generation (T2) of transformed plants were tested. This is the first known successful study in identifying the expression of malaria antigens in both first and second-generation transformed tomato plants.

Keywords: transformed plants, protein expression