C-Rice: Computational and Experimental Design Development of Transgenic Rice to Fulfill the Nutritional Demand of Carnosine in Human

Samanta, Michaela (School: Smak Penabur)

Rice (Oryza sativa) is the staple food for more than half of the world’s population and the main energy source for billions of people worldwide, especially in less developed areas because it is abundant and affordable. However, the nutritional content in rice is incomplete due to a deficiency in several proteins important for humans and livestock. For instance, Carnosine is a dipeptide that is not present in plants and can only be found in meat. As a result, Individuals with low-protein diets (e.g. vegans, vegetarians, eating disorders, and poor economic condition) are prone to contract carnosine-deficiency related diseases, such as stunted growth, muscle atrophy, nerve damage, eye disorder, etc. To resolve such predicaments, this project employs computational & digital analysis to develop engineered rice with carnosine content. The expected result of this report is to attain a competent meta data and affordable design of experiment from reliable bioinformatical tools, such as: algorithms, manually designed program, web-data, server, simulator, database, as well as open and private soft wares. The engineering design of this project is to insert a foreign multi-gene comprises of high alanine and histidine oligopeptide chain (C-gene), beta-alanine pyruvate transaminase gene, and carnosine synthase using golden gate and conventional restriction ligation method of assembly into rice genome. Each gene is combined with GluC endosperm-specific promoter from Oryza sativa Nipponbare in pCambia binary vector to be cloned and transformed into rice callus using E.coli and Agrobacterium mediated gene transfer respectively. By utilizing these techniques and analyzing the meta data gathered, it seems plausible to produce C-Rice which capable of manufacturing sufficient Carnosine.

Awards Won:

Patent and Trademark Office Society: Second Award of $500