

## Golden Rice: A Boon of Biotechnology

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### EDITORIAL

From the very beginning of human civilization, the major challenge has been the battle of survival. The major requirement for this survival is food which will provide us with energy and will help us to fight and prosper in life. The fact that even in these days of globalization, many countries are suffering hard to remove hunger from their country, example of such countries are Chad, Angola, Ethiopia, Afghanistan, Sierra Leone, Pakistan, Madagascar, Malawi, Mali, Cameroon, Burkina Faso, Kenya, Togo (The global hunger index provides us with all these data). The major staple food for the majority of the country is rice. Biotechnology with the sole goal of providing nutrition to those who need it came up with golden rice.

Golden Rice is manufactured by the process of genetic engineering by altering the plant's biochemical pathways and synthesizing beta carotene found in high quantities in carrots. Golden rice is a rich source of vitamin A and hence it is highly recommended for patients suffering from Vitamin A deficiency. Reports suggest that Vitamin A deficiency is the leading cause of blindness in children and also accounts for the highest number of death from measles and diarrhea. Genetic engineering is done by the addition of two

Beta Carotene biosynthesis genes in the plant namely phytoene synthase (psy) from daffodils and phytoene desaturase (ctr 1) from bacteria. The initiation of carotene biosynthesis starts with the C5 compound named dimethyl diphosphate (DMAPP) and isopentenyl -diphosphate (IPP) one of the isomers of DMAPP. C5 chain elongation forms the c20 compound named geranylgeranyl-diphosphate (GGPP). GGPP marks the biosynthetic pathway of several products. Two GGPP molecules condense to produce colorless beta carotene, phytoene. In the subsequent step, desaturation reaction occurs forming colored chromophore of lycopene and  $\beta$ - and  $\epsilon$ - ionene ring. Subsequent oxygenation steps lead to xanthophyll. Carotenoid with a single unsubstituted Beta ionone ring can synthesize provitamin A

Golden rice has although faced some or other issues related to ethics in some countries where genetic engineering seems going against nature. The fact that all these theories are nothing but barriers in the path of development of science must be understood. Golden rice can be an important weapon in the fight against hunger and malnutrition especially in developing and under-developed countries.

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