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LETTER TO EDITOR

A GUIDE TO PROGRAMMING BASED SYNTHETIC GENETIC CIRCUIT IN PLANTS

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A series of precise programmable genetical steps are needed for successful design and implementation of synthetic circuit in plant cell. That might involve precise programming and designing of circuit, assembling of DNA, proper prototyping, delivery into a model crop system following delivery into the target crop and subsequent field trials.

Although challenging, developing crop genetic circuit has got outstanding advancement in molecular biology as DNA assembling, transformation vectors have already developed and successfully installed in plant cell. However, significant research are still lacking to successfully install synthetic genetic circuit in plants. The research gap might include designing of precise prototype circuits, its delivery to plant cell, proper activation and remote control, compatibility with natural system and even challenges in marketing.

Random screening is time consuming. The alternative strategy could be model circuit that could be installed in crop plants. However, the model circuit and following algorithm for generation of precise genetic circuit is

still lacking and under research. Hence, designing of current genetic circuit is mostly needed to combine rational genetic parts with careful screening to select the targeted phenotype. Indeed, programming based synthetic genetic circuit has got proven success in genetic circuit enabled plants (Hasan 2024, Islam et al 2024, Hasan 2023).

Initially composable parts should be utilized for constructing genetic circuit. Each part of circuit should receive a strictly defined input that would be converted it into an expected output (Figure 1). For getting targeted phenotype, selection of parts that must be compatible with outputs and inputs. Synthetic promoters having different *cis* regulatory elements are commonly used in synthetic biology do not fit the prerequisites for composable parts. Synthetic transcription factor could also. Hence, a precise programming based synthetic genetic circuit needs proper skill in programming and deep knowledge of plant biology for efficient and precise designing and transformation of synthetic circuit in plant.

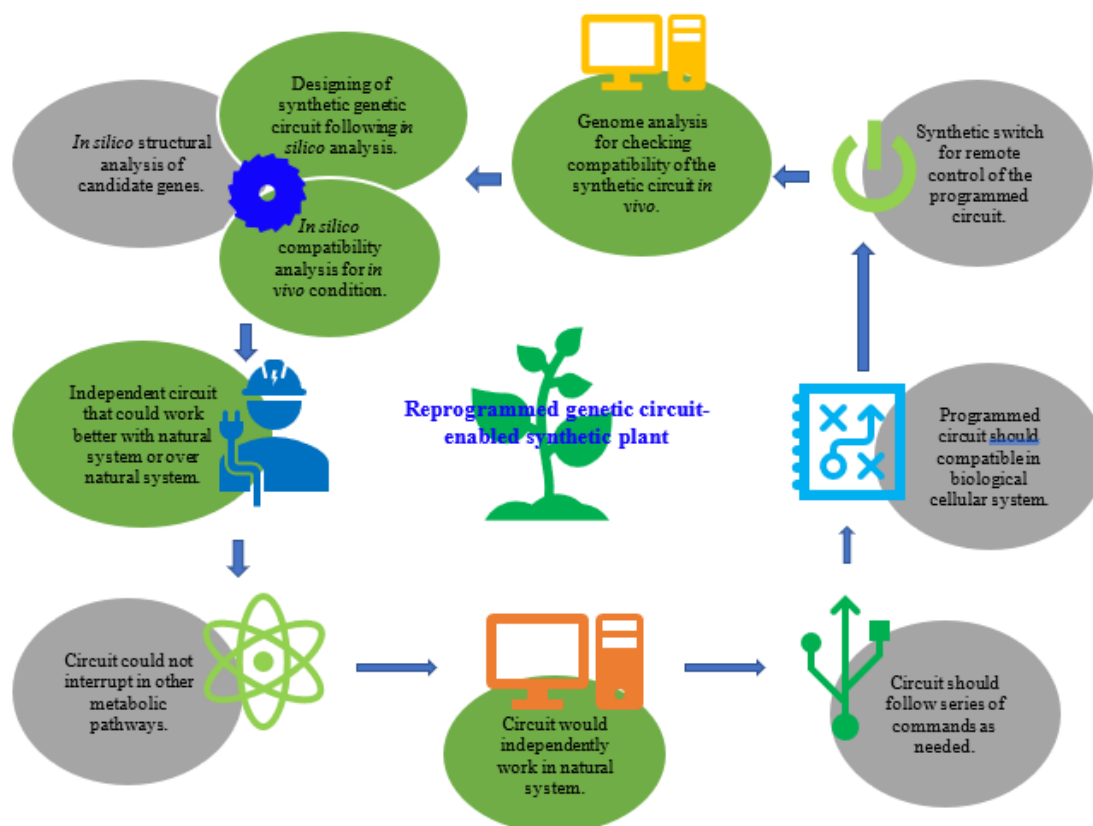


Figure 1: Characteristics need to be considered for developing and transforming synthetic genetic circuit in plants.

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