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## **Marker Genes**

A marker gene may be described as a gene whose expression can be efficiently monitored and can be easily detected. During transformation techniques marker genes are available in the vectors which are then transferred into the host cells also. In all types of transformation techniques the isolation of transformed cells or tissue is a necessary step and marker genes provide an aid for this isolation. Like other transformation techniques the isolation is important in Agrobacterium mediated transformation also. After the explants are inoculated with engineered or transformed cells or screening transformed cells from the non transformed ones. Marker genes facilitate this selection and screening of transformed cells and are termed as selectable marker and reporter genes so marker genes are of following two types

### **a) Selective marker**

Some marker genes express certain features which allow the survival of only the transformed cells under a particular condition. Such marker genes are referred to as **Selectable Markers** usually selective conditions employed are toxic levels of a substrate like an antibiotic or a herbicide. The selectable markers used here are the genes conferring resistance against these antibiotics or herbicides. Also for each marker gene there is one substrate

Generally steps involved in the selection process by selectable marker genes are

- First of all, selectable Marker genes (which provide resistance to herbicides) are introduced into the vector.

- This vector containing selectable marker is then introduced into the host cells which are now called transformed cells
- Such transformed cells are cultured on the culture medium which contain toxic level of substrate used for selection
- Those cells which are really transformed survive on the medium due to presence of selectable marker gene while the non transformed cell die to toxic level of substrates

Example If the marker gene present in vector is streptomycin resistant gene then only the transformed cells survive in mediums having toxic levels of streptomycin. The non transformed cells would die due to absence of spt. Gene.

#### b) **Reporter gene**

A reporter gene is basically test gene whose expression produces a phenotype which is quantifiable.

Reporter gene is very useful in deciding the success of a gene transfer system and also for testing the gene expression in plants. A reporter gene system plays a valuable role in setting up the standards for parameter deciding the success of any gene transfer technique.

Example If a gene codes for a green fluorescent protein. It expresses a unique property of emission of green light or exposure to UV light. Thus the transformed cells having this gene will emit green light in UV rays while the non transformed cell will not. If a gene is a reporter gene facilitating the screening of transferred cell from others. This GFP gene is isolated from Jelly fish.