



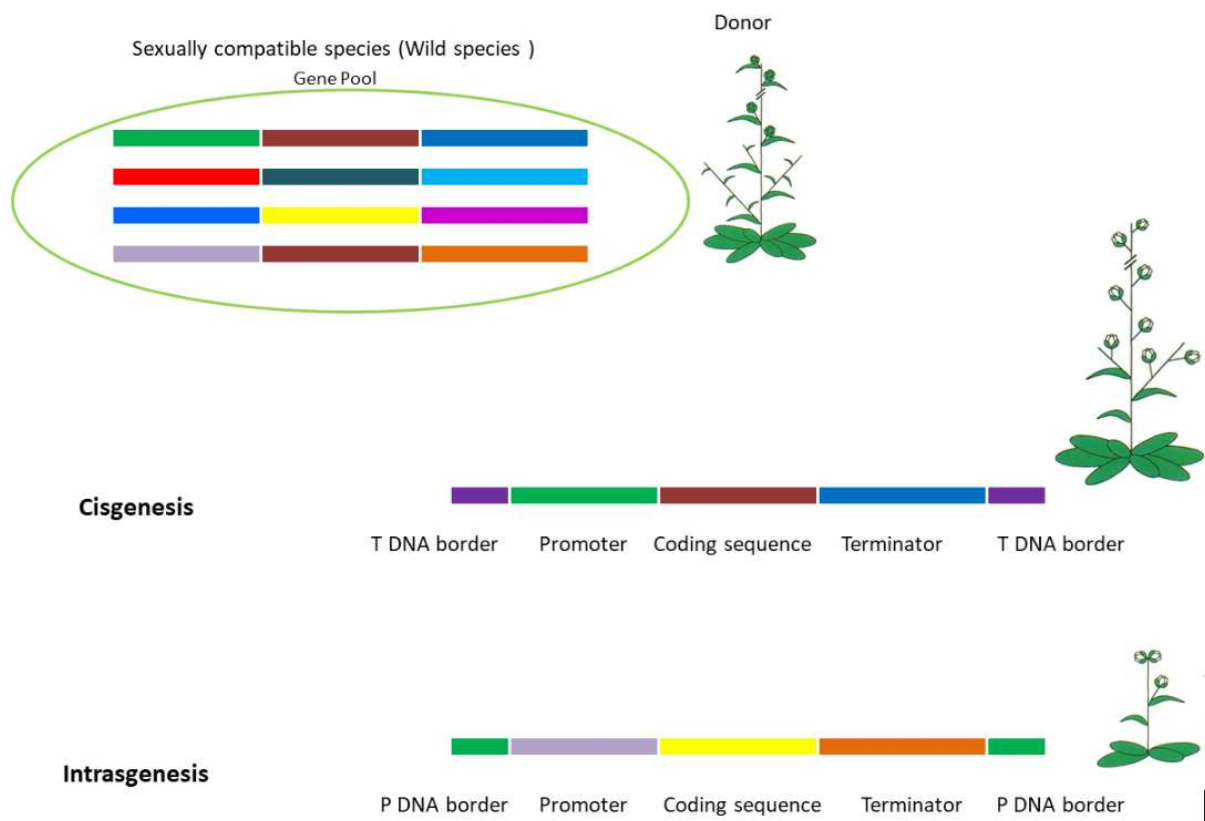
## Cisgenesis and Intragenesis: an alternative to Transgenesis

- Dr A. Manivannan and Dr Santosh HB

**Transgenesis:** Transgenic plant is genetic modification of a recipient plant with one or more genes from any non-plant organism, or from a donor plant that is sexually incompatible with the recipient plant, by enlarge called as Genetically Modified (GM) crops or Transgenic crops. There is growing concern among the general public about the introduction of foreign DNA into the food crops, leading to worldwide objections to transgenic plants (Schouten *et al.*, 2006; Krishna *et al.*, 2014).

**Cisgenesis :** Cisgenic plant as a crop plant that has been genetically modified with one or more genes isolated from a crossable donor plant (sexually compatible plant species). That gene (cisgene) is an identical copy of the endogenous gene of the plants in which the promoter, coding sequence and the terminator are present in normal sense orientation. Thus, cisgenesis restricts any alteration whatsoever in the original gene (Jochemsen and Schouten, 2007).

**Intragenesis :** Isolation of specific genes or genetic elements from a plant and allowing *in vitro* recombination of these genes or genetic elements and insertion of the resulting expression cassettes into a plant belonging to the same sexual compatibility group (Rommens, 2004). The inserted DNA can be a new combination of DNA fragments from the species itself or from a cross compatible species. Here Plant transfer DNA (P DNA) borders used instead T DNA borders employed in *Agrobacterium* mediated transformation.



**Advantage of Cis/Intragenesis compare to Transgenesis :** Transgenic crops possess a panic about health hazard, biosafety, non-targeted effects on other organisms and threat of gene flows through transgene escape. Therefore, adaptation and use of GM crops is still in controversy across the world. In case of cisgenic and intragenic plants are free from other non-plant sequences, such as selection markers (antibiotic markers) and vector backbone. Several strategies are available either to avoid or remove marker genes such as selectable marker elimination and recombinase induced excision. This advantage of exclusion of antibiotic markers elimination and cross insertion of vector backbone into recipient plants makes the modified plants as safe to consume (biosafety) and chances of environmental gene flow or super weed formation would be nearly nil as we are manipulating native plant species genes only. Higher expression level of a desired trait could be possible by reintroducing the gene of the trait with its own promoter and terminator (cisgenesis) or with a promoter and terminator isolated from the sexually compatible gene pool (intragenesis). Lower expression levels can be obtained through different silencing constructs as is the case in intragenesis (gene silencing). These will enhance the quality and quantity of the desired gene of interest.

### Suggested Reading

1. Jacobsen, E and Schouten, H.J. 2007. Cisgenesis strongly improves introgression breeding and induced translocation breeding of plants. *Trends Biotechnol.*, **25(5)**:219-223.
2. Krishna, V.V., Qaim, M and Zilberman, D. 2014. Transgenic crops, production risk, and agrobiodiversity. ZEF- discussion papers on development policy no. 186. <http://dx.doi.org/10.2139/ssrn.2405466>
3. Schouten H.J., Krens, F.A and Jacobsen, E. 2006. Cisgenic plants are similar to traditionally bred plants. *EMBO Rep.*, **7**:750-753.
4. Rommens, C.M. 2004. All-native DNA transformation: a new approach to plant genetic engineering. *Trends Plant Sci.*, **9**:457-464.

### Lecture/ Radio talk delivered

- Dr. V. S. Nagrare, Principal Scientist (Entomology) delivered lecture on Pink bollworm management on 5<sup>th</sup> June, 2018 in a Shetkari Melava organized by Agriculture Department in association with Mahabeej and Vasantarao Naik Krishi Pratishthan, Pusad, Dist. Yavatmal. The program was chaired by Shri. Manoharrao Naik, MLA Pusad. The staffs from agriculture department and Mahabeej were present on this occasion and interacted with farmers. About 700 farmers from nearby tahsils attended the program.
- As desired by the Director of Media Centre, Community Radio Station of Chaudhary Devi Lal University (CDLU), Sirsa, Haryana, The Head, ICAR-CICR, Regional Station, Sirsa shortlisted Dr R. A. Meena, Dr Rishi Kumar, Dr S. K. Sain and Dr Amarpreet Singh to deliver radio talk on cotton crop for the farmers of the district during the crop season. In this context, first radio talk was delivered by Dr. Amarpreet Singh, Scientist (SS), ICAR-CICR, Regional Station, Sirsa, Haryana 125 055 from 10:00 hours to 11:00 hours on 27-06-2018. The topic of radio talk was "Nutrient and weed management in cotton". It was a live phone-in program of the said Radio Station. During this talk various aspects of nutrient and weed management in cotton were covered. The answers to the phone calls received from farmers were taken during this live phone-in program. Dr. Rishi Kumar, Principal Scientist compered the program for Dr Amarpreet Singh.





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