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Selfish DNA: A Genetic Camouflage in Evolution

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Selfish DNA is a set of genetic elements like transposons, plasmids that prioritize their own copy replication and its transmission into the host genome which is similar to the microbial multiplication. Normal genes that contribute to an organism growth and development but selfish DNA neither harm nor benefit the host organism but play a key role in the evolution of the species. In the past it considered to be junk DNA but now they known to play a remarkable role in creation of genetic diversity to drive the evolution of crop genomes and the emergence of new traits that can be valuable for plant breeding. At the same time, uncontrolled movement of these elements may disrupt gene functions and reduce genome stability.

Introduction

Selfish DNA or parasitic DNA is referred as the genetic elements that can self replicate and transmit into the host organism at the expense of other genes in the genome, even if this has no positive effect or negative effect on the survival of host organism (Hurst, G.D. and Werren J.H. 2001). Selfish DNA concept given by Leslie Orgel and Francis Crick and independently by W. Ford Doolittle and Carmen Sapienza in the year 1980, (Doolittle, W.F. and Sapienza,C.1980). Selfish genetic elements, include transposable elements, retrotransposons, meiotic drive elements and B chromosomes, which pass on to the next generations from parents to off-springs by exploiting the host cellular machinery to ensure their own survival. These selfish genetic elements are evolved from microorganisms. In the past these are called as junk or parasitic DNA (Hickey, D.A.1982) but now recognized as important contributors to genome diversity and its evolution. Genetic elements transmission and amplification generate mutations, chromosome rearrangements and novel regulatory sequences that can influence gene expression and adaptation and in some cases it may disrupt gene function (Werren *et al.* 1988). These elements present in all the organisms but higher number in the genome of eukaryotes and a very little in prokaryotic organisms. This may transmit to parents to progeny of a similar species or different species or it is born directly inside the genome due to the copying mistakes.

Selfish DNA: How it is beneficial

- Hybrid development via cytoplasmic male sterility: mitochondrial selfish genes cause pollen failure, making plants male sterile which prevent tedious emasculation procedure and it made very easier hybrid crosses. Plant breeders use these lines to produce hybrid seeds efficiently on a large scale without the intensive labor for hand emasculation.
- Mobile selfish elements (jumping genes) insert themselves into normal genes to disrupt or tag them, helping breeders to discover and map useful agricultural traits. These elements turning the trash (non-coding genomic regions) into treasure of desirable traits (Agren, 2016).

- Source of genetic variation: creates mutations by inserting into or excision from genes. By using the genome editing tools novel genotypes are created.
- Crop evolution and germplasm enhancement: earlier highly complex genomes of eukaryotes are evolved from prokaryotes and these are also evolved from microbes, as the time pass on this leads to more evolved genes by the duplication of genomic elements.
- Genome restructuring: continuous entry into the genome by breaking the genome sequences it will shuffle the genome and it leads to the rearrangement of chromosomal segments.
- Molecular marker development to the selection of superior genotypes and diversity studies.
- It serves as a tool to determine the gene function.

Selfish DNA: How it is harmful

- Harmful mutations may arise if insertions disrupt the functions of genes.
- Genome instability from excessive transposition: these transposable elements can transmit or copied repetitively it leads to the changes in the position of genes.
- Reduced fertility in some cases.
- Cellular toxicity.
- Increased breeding complexity when undesirable insertions occur.
- Waste of host cellular machinery for their survival by spending the metabolic energy while copying the non-functional or parasitic DNA.
- Increased extinction risk by accumulating the selfish genomic elements which enlarges the genome size.

Conclusion

earlier it is considered to be the selfish DNA do not inherently care about the host organism but now it has emerged as one of the most fascinating and valuable components of plant genomes in driving evolution patterns, higher genetic diversity and providing powerful tools to the crop improvement. By creating new genetic variations, aiding gene discovery and supporting the advanced breeding techniques, selfish DNA has become an important in developing high-yielding, climate-resilient and nutritionally enriched crop varieties. As genomic technologies continue to advance, understanding and harnessing selfish DNA will enable plant breeders to transform what was once considered a genomic burden into a resource for sustainable agriculture and global food security. Even though selfish DNA is not harmonious or cooperative with the host genome but these sequences can successfully survive by not harming the host organisms.

References

1. Doolittle, W.F. and Sapienza, C. (1980). Selfish genes, the phenotype paradigm and genome evolution. *Nature*. 284(5757):601-603.
2. Hickey DA. (1982). Selfish DNA: a sexually-transmitted nuclear parasite. *Genetics*. 101: 519-531.
3. Werren, J.H., Nur, U. and Wu C.I. (1988). Selfish genetic elements. *Trends in Ecology and Evolution*.3(11):297-302.
4. Hurst, G.D. and Werren J.H. (2001). The role of selfish genetic elements in eukaryotic evolution. *Nature Reviews.Genetics*. 2(8): 597-606.
5. Ågren JA. (2016). Selfish genetic elements and the gene's-eye view of evolution. *Current Zoology*. 62:659-665.