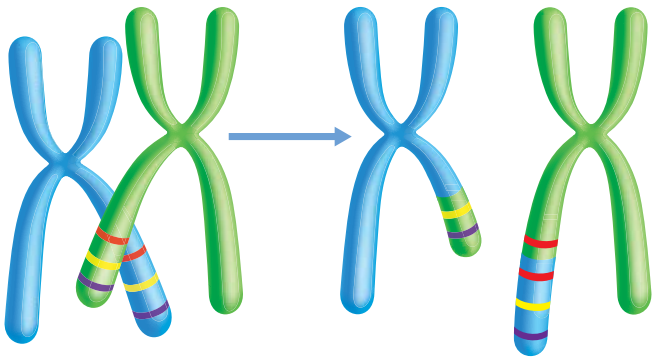
Guided Research

Gene Duplication and Genetic Variation

FIGURE 16: Gene duplication has influenced the traits of domestic sunflower plants.



In metaphase I of meiosis, homologous chromosomes exchange DNA segments via crossing over. This leads to genetic variation in the offspring of sexually reproducing organisms. Sometimes during crossing over, homologous chromosomes do not align with each other properly. If this happens, the two segments crossing over may be different in size. As a result, one chromosome may have two copies of a gene or genes, which is called gene duplication. The other chromosome may have no copy of the gene or genes, known as a gene deletion.

Gene duplication has occurred many times over millions of years of eukaryotic evolution. For example, domesticated sunflowers have a duplicated gene that lengthens plants' growing period. Interestingly, this gene duplication is not the result of domestication. Evidence shows that the duplication occurred long before Native Americans began breeding the plants as a part of their horticultural practices. This variation of sunflower was simply preferred by Native Americans.

Language Arts Connection Conduct research to construct an argument for how gene duplication increases genetic variation. Start by choosing a specific species to research, and look for materials explaining how gene duplication has affected this species. As you conduct your research, evaluate your sources carefully to be sure they are reliable. Do they present verifiable facts? Are the opinions those of an expert or experts in this field? Is there enough evidence to support the claims being made?

Using your own words, write an argument explaining how gene duplication from unequal crossing over has influenced genetic variation in a certain species. Use these questions to guide your research:

1. Which species will you be researching, and what evidence exists that gene duplication has occurred in this species?
2. How did gene duplication influence the traits of this species?
3. What is the connection between gene duplication and the evolution of this species?

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