

## Approaches for Farmers Benefits of Genetic Variability in Lentil (*Lens culinaris*, Medik)

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Genetic variability in lentil crops refers to the variation of genetic traits (such as size, shape, colour, disease resistance, yield, etc.) that exist among different individuals within a population of lentil plants. This variation is the result of natural processes such as mutation, recombination and gene flow, and it is the foundation of evolution and adaptation to changing environments. In agriculture, genetic variability is important because it provides the raw material for plant breeding programs to improve crop traits and develop new varieties with desired characteristics. Lentil crops are known to have a high degree of genetic variability, which makes them a good candidate for plant breeding efforts to develop improved varieties for various growing conditions and uses.

*“Genetic variability refers to the diversity of genetic material within a population of individuals or species. It encompasses differences in the DNA sequences, chromosomal structure, and gene expression of individuals. This variability is a key factor that drives evolution and adaptation to changing environments, and can provide a basis for the development of new traits and the evolution of species over time”*

**Genetic variability in lentil crop is important for several reasons:**

1. **Biodiversity:** Genetic variability provides a pool of diverse genes that can be used to breed new and improved varieties of lentil that are resistant to biotic and abiotic stress, diseases and pests.
2. **Adaptation:** Lentil crops grown in different regions face different environmental conditions, such as temperature, moisture, soil type, etc. Variability in genetic traits allows for lentil plants to adapt to these conditions, improving their growth and yield.
3. **Breeding:** The presence of genetic variability allows plant breeders to select desirable traits and incorporate them into new cultivars through traditional breeding methods or genetic engineering.
4. **Food security:** Maintaining genetic variability in lentil crops ensures that farmers have a range of options to choose from, reducing their dependence on a single cultivar, and reducing the risk of crop failure due to disease or environmental stress.
5. **Sustainability:** Lentil crops with high genetic variability are better



Fig. 1: Various types of Lentil Varieties

equipped to face changing environmental conditions, including those associated with climate change, and can be sustained over the long term.

Overall, genetic variability in lentil crops is critical for ensuring the long-term viability and sustainability of this important food crop.

#### Method for creating genetic variability in Lentil crops:

There are several methods for creating genetic variability in lentil crops, including:

- **Cross-pollination:** This involves the transfer of pollen from one plant to the stigma of another plant, creating hybrid offspring that exhibit genetic diversity.
- **Mutagenesis:** This involves exposing plants to chemicals or radiation, which can cause genetic mutations and increase genetic variability.
- **Tissue culture:** This involves growing plant tissues in a laboratory setting, which allows for the manipulation of plant genetics and the creation of genetically diverse plant populations.
- **Wide crosses:** This involves crossing two genetically diverse lentil varieties to create offspring with a range of new traits and increased genetic variability.
- **Gene editing:** This involves using tools like CRISPR-Cas9 to make precise changes to the plant's DNA, creating new genetic diversity.

These methods can help create genetic variability in lentil crops, which can lead to the development of new and improved varieties with improved yield, disease resistance, and adaptability to different environmental conditions.

#### Farmers benefits of genetic variability in Lentil:

Farmers benefit from genetic variability in lentils because it allows for:

- **Increased yield and productivity:** The genetic diversity provides options for farmers to choose from different lentil varieties that are better suited to specific growing conditions and are more resistant to pests and diseases.
- **Crop improvement:** By selecting desirable traits from different lentil varieties, farmers can continuously improve their crops and increase the quality of their harvest.
- **Adaptation to changing environmental conditions:** Genetic variability enables crops to evolve and adapt to changing environmental conditions, such as changes in temperature, rainfall, and soil conditions.
- **Diversification of crops:** By growing different lentil varieties, farmers can diversify their crops and reduce the risk of crop failure due to disease or environmental factors.



Fig. 2: Lentil crops in Research field

Genetic variability in lentils provides farmers with more options and the ability to improve their crops, leading to increased yields, productivity, and profitability

**Disadvantages of genetic variability in lentil include:**

- **Increased susceptibility to diseases:** A high degree of genetic variability can increase the likelihood of the crop being affected by diseases and pests.
- **Difficulty in breeding:** Lentil breeders may face difficulties in selecting the desired traits in their breeding program due to the presence of a large number of alleles for a single trait.
- **Quality variability:** Variability in grain size, shape, and other seed quality traits can result in crop lots with varying levels of quality, which can make it more difficult to produce a consistent product.
- **Challenges in seed production:** Seed production can be challenging in highly variable populations, as it may be difficult to obtain uniform seed lots with the desired characteristics.

**Conclusion**

Genetic variability in lentil offers numerous benefits to farmers. This diversity allows for the development of improved varieties with desirable traits such as increased yield, disease resistance, and tolerance to environmental stresses. The availability of a wide range of genetic material also enables farmers to choose varieties that are well-suited to their specific growing conditions, leading to higher crop productivity and profitability. Additionally, genetic variability helps to ensure the long-term sustainability of lentil crops by providing a source of resistance to new diseases and pests that may emerge. Overall, the utilization of genetic variability in lentil production plays a crucial role in promoting food security and increasing the competitiveness of the lentil industry.