Importance of Genetically Pure Seed in Agriculture

Kunja Vijaya Durga[1]* and Bollineni Sai Mohan[2]

[1]*Assistant Professor, Department of Genetics and Plant Breeding, Kadiri Baburao College of Agriculture, C.S. Puram, Andhra Pradesh, 523112, India.*
[2]*Assistant Plant Breeder, Sangam Dairy Seeds, Vadlamudi, Guntur, Andhra Pradesh, 522002, India.*

Corresponding Author
Kunja Vijaya Durga
Email: kunjavijayadurga@gmail.com

OPEN ACCESS

Keywords

Genetically pure seed, Agriculture, Genetic purity, Diseases, Pests

How to cite this article:

Durga, K. V. and Mohan, B. S. 2026. Importance of Genetically Pure Seed in Agriculture. *Vigyan Varta* 7 (11): 144-146.

ABSTRACT

Genetically pure seed is the basic component in agriculture, this seed plays a vital role in modern agriculture, serve as the foundation for agriculture productivity, sustainable farming and food security. Genetically pure seed is elucidated as the seed with highest genetic purity, physical purity, viability, vigour, and free from diseases and pests. The production of genetically pure seed involves strict agronomic, genetic, and morpho-physiological criteria from field level to storage level. However, different factors like mechanical mixtures, improper field conditions, poor pre & post harvesting handling, and inappropriate storage conditions can lower the genetic purity of the seed. Low genetic pure seed result in poor germination, disease & pest incidence, uneven crop growth, which finally leads to lower crop yield. Many organizations like OECD, ISTA and FAO, around the globe and in India institutions like ICAR and NSC, promote and regulate genetically pure seed production and certification.

INTRODUCTION:

Genetically pure seed is the fundamental and most important farming input in agriculture, amongst all inputs used in crop cultivation, genetically pure seed has great impact on agricultural production (Rajesh *et al*., 2025). Genetically pure seed means true- to- type and carries 100 % of the fixed morphological and genetic traits of the original variety placed by the plant breeders. High quality genetically pure seeds

are solitary can enhance total crop yield by 20% to 30% and also free from off - types or admixtures, genetic contamination, belonging to species or other varieties. Genetically pure seed is the most vital, when procure seed for crop planting purpose (Douglas *et al.,* 2022).

Fundamental Characteristics of Genetically Pure Seeds

Morphological Homogeneity: When genetically pure seeds grown, all plants display predictable and identical physical characteristics, such as uniform flower colour, leaf shape, plant height, pod size and branching patterns.

Trueness to Type: The genetically pure seeds produce plants that rigorously contagious to the genetic constitution of the intended crop variety.

Consistent Production Yields: Genetically pure seeds carry the unique biological benefits bred into that variety, including fruit quality or specialized grain, optimized yield potential, and target responsiveness to agricultural practices (Dash *et al*., 2025).

Synchronous Maturity: The resulting crop reaches and develops maturity at the same time. This constancy simplifies field management and harvesting of the seed crop.

Main Steps to Produce Genetically Pure Seed

A. **Control the Seed Source:** Seed crop always grown with an authentic seed source *viz*., breeder seed or foundation seed or certified seed, obtained from seed or corporation an authorized state agricultural university rather than unverified commercial grain.

B. **Land History and Field Selection:** The land needs to be clean, free from weed plants, off types, disease plants, volunteer plants and also soil borne diseases. Avoid planting in land that grew the same crop or same variety but not known genetic purity or a closely related variety in previous season to protect the crop from contaminated leftover unwanted plants.

C. **Maintain Proper Isolation Distances:** Seed crop should have to proscribe from unwanted cross pollination from wild relatives or different varieties. Grow the seed crop isolated from same variety or other varieties of the same species using distance isolation or time isolation or physical barriers isolation.

D. **Rigorous Roguing:** Roguing means systematic removal of off -types, plants that look different when compare to seed crop in terms of flower color, leaf shape, plant height or maturity stage. Check the seed fields at critical stages like seedling, vegetative growth, pre-flowering, flowering, maturity and harvesting.

E. **Prevent Mechanical Mixing during Harvest and Post-Harvest:** A seed lot can easily lose its genetic purity during harvest and after harvest through human error. Overcome this problem thoroughly clean all seed planter machines, combine harvesters, threshers, seed processing plants and storage equipment's like storage bins and bags before handling a new variety.

Advantages of Genetically Pure Seed

1. Genetically pure seed solitary can increase overall seed crop production by 25% to 30% when perfectly combined with standard agri-inputs like fertilizers and water.

2. Genetically pure seeds make sure that all plants in a field germinate, grow and mature at the same time.

3. Genetically pure seeds guaranteed character expression such as a specific fruit size or exact grain colour and high protein content.

4. Genetically pure seed enable inherent biotic and abiotic resistance.

Using Different Methods for Testing the Genetically Pure Seed

(a). Grow Out Test (GOT): Authentic control samples and seed samples were sowed side-by-side in field plots. Plants are extrapolated from the seedling stage through reproductive, flowering and maturity stages based on morphological characters (flower colour, leaf shape, plant height, and maturity time). Usually evaluates 400 to 1000 plus plants for each sample.

(b). Chemical Colour Reactions Test: Uses reagents like potassium hydroxide (KOH), modified phenol, phenol, ferrous sulfate ($FeSO_4$) or sodium hydroxide (NaOH) on seedlings or seeds. Colour changes in the kernel or seed coat help very quickly differentiate specific crop and cereal varieties (such as rice, wheat or sorghum).

(c). Polymerase Chain Reaction (PCR) Assay: Study DNA polymorphism directly from leaf tissue or seed. Used different markers like ISSR (Inter-Simple Sequence Repeat / Microsatellites), RAPD (Random Amplified Polymorphic DNA) and SNP (Single Nucleotide Polymorphisms). Benefits of PCR assay, detecting parental line, DUS (Distinctness, Uniformity and Stability) testing and identification of low level off-types.

CONCLUSION

Genetically pure seeds are fundamental element of sustainable agriculture, directly influencing resilience, crop yield, and ecological impact. Genetically pure seeds are conserve their desired attributes, namely biotic resistance, abiotic resistance, high productivity and desirable agronomic characters, which are pivotal for consistent crop performance. High genetically pure seeds are encompassing vigour, viability, germination capacity, purity and reduces the need for chemicals *viz*., herbicide, fungicide and pesticide, thereby encouraging eco-friendly practices. Conserving genetic diversity within genetically pure seed plants are aid resilience against pests, diseases, climate variability and also food security.

REFERENCES

Dash, A. K., Sannagoudar, M. S., Kumari, K., Vinesh, B. and Kumar, A. (2025). Sustainable soil health management practices for quality seed production. Recent innovations in seed production and quality control system. 214 – 228.

Douglas, J., Dial, H., Casey, A., Miller, C., May, C. and Englert, J. (2022). The Importance of Seed Quality for Natural Resource Conservation Practices. *United States Department of Agriculture*. Technical Note No. 190-PM-7. 1-13.

Rajesh, J., Mrudhula, C. and Kala, C. V. (2025). Quality Seed and its' Importance in Agriculture. *Greenaria, An agricultural Monthly e- Magazine*. 3(6).1-3.