

Seed Pelleting: Enhancing Seed Performance and Precision Agriculture

* Anjali Kumari Jha¹, Kumari Punam Sinha², Shruti Sinha³ and Kumari Kajol⁴

¹Ph.D. Research Scholar, Department of Vegetable and Spice Crops, Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar, West Bengal, India

²Ph.D. Research Scholar, Department of Seed Science & Technology, Uttar Banga Krishi Viswavidyalaya, Pundibari, Coochbehar, West Bengal, India

³Ph.D. Research Scholar, Department of Plant Pathology, College of Agriculture, CAU Imphal, Manipur, India

⁴Ph.D. Research Scholar, Department of Floriculture & Landscaping, Bihar Agricultural University, Sabour, Bhagalpur, Bihar, India

*Corresponding Author's email: anjalikjha.7@gmail.com

Seed pelleting is a valuable advancement in seed technology that improves seed handling, sowing efficiency, and overall crop establishment. By coating seeds with inert or active materials, seed pelleting transforms irregular-shaped, small, or light seeds into uniform, spherically shaped units ideal for mechanized sowing. This technique finds wide application in vegetables, flowers, medicinal plants, and precision agriculture systems. The integration of bioactive compounds, micronutrients, and biocontrol agents into the pelleting matrix opens avenues for enhancing seed performance and protecting against biotic and abiotic stresses. This article explores the methods, materials, machinery, benefits, limitations, and field-level applications of seed pelleting, emphasizing its potential in modern agriculture.

Introduction

Precision agriculture demands uniform seed size, shape, and performance to ensure consistent plant population and productivity. Seed pelleting, an advanced technique of seed enhancement, modifies seeds into near-spherical structures through the addition of binding agents and fillers. This process is especially crucial for small-seeded crops like onion, carrot, and tomato, where precise spacing and uniform germination are critical.

What is Seed Pelleting?

Seed pelleting involves coating seeds with inert or active materials to change their shape and size, making them suitable for precision sowing. It is distinct from seed coating, as it substantially alters the physical dimensions of the seed.

Objectives of seed pelleting

- To improve seed size and shape for precision planting
- To enable uniform sowing using mechanical planters
- To incorporate nutrients, pesticides, fungicides, or bioagents directly with the seed
- To protect seeds from pests and unfavorable conditions during germination

Materials used in pelleting

Pelleting materials fall into three main categories:

Filler materials: Clay, chalk powder, talc, lime, kaolin, bentonite

Binders: Gum arabic, gelatin, starch, methylcellulose, molasses

Active ingredients (optional): Fungicides, insecticides, micronutrients, growth promoters, biofertilizers

Types of seed pelleting

1. Inert Pelleting: Only inert materials are used to alter seed shape.
2. Protective Pelleting: Incorporates fungicides or insecticides.
3. Nutrient Pelleting: Supplies micronutrients or macronutrients for initial seedling growth.
4. Biological Pelleting: Embeds beneficial microbes like Rhizobium, Trichoderma, or Azospirillum.
5. Polymer Pelleting: Uses polymeric binders for controlled release or weather resistance.

Seed pelleting process

1. Pre-cleaning: Seeds are cleaned and sometimes pre-treated (e.g., priming).
2. Pelleting: Seeds are placed in a rotating drum, and binders and fillers are added alternately until the desired size is achieved.
3. Drying: Pelleted seeds are dried at ambient or controlled temperatures.
4. Packaging and Storage: Finished seeds are stored in moisture-proof containers.

Applications of seed pelleting

Crop Type	Benefits of pelleting
Onion, Carrot	Improved precision in spacing and depth
Tomato	Reduced seed wastage and enhanced uniform germination
Medicinal Herbs	Better sowing accuracy and early establishment
Flowers	Improved ornamental nursery establishment
Pulses	Nutrient/biofertilizer pelleting enhances nodulation

Advantages of seed pelleting

Enables precision sowing in field or greenhouse conditions
 Facilitates mechanization and reduces labor costs
 Allows multi-functional delivery of nutrients or bioagents
 Improves seedling vigor and uniform emergence
 Enhances resilience against pests and unfavorable conditions

Limitations

Costly for small and marginal farmers unless subsidized
 Requires specialized equipment and controlled conditions
 Improper drying or formulation can affect seed viability
 Limited adoption in rainfed or smallholder systems

Future prospects

With the increasing focus on climate-resilient agriculture and smart farming, seed pelleting holds immense promise. Integration of nano-nutrients, biopolymers, and microbial consortia into pelleting formulations can revolutionize seed enhancement. Moreover, seed pelleting combined with drones and automated sowers can redefine sowing practices in precision agriculture.

Conclusion

Seed pelleting is a transformative technology in seed enhancement that addresses several agronomic challenges—ranging from sowing precision to early vigor and protection. As agricultural systems become more mechanized and input-efficient, pelleted seeds can serve as an intelligent tool for sustainable crop production.

References

1. Halmer, P. (2000). Commercial seed treatment technology. In *Seed Technology and Its Biological Basis* (pp. 257–286). Sheffield Academic Press.

2. Nema, K. P., & Gupta, P. C. (2010). Advances in seed pelleting technology. *Indian Journal of Agricultural Sciences*, 80(9), 805–810.
3. ISTA (International Seed Testing Association). (2023). Seed Testing Rules. www.seedtest.org