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Understanding and Mastering Geranium Propagation

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Abstract

Pelargonium graveolens is a fragrant perennial plant native to South Africa. This plant is both decorative and operational, with its seductive aroma evocative of roses, rich green foliage and delicate blossoms. Geranium is grown for its essential oil, which contains geraniol and citronellol and is used in aromatherapy and other sectors. This work goes into Geranium propagation, focusing on crucial techniques such as terminal stem cuttings, leaf with petiole and tissue culture. Geranium vegetative multiplication is critical for obtaining consistent plant material with the right genetic makeup. The selection of cutting length, rooting hormones and healing period is critical to effective propagation. Furthermore, a novel method of propagating mother plants utilising single-node stem cuttings considerably boosts their proliferation potential. Tissue culture is emerging as a sophisticated technology for large-scale, true-to-type Geranium multiplication. In addition, it introduces a split stem burying approach, which provides insights into effective field propagation. Understanding these propagation processes is critical for horticulturists and growers who want to cultivate Geranium for its various applications in a sustainable manner.

Introduction

Pelargonium graveolens, recognized commonly as the rose-scented Geranium earns its name due to the delightful rose-like fragrance emanating from its leaves. This plant finds its botanical home in the Geraniaceae family and traces its origins to the Republic of South Africa, particularly flourishing in the Mediterranean climate of Cape Province.

The Geranium is a highly significant perennial aromatic shrub, prized for its fragrant allure. It can attain an impressive stature of up to 1.5 meters with a spread of approximately 1 meter. The leaves exhibit a diverse range in terms of size and shape, ranging from large to small, and they

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can be either smooth or deeply toothed. These leaves are characterized by their lush green hue, soft texture and pronounced, enchanting aroma reminiscent of roses.

The flowers of the *Pelargonium graveolens* boast five delicate petals and come in an array of colors, ranging from a pristine whitish shade to a delicate pale pink. They also exhibit variation in size, spanning from a diminutive 0.5 centimetres to a more substantial 4 centimetres. This charming plant typically graces us with its blossoms from August through January. Its hairy stems are herbaceous when young and become woody with age (Sharopov *et al.,* 2014).

Importance

Originally introduced as an ornamental plant, Geranium has gained significant prominence as a valuable aromatic crop in India. It is cultivated primarily for its essential oil, which is extracted from the leaves and tender shoots of the plant. This oil is prized for containing geraniol and citronellol, both of which emit a potent rose-like fragrance.

Beyond its aromatic qualities, Geranium holds substantial medicinal and commercial significance (Matthews, 1995). In the past, it was employed to staunch bleeding, promote the healing of wounds, ulcers, and skin disorders, and address issues such as diarrhoea, dysentery, and colic (Matthews, 1995). Today, Geranium has become an indispensable element in aromatherapy, recognized as a balancing oil for both the mind and body (Dormon and Deans, 2000).

Furthermore, extracts derived from *Pelargonium graveolens* have been documented for their utility as antibacterial and insecticidal agents (Tabanca *et al*., 2013). The enchanting rose-scented Geranium finds widespread use in scenting soaps and high-quality perfumes, further highlighting its versatile applications in various industries.

Propagation of geranium

Propagation: Plant propagation is the process of creating new plants from a variety of sources such as seeds, cuttings, bulbs and other plant parts. The main aim of propagation is to retain a species and to preserve its youthfulness (rejuvenation) (Hartman and Kester, 1983).

Multiplying geranium through seeds can be a challenging endeavour, especially in plains or hilly regions, as these conditions often do not yield viable seeds. Consequently, the primary method for propagating geraniums is through vegetative means. This approach is essential for obtaining consistent plant material with the desired genetic makeup on a large scale.

The successful rooting of cuttings in vegetative propagation is contingent on various factors. These factors encompass the choice of rooting medium, the application of rooting hormones, the length of the stem cuttings (Hartman *et al.*, 2002) and the duration required for the cuttings to heal wounds (Cline and Neely, 1983 and Takagaki *et al*., 2000). These considerations

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play a pivotal role in ensuring the effective and reliable multiplication of geranium plants, a vital process for horticulturists and growers.

Geranium is propagated by:

1. Terminal stem cuttings
2. Leaf with petiole
3. Tissue culture

Terminal stem cuttings

Multiplying plants through stem cuttings stands as a crucial method in vegetative propagation. For geranium, terminal cuttings measuring 10-15 centimetres in length, adorned with 2-4 leaves and 3-4 nodes, are typically selected from matured shoots.

The choice of cutting length plays a pivotal role in influencing the rooting capacity of stem cuttings. Unlike a universal internode length recommendation for various species, the ideal length often hinges on the specific type of plant involved (Hartmann *et al*., 2002). In general, longer stem cuttings are more likely to foster quicker root development and yield more robust plants compared to shorter ones.

Furthermore, the presence of leaves on these geranium stem cuttings proves advantageous in promoting rooting. Young leaves serve as valuable sources of auxins, which accelerate the initiation of root growth. They also supply essential photosynthates and nutrients needed for various metabolic processes crucial in root formation and development.

To enhance the rooting success of prepared geranium cuttings, different rooting hormones are often applied to the basal portion. This treatment is employed to encourage and facilitate the rooting process, ultimately ensuring the propagation of healthy geranium plants (Kumar *et al.,* 2023).

Leaf with petiole

To overcome the limitation of obtaining only a limited number of terminal stem cuttings from each mother plant, researchers have explored the possibility of developing plants from single-node stem (leaf) cuttings. These single-node stem cuttings consist of a single leaf with an axillary bud and a 2.5 centimetres segment of the stem, longitudinally split through the middle (Bhattacharya and Rao, 1998)

In this innovative approach, single-node stem cuttings utilize the leaf and axillary bud as sources while relying on the stem segment as a sink and a base for root development. This method has proven successful in producing roots and enabling the growth of healthy, fully-developed plants.

The particularly noteworthy is that, compared to traditional terminal stem cuttings, the use of single-node stem cuttings from the third to the tenth leaves on a branch (yielding 8 single-node

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stem cuttings per branch) can generate up to six times more plants. This represents a significant increase in the propagation potential of mother plants.

To further enhance the success rate of these single-node stem cuttings, they are treated with various rooting hormones. Among these treatments, IBA (Indole-3-butyric acid) is found to be particularly beneficial for inducing, promoting the growth of and developing roots in these cuttings. Overall, this method serves as a complementary system to traditional stem cuttings, allowing for the generation of a greater number of planting materials from a limited number of mother plants, while the application of IBA hormone treatment contributes to successful rooting and growth.

- Petiole with leaf lamina
- Petiole without Leaf lamina

(With split stem and without split stem)

- Petioles without leaf lamina having split stem developed roots but were inferior to cuttings having leaf lamina.
- Petioles with unsplit stems did not root.

Tissue culture

Tissue culture (TC) is a sophisticated technique that involves the cultivation of plant cells, tissues or organs on specialized nutrient media within strictly aseptic conditions. Remarkably, this method allows for the regeneration of an entire plant from a single cell and is often referred to as micropropagation.

In the context of geraniums, particularly *Pelargonium graveolens*, the *in vitro* nodal culture technique enables direct and rapid multiplication of shoots, resulting in true-to-type plants. This approach is invaluable in overcoming the challenges associated with large-scale propagation of geranium.

As the demand for geranium plants continues to rise, there is an increasing need for large-scale production. To meet these potential future demands and address the complexities associated with conventional breeding methods for this species, it becomes crucial to optimize an efficient and cost-effective protocol for in vitro micropropagation of Geranium (*Pelargonium graveolens* L.) from nodal cultures. Such optimization can pave the way for the consistent and sustainable production of these plants while preserving their desirable traits and genetic integrity (Rabuma., 2015).

Split stem burring method

- Geranium stems approximately 25 cm in length, were longitudinally split and buried in field soil to a depth of around 3 cm and enriched the soil with organic matter and nutrients.

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- Irrigation twice a week for the first 3 weeks, afterward fortnightly basis for the remaining period.
- The split twigs were excavated, cleaned, and assessed for the number of rooted nodes and propagules produced.
- In cuttings, rapid rooting was observed in the field blocks then placed in polybags.
- It took approximately 7 weeks for the cuttings to develop sufficient roots for use as propagules. This process occurred during early winter in December (Bansal *et al*., 2014)

Conclusion

With its alluring perfume and numerous uses, *Pelargonium graveolens*, the rose-scented geranium, is a botanical marvel. For horticulturists and growers, the propagation methods investigated in this study-such as tissue culture, leaf with petiole and terminal stem cuttings-offer insightful information. Large-scale production and the preservation of genetic integrity depend on these techniques. True-to-type multiplication can be achieved through tissue culture, but novel single-node stem cutting greatly increases propagation potential. Practical insights for effective field propagation are added by the split stem burial approach. Comprehending and executing these propagation tactics is imperative to guarantee the steady and enduring output of geranium, satisfying the varied needs of the sector.

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