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Annual Plant Propagation: Sculpting Growth and Elevate Garden

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Abstract

The propagation of annual plants is a fundamental aspect of horticulture and agriculture, crucial for maintaining biodiversity, ensuring food security and enhancing ornamental landscapes. Annual plants complete their life cycle within a single year, germinating, growing, flowering, producing seeds, and eventually dying within this relatively short time frame. Propagating annuals involves various methods aimed at reproducing these plants, ensuring the continuation of their species or the cultivation of desired varieties. One common method of propagation for annual plants is seed sowing. Seeds serve as the primary means of reproducing annuals, embodying the genetic information necessary for their development. Proper seed selection, quality and sowing techniques significantly impact the success of this process. Seed propagation allows for genetic diversity, enabling adaptation to different environmental conditions. Cutting also play a role in annual plant propagation, particularly for certain ornamental and vegetable varieties. Taking a portion of the plant often a stem or leaf and encouraging it to root and grow into a new individual allows for the cloning of specific traits. This method is advantageous for preserving desirable characteristics in successive generations. In addition, some annuals exhibit natural propagation mechanisms such as self-seeding. This occurs when mature plants drop seeds that subsequently germinate in the same location. Moreover, advancements in technology have introduced tissue culture as a method for propagating annuals. This laboratory-based technique involves the cultivation of plant cells or tissues in a controlled environment, providing a sterile and efficient way to produce numerous identical plants. Tissue culture is particularly useful for mass propagation of valuable or rare annual species.

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Introduction

An annual flowering plant is a type of plant that complete its life cycle within one growing season. This means that the plant germinates from seed, grows, flowers, sets seed and then dies all within a single year. Annuals are known for their ability to provide vibrant and often prolific blooms in a relatively short period. Propagation of annual ornamental plants is important for the floriculture industry, as it allows for the production of high-quality, uniform, and disease-free plant material, as well as the introduction of new varieties and cultivars. Propagation techniques for annual ornamental plants vary depending on the species. Propagation of annual ornamental plants also faces some challenges, such as the need for improved methods of seed production, storage, and germination, the risk of genetic erosion and loss of biodiversity, the occurrence of pests and diseases, the impact of climate change and environmental stress, and the demand for sustainability and best management practices. (Mehbub *et al.* 2022)

Classification

1. **Based on flower colour :-**
   - **White flowered annuals:** Alyssum, Nigella
   - **Yellow and Orange flowered annuals:** *Calendula officinalis*, Zinnia, Tagetus
   - **Blue flowered annuals:** Ageratum, Corn flower, Linaria
2. **Based on growing season: -**
   - **Winter season:** Antirrhinum, China aster, Ageratum, Carnation, Pansy, Phlox, Nasturtium, Nigella, Salvia, Cineraria, Gazania
   - **Summer season:** Cosmos, Coreopsis, Gaillardia, Tithonia, Zinnia, Sunflower, Portulaca
   - **Rainy season:** Cockscomb, Gomphrena, Marigold, Gaillardia
3. **Based on flowering season: -**
   - **Early blooming:** Celosia, Balsam, Gomphrena, Salvia, Zinnia
   - **Late blooming:** Antirrhinum, Carnation, Hollyhock
4. **Based on specific purpose: -**
   - **Dry flower:** Statice, Helichrysum, Nigella, Lady's lace, Acrolinum
   - **Cut flower:** Carnation, Sweet William, Antirrhinum, Corn flower
   - **Loose flower:** Marigold, Annual chrysanthemum, Aster, Zinnia, Gaillardia, Sunflower

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- **Bedding purpose:** Dahlia, Marigold, Pansy, Carnation, Petunia
- **Shade loving:** Balsam, Verbena, Salvia, Calendula, Delphinium
- **Hanging basket:** Petunia, Phlox, Zinnia, Ageratum
- **Fragrant:** Phlox, Alyssum, Carnation, Sweet William
- **Screening flower:** Hollyhock, Cineraria

Sowing and transplanting time

Annuals	Sowing Time	Transplanting Time
Summer season annuals	Mid-February to early March	March - April
Rainy season annuals	June	July
Winter season annuals	September	October

Life cycle

- **Germination:** The life cycle begins when the seed germinates, usually triggered by specific environmental conditions such as temperature, moisture and light.
- **Vegetative Growth:** After germination, the plant enters a phase of vegetative growth. During this stage, the plant develops leaves, stems and roots.
- **Flowering:** As the plant continues to grow, it eventually reaches maturity and produces flowers. The flowering stage is crucial for the reproduction of the plant.
- **Pollination:** In many cases, annuals rely on pollination to transfer pollen from male to female flowers. This process is essential for the formation of seeds.
- **Seed Formation:** Following successful pollination, the fertilized flowers develop into seeds. These seeds contain the genetic information necessary for the next generation of plants.
- **Seed Dispersal:** Once the seeds mature, the plant disperses them to new locations. This can occur through various mechanisms, such as wind, water, animals, or explosive seed pods.
- **Senescence and Death:** After completing the reproductive cycle, the plant typically enters a period of senescence, where it begins to age and eventually dies. This process is accelerated by factors like adverse environmental conditions or the completion of its life cycle.

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Specific practices

Pricking: Operation of transferring the young seedling to pan or tray it called pricking. ex, Marigold, Gaillardia	
Staking: Support of the plant it called staking ex. Morning glory	
Pinching: Removing the tips of plant's new growth it called pinching. ex. Carnation, Marigold, Dianthus (pink)	

Annual Flowering Plant

Marigold (*Tagetes spp.*) 	Marigolds are known for their vibrant orange, yellow, or red blooms. They are easy to grow and are often used as border plants or in containers. • Propagation in 2 ways Through Stem Cuttings Through Seed Propagation Aparna *et al.* (2019) studied in mist chamber use cocopeat media and IBA @ 3000 ppm as powder among hormonal treatments are the best which recorded highest percentage of rooted cuttings (75.00%, 95.10%)	 

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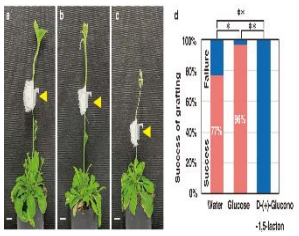
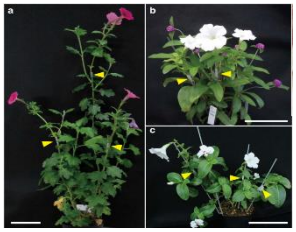
Petunia (*Petunia spp.)* 	Petunias come in a wide range of colors and are popular for hanging baskets, containers, and flower beds. They have trumpet-shaped flowers. • Petunias can be propagated through seeds, cuttings, or rhizomes. Kurotani *et al.* (2022) work on grafting usability of *P. hybrida* with Arabidopsis rootstock. Strong inhibition of graft establishment was observed only with D-glucono-1,5-lactone, thus suggesting the important role of GH9B3 in P. hybrida grafting. The newly discovered grafting compatibility of Petunia with different families enhances the propagation techniques and the production of flower plants.	  
China aster (*Calistephus chinensis*) 	Being colourful and having very diverse, cool hues, these plants make for one of the most cut and loose species and tend to not only complement but enhance the overall appearance of whatever background they are… • Can be propagated through seeds, cuttings and division. Muneeb *et al.* (2021) observed that KNO_3 played a vital role in the establishment and survival of seedlings in the china aster field. maximum germination percentage (87.50%) and seedling survival percentage (81.95%).	 

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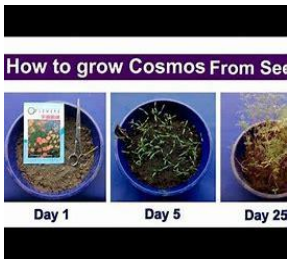
Zinnia (*Zinnia spp.*) 	Zinnias produce colorful, daisy-like flowers and come in various heights. They are excellent for cut flowers and are attractive to butterflies. • Zinnia can be propagated through seeds and cuttings. Sardoei *et al.* (2014) In Zinnia leaf manure produced significantly the maximum vase life and diameter of flower while the maximum vase life and diameter of flower was obtained with mix (coconut compost + soil loam; 1:1).	 
Cosmos (*Cosmos spp.*) 	Cosmos have delicate, feathery foliage and produce daisy-like flowers in shades of pink, white, and red. They are drought-tolerant and attract pollinators. • Can be propagated through seeds. Gomez-Pedraza *et al.* (2015) study in chocolate Cosmos, it results show that the response to callus formation with 2,4-D was observed in only 50% of leaf segments and BA response was in nodal segments with 100% callus formation.	 
Gaillardia (*G. pulchella)* 	With brightly colored daisy-like flowers in shades of red, orange, and yellow, the heat-tolerant and heavy blooming blanket flower is a good addition to the informal garden. • Can be propagated by seed, shoot-tip cuttings, division or tissue culture.	 

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Gomphrena (*Amaranthus spp.*) 	Gomphrena is adorning gardens with vibrant color from June until frost. These are low-maintenance plants with papery, clover-like blooms that retain their color when dried. White, pink, purple, orange, and red make up the globe-shaped blooms with tiny flowers in contrasting colors in the center. • Can be propagated by seed Moreira *et al.* (2002) When cultures supplemented with IBA then callus was thick and frangible roots appeared at the base of the micro cuttings.	 
Snapdragon (*Antirrhinum majus*) 	Snapdragons have distinctive spikes of flowers and are available in a range of colors. They are often used in flower arrangements and are known for their "snapping" flowers. • Can be propagated through stem cutting, seeds and root cuttings	 
Alyssum (*Lobularia maritima*) 	Alyssum is a low-growing plant with small, fragrant flowers. It is often used as a ground cover or in hanging baskets. • Can be propagated through seeds.	 

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 Nasturtium	 Sunflower	 Dusty Miller
 Fancy Leaf Geraniums	 Begonia	 Polka Dot Plant
 Salvia	 Coral Bells (Heuchera)	 Ornamental Pepper Plant

Table 1.1 Effect of media on root and shoot parameters in African marigold cv. Bidhan marigold

Parameters	Media			SE m±	CD at 5%
	Vermiculite	Sand	Cocopeat		
Root parameters					
Percentage of rooted cuttings (%)	71.93 (59.25)	68.29 (56.61)	75.00 (61.53)	0.24	0.72
Number of roots per cutting	116.48	110.36	122.68	0.35	1.03
Number of primary roots per cutting	7.44	7.01	7.94	0.04	0.13
Number of secondary roots per cutting	80.59	77.67	84.99	0.04	0.13
Length of longest root per cutting (cm)	4.49	4.35	4.64	0.01	0.03
Fresh weight of roots per cutting (g)	1.00	0.91	1.09	0.01	0.03
Dry weight of roots per cutting (g)	0.38	0.35	0.40	0.002	0.005
Shoot parameters					
Shoot length (cm)	15.56	14.87	16.07	0.05	0.13
Number of leaves per rooted cutting	148.10	143.97	153.73	0.55	1.63
Root to shoot ratio (%) (on dry weight basis)	0.59	0.55	0.66	0.01	0.03
Survival percentage of rooted cuttings (%)	76.51 (62.40)	72.67 (59.66)	77.96 (63.56)	0.24	0.72
Percentage establishment of rooted cuttings (%)	72.15 (59.35)	68.55 (56.82)	76.03 (62.28)	0.28	0.82

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Table 1.2 Effect of Hormone on root and shoot parameters in African marigold cv. Bidhan marigold

Parameters	Hormones						Con-trol	SE m±	CD at 5%
	IBA (Solution)		IBA (Powder)		NAA (Solution)				
	200 ppm	400 ppm	1500 ppm	3000 ppm	200 ppm	400 ppm			
Root parameters									
Percentage of rooted cuttings (%)	80.17 (63.54)	73.50 (59.01)	87.80 (69.64)	95.10 (77.76)	65.50 (54.02)	56.50 (48.71)	43.50 (41.21)	0.37	1.10
Number of roots per cutting	129.52	112.13	147.75	174.90	97.23	82.87	71.17	0.53	1.58
Number of primary roots per cutting	8.52	7.10	9.67	11.58	6.05	5.20	4.13	0.07	0.20
Number of secondary roots per cutting	90.42	78.12	99.90	114.60	70.63	60.57	53.33	0.07	0.20
Length of longest root per cutting (cm)	4.75	4.47	5.04	5.62	4.17	3.89	3.52	0.02	0.05
Fresh weight of roots per cutting (g)	1.15	0.93	1.46	1.68	0.74	0.59	0.44	0.01	0.04
Dry weight of roots per cutting (g)	0.45	0.38	0.53	0.60	0.29	0.22	0.17	0.003	0.007
Shoot parameters									
Shoot length (cm)	20.15	17.36	12.18	11.14	22.86	14.68	10.15	0.07	0.20
Number of leaves per rooted cutting	162.45	156.23	138.75	131.85	184.80	147.93	118.18	0.84	2.49
Root to shoot ratio (%) (on dry weight basis)	0.63	0.52	0.73	1.25	0.42	0.39	0.25	0.02	0.05
Survival percentage of rooted cuttings (%)	84.59 (66.89)	76.08 (60.73)	90.68 (72.25)	96.62 (79.64)	68.13 (55.61)	62.50 (52.23)	51.36 (45.76)	0.37	1.10
Percentage establishment of rooted cuttings (%)	81.02 (64.20)	73.01 (58.70)	88.20 (69.98)	95.58 (40.09)	67.04 (78.14)	59.27 (54.96)	41.62 (50.33)	0.42	1.25

Some tips for planting annuals in the Landscape

- When planting young annuals make sure you are giving them enough space to reach their full size.
- Add slow-release fertilizer to the planting hole to get your plants off to a good start.
- Make sure you plant them in a spot where they'll receive the right amount of light.
- Check the weather, it is safest to plant when all danger of frost has passed.
- If the roots are twisted and dense when removed from the growing pot, loosen them slightly by hand or run a knife down the sides.
- Water your new plants well immediately after planting.
- Spread a layer of mulch after planting to complete the look, reduce water loss and prevent weeds.

Conclusion

- There are numerous types of annual flowering and foliage plants, each with its own unique characteristics, colors, and growth habits.
- There are many more annual flowering and foliage plants to explore, each contributing its own charm to gardens and landscapes.
- Annual plants play a crucial role in ecosystems by contributing to biodiversity.
- Annual flower plants use in different purpose like cut flower, dry flower, landscape purpose, screening purpose etc.
- Mostly annual plants propagate through Seed and Terminal cutting and also work on Grafting and Micro propagation.

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- Despite their short lifespan, annuals are vital contributors to the overall balance of nature.

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