



Tissue Culture in Ornamentals: Cultivation Factors, Propagation Techniques, and Its Application

Mehbub, Hasan ; Akter, Ayasha ; Akter, Mst. Arjina ; Mandal, Mohammad Shamim Hasan ; Hoque, Md. Ashraful ; Tuleja, Monika ; Hasan, Mehraj

(Citation)

Plants, 11(23):3208

(Issue Date)

2022-11-23

(Resource Type)

journal article

(Version)

Version of Record

(Rights)

© 2022 by the authors. Licensee MDPI, Basel, Switzerland
Creative Commons Attribution 4.0 International license

(URL)

<https://hdl.handle.net/20.500.14094/0100483094>



Review

Tissue Culture in Ornamentals: Cultivation Factors, Propagation Techniques, and Its Application

Hasan Mehbub ¹, Ayasha Akter ² , Mst. Arjina Akter ^{3,4} , Mohammad Shamim Hasan Mandal ⁵ ,
Md. Ashraful Hoque ³, Monika Tuleja ⁶ and Hasan Mehraj ^{4,*} 

- ¹ The United Graduate School of Agricultural Science, Ehime University, Matsuyama 790-8556, Japan
 - ² Department of Horticulture, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh
 - ³ Department of Plant Pathology, Bangladesh Agricultural University, Mymensingh 2202, Bangladesh
 - ⁴ Graduate School of Agricultural Science, Kobe University, Rokkodai, Nada-ku, Kobe 657-8501, Japan
 - ⁵ Graduate School of Advanced Science and Engineering, Hiroshima University, Hiroshima 739-8511, Japan
 - ⁶ Department of Plant Cytology and Embryology, Institute of Botany, Faculty of Biology, Jagiellonian University, Gronostajowa 9, 30-387 Krakow, Poland
- * Correspondence: hmehraj02@yahoo.com or hmehraj02@port.kobe-u.ac.jp

Abstract: Ornamentals come in a variety of shapes, sizes, and colors to suit a wide range of climates, landscapes, and gardening needs. Compared to demand, a shortage of plant materials and diversity force the search for solutions for their constant acquisition and improvement to increase their commercial value, respectively. In vitro cultures are a suitable solution to meet expectations using callus culture, somatic embryogenesis, protoplast culture, and the organogenesis of protocorm-like bodies; many of these techniques are commercially practiced. Factors such as culture media, explants, carbohydrates, plant growth regulators, and light are associated with the success of in vitro propagation. Techniques, especially embryo rescue and somatic hybridization, are widely used to improve ornamentals. The development of synthetic seed allows season-independent seed production and preservation in the long term. Despite the advantages of propagation and the improvement of ornamentals, many barriers still need to be resolved. In contrast to propagation and crop developmental studies, there is also a high scope for molecular studies, especially epigenetic changes caused by plant tissue culture of ornamentals. In this review, we have accumulated and discussed an overall update on cultivation factors, propagation techniques in ornamental plant tissue culture, in vitro plant improvement techniques, and future perspectives.

Keywords: in vitro; callus; somatic embryogenesis; hybridization; protoplast fusion; protocorm-like body; synthetic seeds; epigenetic variation



Citation: Mehbub, H.; Akter, A.; Akter, M.A.; Mandal, M.S.H.; Hoque, M.A.; Tuleja, M.; Mehraj, H. Tissue Culture in Ornamentals: Cultivation Factors, Propagation Techniques, and Its Application. *Plants* **2022**, *11*, 3208. <https://doi.org/10.3390/plants11233208>

Academic Editor:
Iyyakkannu Sivanesan

Received: 19 October 2022
Accepted: 17 November 2022
Published: 23 November 2022

Publisher's Note: MDPI stays neutral with regard to jurisdictional claims in published maps and institutional affiliations.



Copyright: © 2022 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<https://creativecommons.org/licenses/by/4.0/>).

1. Introduction

Ornamental horticulture, flowering, and landscape horticulture are economically viable industries in the agricultural sector. It deals with producing and commercializing flowers, flowering plants, foliage plants, and landscape plants; plants used in ornamental horticulture are collectively called ornamentals. Plant tissue culture, including micropropagation, is the most applicable plant propagation technique in ornamentals. It allows the production of several exact genetic copies from small pieces of plant tissue (known as explants), and the propagation of uniform, season-independent, and seed-borne diseases free seedlings is an additional advantage [1]. Thus, micropropagation techniques are frequently used in the commercial production of seedlings in diversified plant species. Explants are usually cultured in a nutrient-supplemented medium under sterile conditions. White's medium was the first chemically defined nutrient medium [2–5]. Afterward, Murashige and Skoog (1962) developed a new nutrient supplemented medium, which is known as Murashige–Skoog (MS) medium [6], and it is the most used nutrient supplemented medium in the world for plant tissue culture. Other nutrient-supplemented media, such as White

(WH) medium [7], Linsmaier and Skoog (LS) medium [8], Gamborg (B5) medium [9], Nitsch and Nitsch (NN) medium [10], etc., are also widely accepted. These nutrient supplement media are the basal media that usually contain major salts (plant macronutrients), minor salts (plant micronutrients), vitamins, and organic compounds. Solidifying agents are used in the basal medium to support the plantlets in micropropagation and, to some extent, in liquid culture medium. Different kinds of agars—phytagel, gelrite, gellan gum, etc.—are used to solidify the nutrient supplement culture media for plant tissue culture that are available in the commercial market. The pH of the basal nutrient supplement media keeps changing during preparation, which is required to adjust before autoclaving. The pH in the media is considered a dynamic variable for in vitro plant growth and development. MS medium is the most used medium in vitro, and manipulation of MS medium and culture conditions according to the plant—specific requirements are also practiced [11,12]. The success of plant tissue culture techniques largely depends on sources of carbon, plant growth regulators (PGRs), culture environment, lights, genotype, type of explant, etc. The key tool for the success of plant tissue culture technology greatly relies on the proper culture media composition and their culture condition because of plant—specific response. Other than propagation, tissue culture technology has been used for plant improvement, somatic hybrid development, synthetic seed production, and ploidy manipulation. We reviewed the research findings of plant tissue culture technologies for ornamental plant propagation, cultivation factors, and their application in ornamentals from a future perspective.

2. In Vitro Cultivation Factors

2.1. Carbohydrate Supplements as Carbon Sources in Culture Media

Plant tissues, cells, and organs usually go through either heterotrophic or mixotrophic conditions in vitro. Heterotrophic conditions are the primary obstacle to in vitro plant growth and development where cultured tissue or cell or organ can only synthesize their required nutrients from the basal media, and mixotrophy conditions where plants depend on heterotrophy and can produce food by photosynthesis as well [13]. Plants need exogenous carbohydrates in both phases for proper growth and development due to their morphogenic effect on nutritional value, osmotic potential, and cell division [13,14]. The addition of exogenous carbohydrates can easily supply energy to explants when explants are not ready for photosynthesis. Even though plants become ready for photosynthesis, they need exogenous carbohydrate supplements because of their lower photosynthesis efficiency than in vivo conditions [15]. Exogenous carbohydrate supplements assist plant embryos in increasing cell division by encouraging cell expansion and reserve accumulation [16]. Many forms of carbon sources are available in commercial markets, such as sucrose, glucose, fructose, maltose, trehalose, lactose, galactose, sorbitol, etc. The specific sources and requirements vary according to the plant species, stages, tissues for explants, culture period, culture environment, etc. [13]. Sucrose is superior and cheaper than other carbon sources, which ensures favorable effects on in vitro plant growth [17–20]. In plants, phloem sap contains sucrose to control plant growth and developmental processes [21], while sucrose is highly soluble in water, acts as a molecule transporter, and is transported by the plasma membrane [22,23]. Therefore, plants efficiently utilize sucrose for their carbon requirements during the in vitro heterotrophic and mixotrophic phases. About 2–5% sucrose concentrations are generally used in plant tissue culture of ornamentals [24]. Depending on the plant species and culture conditions, other carbon sources showed more efficiency than sucrose. For example, the wishbone flower (*Torenia fournieri*) extended twice its vegetative culture period in a trehalose-based culture medium over a sucrose-based medium without alteration in plant viability [25]. Trehalose was found to be equally or sometimes more effective than sucrose for the propagation of protocorm-like bodies (PLBs) in *Phalaenopsis* and *Doritaenopsis* orchids [20,26]. Glucose stimulates the in vitro shoot and root growth of chrysanthemum, while its intermediate product, fructose, slowly affects in vitro plant growth and development; however, its efficiency varies according to plant species and culture conditions [27,28]. On the other hand, slower hydrolysis (20 times

slower than sucrose) of maltose is the main oblige [29]. Plants take a long time to absorb and metabolize maltose, and the requirement is sometimes twice that of sucrose [29]. From the above discussion, it is clear that exogenous carbohydrate supplements are crucial for in vitro plant growth and development. Exogenous carbohydrate concentration is also varied, and concentrations over a threshold level could be toxic, hamper photosynthesis, and inhibit in vitro plant growth [30–32].

2.2. Plant Growth Regulators, Inhibitors, and Elicitors in Culture Media

The application of PGRs in basal media accelerates the induction of a new plant from a cell or tissue. Auxins (Au), gibberellins (GA), cytokinins (CK), abscisic acid (ABA), and ethylene (ET) are the five groups of PGRs; Au and CK are widely used, while GA, ABA, and ET are less used for vitro micropropagation of ornamentals [33]. The in vitro propagation of plants is significantly influenced by the addition of auxin to culture media. Auxin triggers cell division and leaf initiation before lateral root initiation [34–36], and it is crucial for the formation of meristems [37]. In culture media with auxin, the cells of the explant rapidly undergo cell division to form calli [38] and start to develop shoots and/or roots from the calli [39]. A proper concentration of auxin can assist in initiating plant roots; application of exogenous auxin can stimulate auxin-triggered pathways and GA biosynthesis; meanwhile, it can suppress ABA and ET biosynthesis [40]. The naturally occurring auxins (indole-3-acetic acid (IAA), indole-3-butyric acid (IBA), indole-3-propionic acid (IPA), 4-chloroindole-3-acetic acid, phenylacetic acid, etc.) and synthetic auxins (4-chlorophenoxy acetic acid (4-CPA), dicamba, picloram, etc.) are used in plant tissue culture [41,42]. Cytokinin is naturally found in all plant tissues; however, it is enriched in the root tip, shoot apex, and immature seeds [43]. In vitro micropropagation, cytokinin stimulates cell division and is usually used to initiate the growth and proliferation of buds and shoots and slow down root formation [24]. 6-benzylaminopurine (BAP), 6-(γ,γ -dimethylallylamino)purine (2iP), kinetin, zeatin, and thidiazuron-N-phenyl-N-1,2,3 thiadiazol-5-ylurea (TDZ) are commonly used cytokinins in plant tissue culture. A combination of Au–CK, different combinations of their concentrations, is frequently used in micropropagation, and the effect of both Au and CK depends on their relative concentrations. A culture medium with high-cytokinin and low-auxin causes shoot initiation, while a high-auxin and low-cytokinin medium causes root initiation [44]. Gibberellic acid (GA₃) is the most used gibberellin, which is used to accelerate in vitro plant growth, while the function of ABA can be stimulatory or inhibitory depending on different factors such as media ingredients, light intensity and quality, or plant species [24]. We have summarized 200 research articles belonging to 52 ornamentals studied for the effective PGR concentration and/or effective PGR combinations with their suitable concentrations (Supplementary Table S1).

Different growth retardants, such as paclobutrazol, daminozide, chlorocholine chloride (CCC), ancymidol, etc., can be beneficial for plants propagated in vitro media (Supplementary Table S2). Growth retardants act as anti-gibberellin in sucrose supplemented medium; the addition of growth retardant in culture media activates adenosine diphosphate-glucose pyrophosphorylase (ADGPase) and UDP glucose pyrophosphorylase (UDPGPase), which promotes starch synthesis [45,46]. Similar to tuberization in potatoes, CCC showed a prompting effect on in vitro PLB regeneration in *Phalaenopsis* orchid [26,46]. In vitro treatment of growth retardants, e.g., paclobutrazol, has an additional advantage in increasing in vitro to ex vitro transfer efficiency [47,48]. The positive regulation of growth retardants in micropropagation cannot be ignored. Elicitors, biotic and abiotic, have been widely used for triggering secondary metabolites in plant tissue culture [49]. Chitosan (Ch), aminolevulinic acid (ALA), alginate (Ag), N-acetylglucosamine (NAG), salicylic acid (SA), hyaluronic acid (HA), silver nitrate (AgNO₃), jasmonic acid (JA), methyl jasmonate (MeJA), phloroglucinol (PG), pectin, casein hydrolysate, and yeast extracts are some common elicitors [50]. Like growth retardants, elicitors are also beneficial for micropropagation. For example, MeJA, ALA, AgNO₃, HA, Ch, and PG trigger PLBs, root shoots, and flower organogenesis in ornamentals (Supplementary Table S2). In tulips, MeJA has been applied in a

combination of different polyamines for efficient bulb formation, and MeJA-polyamine combinations significantly enhanced bulb formation [51]. An oxidizing biocide, chlorine dioxide (ClO_2), has been used in the culture media for in vitro plant regeneration in chrysanthemum and gerbera, and it accelerates plant shoot and root regeneration [52,53]. Additives, organic and synthetic, can also influence in vitro plant growth and development (Supplementary Table S3).

2.3. Light-Emitting Diodes over Conventional Light

In vitro culture conditions can be manipulated by altering the light color and intensity for effective morphogenesis or organogenesis. Plants can respond well to a wide spectrum of light in terms of plant growth and development with wavelengths of <400 nm (UV radiation), 400–700 nm (visible), and 700–800 nm (far-red) [54]. White fluorescent light with 350–750 nm wavelengths spectral emission is the conventional light source in vitro culture; however, the consumption of high electricity, high radiant heat, and uneven radiation are the major disadvantages [55]. Monochromatic light-emitting diodes (LEDs) with a specific range of wavelengths are widely used for in vitro plant propagation (Figure 1).

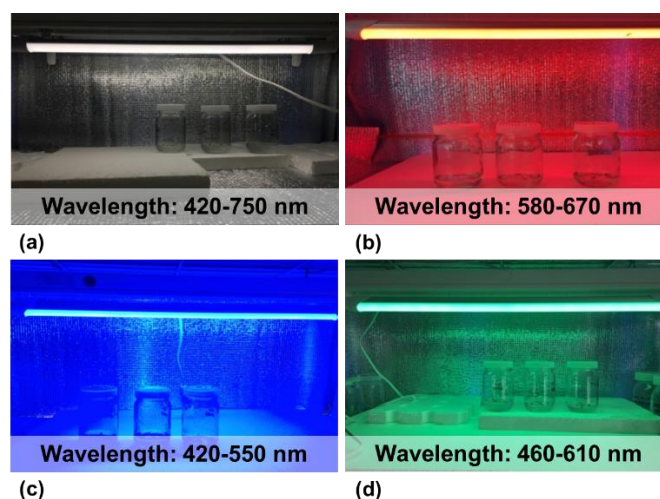


Figure 1. The application of monochromatic white (a), red (b), blue (c), and green (d) LEDs with specific wavelengths (white LED; 420–750 nm, red LED; 580–670 nm, blue LED; 420–550 nm, and green LED; 460–610 nm) for in vitro PLB proliferation.

LEDs are the most efficient over white fluorescent light, which overcomes the stated disadvantages [56,57]. Red LED showed efficiency for callus proliferation, PLB organogenesis, PLB proliferation, shoot induction, shoot multiplications, and plantlet regeneration in different ornamentals, such as orchids, gerbera, chrysanthemum (cv. Kitam Cheonsu), anthurium (cv. Violeta and Pink Lady), heliconia, peace lily, giant protea, and hosta (Supplementary Table S4). Far red was efficient for the plant growth of chrysanthemum (cv. Ellen) (Supplementary Table S4). A higher percentage of red LED with a lower percentage of blue LED is suitable for the PLBs and plantlet regeneration of *Phalaenopsis*, *Rosa × kordesii*, chrysanthemum (cv. Ellen), gerbera, anthurium, heliconia, peony, and spurflower, while some other ratios of red and blue LED mixture were found to be effective in some ornamentals (Supplementary Table S4).

A mixture of red and blue LEDs, compared with red LED alone, enhanced both plant growth and development by increasing the net photosynthesis in *Cymbidium* [58,59] because the spectral energy distribution of red and blue light coincides with that of chlorophyll absorption [60]. Red and blue LED combinations were reported as effective for the growth and development of PLBs in *Cymbidium*, *Doritaenopsis*, *Phalaenopsis*, and *Calanthe* [26,57] (Supplementary Table S4). Blue LED increases the shoot formation of PLB cultures in *Dendrobium officinale* and *D. kingianum* [61,62], while PLBs cultured under red and blue

LED showed the lowest and highest, respectively, in vitro differentiation rates on *Oncidium* and *D. officinale* [61,63]. Very little information is available on the effect of green LED on in vitro micropropagation of ornamentals. In recent studies, it was found that green LED increased PLB regeneration in *Dendrobium* [31], and *Cymbidium* [64]; however, PLB generation was more efficient under green LED when culture media had anti-auxin, PCIB (*p*-Chlorophenoxyisobutyric acid, an anti-auxin), in *D. okinawense* [31]. Additionally, yellow and orange light spectra have also been reported, respectively, in PLB, shoot, and plantlet regeneration of *Dendrobium* and seed germination and rhizoid development of *Bletilla ochracea* (Supplementary Table S4). These results suggest the requirement for a diverse range of light spectra for in vitro micropropagation, which largely depends on plant species and culture media supplements (Supplementary Table S4; Supplementary Table S5).

3. Standard Techniques Involved in Plantlet Generation In Vitro

3.1. Callus Culture

In the early 20th century, callus formation and its ability to generate independent life were first noticed [65,66]. The callus is a mass of loosely packed parenchymatous cells with various degrees of differentiation, which is raised from the in vitro proliferating cells of plant tissue in response to biotic and abiotic stimuli. It is similar to non-differentiated meristematic cells but different from differentiated plant cells. Depending on the accumulated compounds, calli may be pale brown, creamish yellow, greenish, or colorless. The callus is cytologically diverse in shape and type of cells and is genetically heterogeneous. Under the influence of selected phytohormones, a certain pool of parenchymal callus cells is dedifferentiated and has dividing activity. Calli lack chloroplasts for photosynthesis and have a small vacuole, and their culture can generate new plants. Callus can be induced from any plant part, such as seeds, leaves, stem, root, flowers, etc.; successful callus induction depends on plant species, explant used for the callus inductions, culture media, PGR supplements in culture media, and growth conditions [67]. Two major PGR groups, auxin and cytokinin, are largely used for callus induction [67]. Some plant species induce callus in day–night conditions, while some need entirely night conditions. Callus induction gives an idea of the potentiality of in vitro regeneration of any plant species, while it can also be a good source of materials for other in vitro culture techniques and can be used for long-term preservation [67]. Callus has been used for the successful plant regeneration and genetic modification of different ornamental plant species [68].

3.2. Protoplast Culture

Protoplast culture is used for plantlet regeneration (process illustrated in Figure 2), and protoplast fusion is used for crop improvement, which is known as somatic hybridization (details in Section 4.2) [69]. The nature of the explant tissue and the thickness of the cell wall play an important role in high-efficiency protoplast isolation, which is a critical stage in the process of seedling regeneration or somatic hybridization. However, protoplasts were successfully isolated and cultured in different ornamentals, such as *Dendrobium* [70], lily [71], rose [72], chrysanthemum [73], petunia [74], carnation [75], coneflower [76], geraniums [77,78], Persian silk tree [79], etc. Pre-plasmolyzing the explant tissue with osmotic stabilizers, such as mannitol and sorbitol, before enzyme treatment is effective for protoplast isolation in most plant tissue [80].

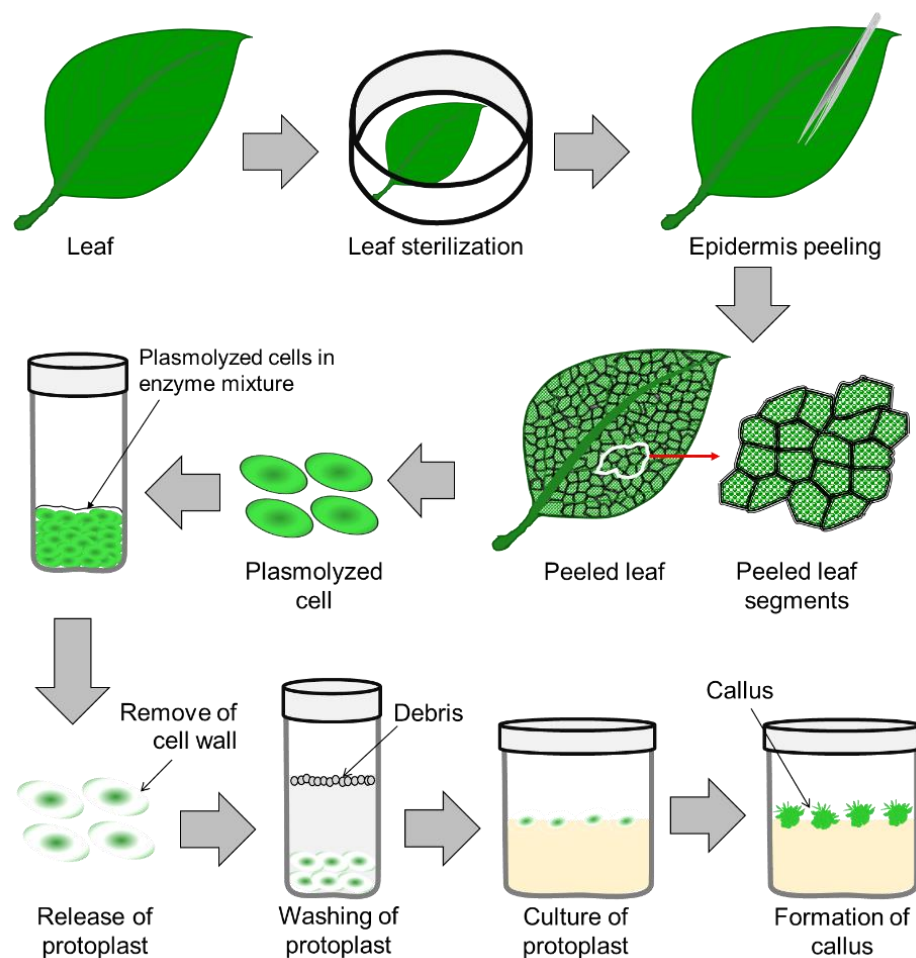


Figure 2. A detailed scheme of protoplast isolation and establishment of an in vitro protoplast culture.

Sugar concentration is another important factor for high-yield protoplasts, and the effective sugar concentration ranges from 0.3 to 0.8 M in ornamentals [69,74,76,81–84]. Factors such as the concentration of enzyme, digestion period, pH of the enzyme solution, temperature, and agitation during incubation are also important for protoplast isolation in ornamentals [69,73,74,79,83,85,86]. In orchids, the first protoplasts were isolated in 1978 [87,88], while few studies reported colony formation [89–93]. After successful protoplast isolation, there are some challenges to plantlet regeneration from an isolated protoplast. Types of culture medium, culture medium components, strength of the culture medium, carbon sources, pH of the culture medium, supplements of the culture medium, PGRs, and culture conditions have been proven to be vital factors for plantlet generations from protoplasts [69]. Considering these factors and despite these limitations, plantlets have been generated successfully in several ornamental plant species [69,73,74,78,94,95].

3.3. Somatic Embryogenesis

An alternative to root and shoot regeneration from the callus, regeneration of the whole plant from the plant cell throughout embryo formation, was identified in 1958 [96,97]. The development of an embryo or plant from the vegetative/somatic cell is known as somatic embryogenesis [98]. The procedure for somatic embryogenesis is illustrated in Figure 3. Somatic embryogenesis is considered more efficient than other propagation techniques, which guarantees variability. It produces identical genotypes differing from zygotic embryos, which guarantees variability. The bipolar structure of a somatic embryo consists of apical (known as plumule) and basal meristem regions (known as radicles), which are responsible for shoot and root formation, respectively [99]. Cytological and histological studies have

confirmed that PLBs (details in Section 3.4) are also somatic embryos [99]. Morphogenesis or regeneration of PLBs can be initiated by direct or indirect embryogenesis. Organogenesis of PLB avoiding the callus phase is known as direct embryogenesis, and PLB generated from the callus (an intermediate phase) is known as indirect embryogenesis [99].

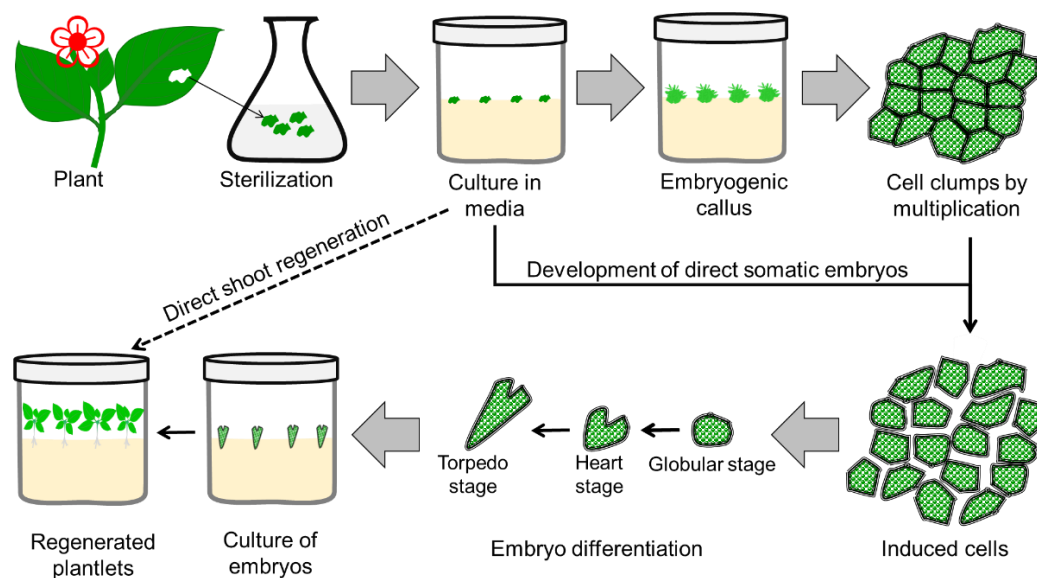


Figure 3. Diagrammatic presentation of the steps involved in somatic embryogenesis for mass propagation in plants.

In somatic embryogenesis, the morphogenic response varies on factors like explants, PGRs, hormones, concentrations of PGRs or hormones, light, etc. [99–102]. Plantlet regeneration by somatic embryogenesis has been reported in many genera of orchids; for example—*Cymbidium* [103–108], *Phalaenopsis* [108–115], *Oncidium* [28,116–120], *Dendrobium* [121–124], *Rhynchostylis* [125], *Renanthera* [126], *Paphiopedilum* [127,128], *Malaxis* [129,130], *Epipactis veratrifolia* [131], *Spathoglottis plicata* [132], *Geodorum densiflorum* [133], *Anoectochilus elatus* [134], and *Nothodoritis zhejiangensis* [135]. In addition to orchids, it has also been reported in diverse ornamentals, such as rose [136], *Rosa × damascena* [137], chrysanthemum [138,139], lilies [140–146], jasmine [147], lisianthus [148–151], carnation [152], *Camellia* [153–157], *Cineraria* [158], coneflower [159,160], *Crocus* [161–163], *Clematis* [164–166]; Sawara cypress [167], cyclamen [168], bellflower [169], passion flowers [170], perennial daisy and false daisy [171,172]; tulip [173], periwinkle [174], peony [175,176], anthurium [177–181], gentian [182–185], *Exacum trinervium* [186], glorioza [187,188], amaryllis [189], phlox [190], *Centaureum erythraea* [191], *Lachenalia viridiflora* [192], pine [193–196], Japanese black pine [197], agave [198–201], and hosta [202].

3.4. Protocorm-like Body

In *Cymbidium* orchid, protocorm-like bodies (PLBs) were noticed for the first time during the shoot-tip culture by Morel (1960) [203]. Protocorms are small spherical tuber-like structures formed in a germinating seed; protocorm-like structures with similar characteristics generated from somatic cells in tissue culture techniques are known as PLBs [204,205]. PLBs are induced directly from explants and/or indirectly from calluses [206], and the formation, regeneration, and proliferation of PLBs are among the most efficient techniques of micropropagation, especially for clonal propagation of orchids [207]. Meristemoids in callus cells initiate polarized growth, and continuous cell division causes the shoot pole (for shoot initiation) and the base pole (for root initiation) of a protocorm-like body (PLB) [127,204,208]. The induction of PLBs has several advantages over typical shoot and plantlet regeneration, such as a higher rate of multiplications, long-term preservation, easy differentiation into shoots, generations of secondary PLBs, etc. The success of efficient PLB induction, regenera-

tion, and proliferation depends on multiple factors. Culture media ingredients, such as carbohydrate sources, plant growth regulators, elicitors, etc., are also crucial for efficient PLB organogenesis and regeneration [205]. Growth retardants also stimulate PLB regeneration in orchids through the inhibition of GA biosynthesis [26]. Setting up the optimum temperature in the growth chamber is also necessary for PLB proliferation, and a higher or lower temperature compared to the optimum causes stress in PLB regeneration in orchids [209]. Light quality is another crucial factor for PLB organogenesis and regeneration for photosynthetic and phototropic responses, and many studies have suggested the efficiency of LEDs over traditional fluorescent light, suggesting the advantages of monochromatic light for PLB organogenesis and regeneration (Supplementary Table S4) [205]. However, different factors can work synergistically for better PLB organogenesis and regeneration compared with their independent applications. However, all these external factors are highly species-specific (Supplementary Table S5) [205]. We have also reported the manipulation of culture media and growth conditions for PLB regeneration in *Dendrobium* [30,209–214] and *Phalaenopsis* [26,215–217]. We found that culture media manipulation and light quality are highly species-specific in orchid PLB proliferation.

Besides these techniques, seed culture, meristem culture, anther culture, embryo culture, ovule culture, cell suspension culture, and direct shoot organogenesis are also practiced for in vitro plantlet generation in ornamentals.

4. Application of In Vitro Techniques in Ornamentals

Plant tissue culture is well known for producing disease-free plantlets by clonal propagation. In vitro culture offers a wide range of possibilities for manipulating plant materials to improve their quality. In vitro techniques are used for hybridization with the assistance of micropropagation, embryo rescue, and somatic hybridization.

4.1. Plant Improvement by the Application of In Vitro Embryo Rescue

The technique of developing a viable plant from an embryo is known as embryo culture or embryo rescue (Figure 4). The embryo culture technique was introduced by Hannig, who cultured mature embryos of a few Brassicaceae plants on sugar-supplemented salt medium [218]. In 1924, Dietrich disclosed that both mature and immature embryos could be rescued [219]. The first interspecific hybridization by embryo rescue from nonviable seeds was reported in the perennial flax (*Linum perenne* L. × *Linum austriacum* L.) in 1925 [220]. Since the first report, embryo rescue has been used for interspecific hybridization in many crops, flowering, ornamentals, medicinals, and woody plants [221,222].

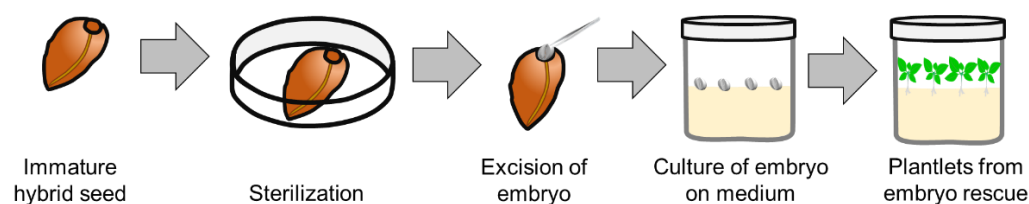


Figure 4. Process of embryo rescue from immature (or non-viable) seed after hybridization.

It allows for the culture of the ovary, ovule, and embryo [223–225]. The success of embryo rescue depends on various factors, such as size and age of the embryo, intactness of embryo, excision procedure, sterilization, culture medium, supplementation in culture medium, light, temperature, etc. [221,222]. It has been used in crop improvement by intraspecific/interspecific/intergeneric hybrid development, haploid/double haploid production, overcoming embryo abortion, overcoming seed dormancy, overcoming self- and cross-incompatibility, shortening the breeding cycle, propagating rare plants, etc. [226–228]. For example, breeding cycles were shortened by embryo rescue in rose [229], and lily [230]. Interspecific hybrids were developed in chrysanthemums by embryo rescue technique for cold-tolerant [224,225,231], heat-tolerant [232], drought-

tolerant [233,234], salt-tolerant [235], aphid resistance [236], and heterotic [224,232,237] characteristics. A new flower shape and cold-tolerant intraspecific (*Campanula carpatica* ‘White’) and interspecific (*C. medium* and *C. formanekiana*) hybrid, respectively, were developed in bellflowers [238]. Interspecific hybrids, haploids, or double haploids were developed in rose [239–241], tulip [242], lisianthus [243], lily [244], day lily [245], calla lily [246], alstroemeria or peruvian lily [247–250], *Primula* [251,252], night-blooming cactus [253–255], gentian [256–258], *Camellia* [259], begonia [260], Christmas bells or golden lily of the valley [261], carnation [262,263], *Gypsophila* [264], *Rhododendron* [265], cyclamen [266], and ornamental alliums [267,268]. Embryo rescue has been widely studied for crop improvement, while its current research has been reduced by the rapid evolution of advanced molecular breeding.

In addition, embryo rescue is generally used to overcome post-fertilization barriers in plants, while many ornamentals have pre-fertilization barriers [269,270] that can be overcome by in vitro pollination. In in vitro pollination, plant reproductive cells (stigma and anther) are isolated and fused under controlled conditions to develop a zygotic embryo. The in vitro technique has been applied for in vitro flowering and pollination in different ornamentals [227,271].

4.2. Plant Improvement by Somatic Hybridization and In Vitro Pollination

Somatic hybridization has been proven to be a great source to produce genetic variability which is known as somaclonal variation. Many somaclones have been considered superior hybrids. Two methods are usually followed to produce the somatic hybrid, one is cytoplasm-protoplast fusion and the other is the donor-recipient method. In cytoplasm-protoplast fusion, protoplasts are allowed to fuse for combining somatic cells either fully or partially from different cultivars or species or genera (Figure 5).

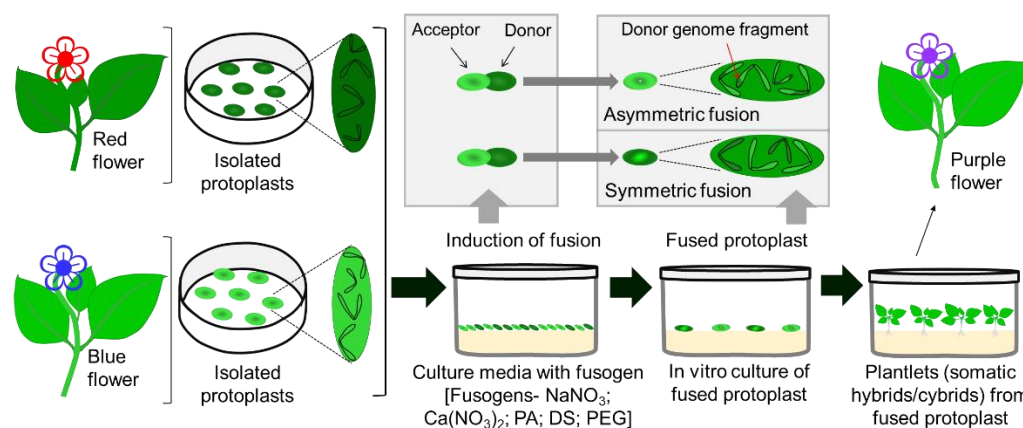


Figure 5. Illustration of somatic hybrid or cybrid development through protoplast fusion. Here, NaNO_3 ; sodium nitrate, $\text{Ca}(\text{NO}_3)_2$; calcium nitrate, PA; polyvinyl alcohol, DS; dextran sulfate, polyethylene glycol (PEG).

The combination of the nuclear genome of one parent with the mitochondrial and/or chloroplast genome of the other parent proceeds in somatic hybridization. An alternative and improved somatic incompatibility is the donor–recipient fusion method, where specific genes or chromosomes can be transferred [272,273]. Chemicals used for protoplast fusions are known as fusogens, and sodium nitrate (NaNO_3), calcium nitrate ($\text{Ca}(\text{NO}_3)_2$), dextran sulfate, polyvinyl alcohol, and polyethylene glycol are common fusogens [274]. Somatic hybridization by protoplast fusion can develop either symmetric or asymmetric hybrids, which are known as somatic hybrids or cybrids (Figure 5).

The first asymmetric hybrid was found in somatic hybridization through fusion between *Nicotiana tabacum* (tobacco) and *Petroselinum hortense* (parsley) [275,276]. Many wild plant species have some significant traits, especially disease and pathogen resistance,

and these traits can be transferred into cultivated crop species. Somatic hybridization allows the transfer of desirable traits to increase yield, resistance, tolerance, etc. [277,278]. It allows breeders to create novel hybrids by the asexual process, bypassing conventional breeding (Figure 5).

Somatic hybridization has been applied for the genetic improvements of various flowering and ornamentals, such as rose [72], *Dendrobium* [279], chrysanthemum [95], dianthus [280], gentian [281,282], iris [283], lily [284], petunia [285], between petunia and *Calibrachoa* [286], hydrangea [287], cyclamen [288], coneflower [289], and *Saintpaulia* [290].

Somaclonal variants or somatic hybrids can be confirmed by morphological, biochemical, protein marker, cytogenetic, and molecular analyses. Restriction fragment length polymorphism (RFLP), simple sequence repeat (SSR), amplified fragment length polymorphism (AFLP), methylation-sensitive amplification polymorphism (MSAP), transposon-based marker systems, and Next-Generation Sequencing (NGS) have been applied for the validation of somatic hybrids at the molecular level in several ornamentals [278]. Somaclonal variation is highly dependent on the PGRs [291]. The main constraints of somatic hybridization are the difficulties in isolating protoplasts (described in Section 3.2), generating unexpected and useless variations, newly generated variants that are not novel, etc. [278].

4.3. Production of Synthetic Seeds

Any encapsulated plant tissue, somatic embryos, or any other micropropagules is known as a synthetic seed or artificial seed (Figure 6). Synthetic seeds have several advantages over natural seeds, such as season-independent seed production, genetic uniformity, maintain hybrid vigor, long-term storage capacity, rapid multiplication, free from vegetative and seed-borne pathogens, propagation of high volume with low cost, assure quality plant materials, and shorten the life cycles [292,293]. Somatic embryos, nodal segments, and shoot tips are mostly used as explants for the development of synthetic seeds in ornamentals, while callus is rarely used, and PLBs are mainly used in orchids to produce synthetic seeds. Synthetic seeds have been generated in *Caladium bicolor* (caladium), *Eustoma grandiflorum* (lilianthus), *Pinus patula* (pine), *Genista monosperma* (bridal broom), *Hyoscyamus muticus* (Egyptian henbane), and *Clitoria ternatea* (bluepea or bluebellvine) from the somatic embryo; *Gypsophila paniculata* (gypsophila), *Saintpaulia ionantha* (saintpaulia), *Urginea altissima* (tall white squill), and *Taraxacum pieninicum* (Mniszek pieninski) from shoot tip; *Rosa × damascena* f. *trigintipetala* (Damask rose), *Syringa vulgaris* (lilac), *Nerium oleander* (oleander), *Centella asiatica* (Asiatic pennywort), *Eclipta alba* (false daisy), *Erythrina variegata* (tiger's claw), *Photinia fraseri* (red tip photinia), *Ruta graveolens* (rue), *Salix tetrasperma* (Indian willow) from axillary buds/nodes, *Anthurium andreanum* (anthurium) from callus, *Lilium longiflorum* (easter lily) from bulb, and different species of orchids from PLBs (*Cymbidium giganteum*, *Vanda coerulea*, *Geodorum densiflorum*, *Coelogyne breviscapa*, *Crematropa appendiculata*, *Flickingeria nodosa*, *Spathoglottis plicata*, etc.) [292,293].

In vitro synthetic seeds in ornamentals allow season-independent seed production, to preserve for long term, and to supply in time to the growers. Some factors are crucial for the synthesis of artificial seeds in ornamentals; these are concentrations of sucrose, sodium alginate (Na-alginate), and calcium chloride (CaCl₂). A range of 2–3% sucrose, 2–3% Na-alginate, and 50–100 mM CaCl₂ was found to be effective concentrations for synthetic seed development in ornamentals [292,293].

Synthetic seeds have some limitations over the advantages: low efficient root systems, development of non-synchronous seeds from the somatic embryo (the most effective plant material for synthetic seed development), deviation from the normal structure, loss of embryogenic potential with time, etc. Synthetic seed technology can be used more effectively in the commercial ornamental plant propagation sector after resolving these limitations.

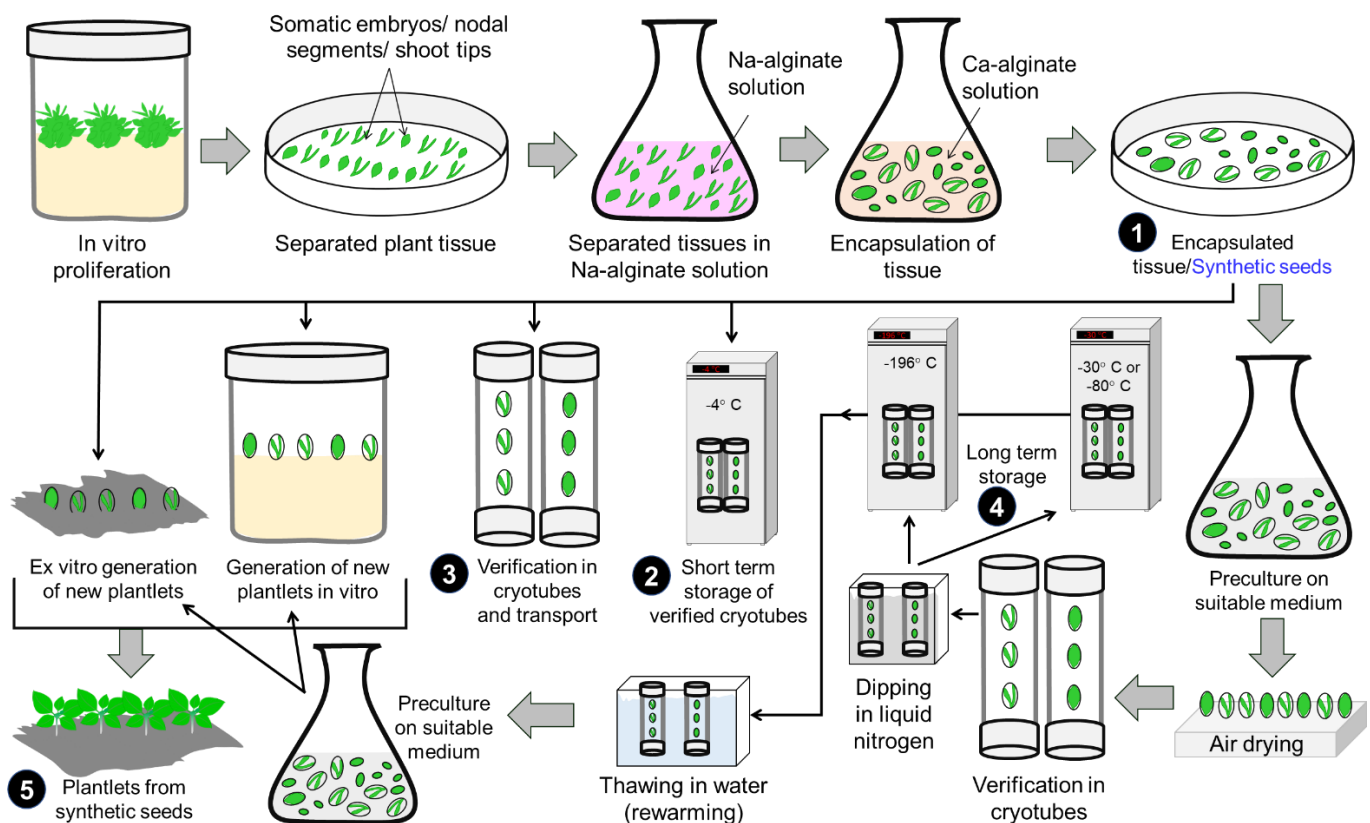


Figure 6. Production and application of synthetic seeds. The numbers in the figure represent the ending point of each step, such as the production of synthetic seeds (1), short-term storage of synthetic seeds (2), synthetic seeds for transportation (3), long-term storage of synthetic seeds (4), and plantlet generation from synthetic seeds (5).

4.4. In Vitro Ploidy Manipulation

In vitro ploidy manipulation is a way of developing genetic diversification by increasing or decreasing chromosome numbers (Figure 7). The induction of polyploidy is used for crop improvement in ornamentals and can expand breeding opportunities to expand traits in ornamentals, environmental tolerances, and restore fertility in wide hybrids [294]. Two antimitotic agents, colchicine or oryzalin, are mostly used for chromosome doubling [295]. Two ginger lily lines: *Hedychium gardnerianum* Shepard ex Ker Gawl. and *H. coronarium* J. Koenig were used for chromosome doubling using colchicine or oryzalin and successfully developed the tetraploid ginger lily [296]. Forty—eight tetraploids were developed in ornamental aroid plants using colchicine (*Caladium* \times *hortulanum* Birdsey) that showed variation in leaf shape, color, and thickness compared to the wild type [297]. Tetraploid anise hyssop (*Agastache foeniculum* L.) was induced by the application of colchicine, which showed a wide range of variation compared to diploid plants in their morphophysiological characteristics [298]. Polyploid has also been induced in *Dendrobium*, *Phalaenopsis*, *Epidendrum*, and *Odontioda* orchids by the application of oryzalin [299]. Diverse phenotypic variations were observed in the in vitro-generated polyploids in rose, lilies, phlox, petunia, bellflowers, rhododendron, etc. [295]. Besides the antimitotic agents, ploidy manipulation also depends on the species, types of explants, antimitotic agent exposure method, duration of antimitotic agent exposure, etc.

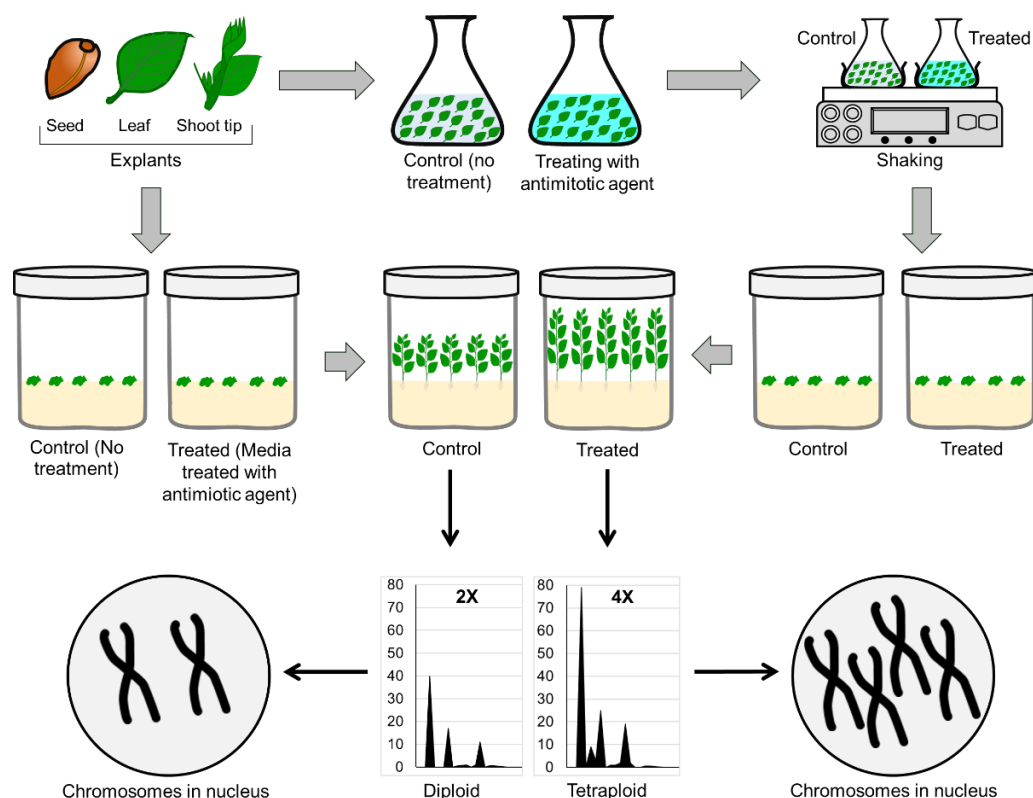


Figure 7. In vitro chromosome doubling (ploidy manipulation) for genetic diversification.

Diverse phenotypic variations were observed in the in vitro-generated polyploids in roses, lilies, phlox, petunia, bellflowers, rhododendron, etc. [295]. Besides the antimetabolic agents, ploidy manipulation also depends on the species, types of explants, antimetabolic agent exposure method, duration of antimetabolic agent exposure, etc. The chromosome doubling technique produces only additional copies of chromosomes and genes, but it does not generate new genetic materials. However, it may cause morphological changes, anatomical changes, loss of duplicated genes, changes in gene expression, changes in epigenome status, and changes in epigenomic alteration-mediated gene expression, which ultimately lead to superior phenotypes in polyploids compared with diploids. These changes may also help generate resistance and tolerance capacity to biotic and abiotic stress.

5. Future Perspective

In vitro plant propagation and multiplication offer significant potential for the advancement of both basic and applied biological sciences. Rapid multiplication and propagation by callus culture, protoplast culture, somatic embryogenesis, PLB organogenesis, and direct plantlet regeneration allowed for the cheaper and disease-free seedling of a diverse ornamental plant species. Millions of in vitro plantlets of different ornamentals are generated worldwide for commercial purposes. However, it is important to put more effort into reducing the cost of production. In contrast to propagation, it also facilitates plant improvement following diverse techniques, such as embryo rescue, somatic hybridization, in vitro pollination, ploidy manipulation, the development of synthetic seeds, etc., and large numbers of hybrids in various ornamentals have already been developed. In addition, the in vitro technique is largely used for phytochemicals and secondary metabolite production. However, more effort is needed to reduce species-specific and other factor-specific responses for the efficient regeneration of ornamentals.

In recent years, researchers have started to study at the molecular level, including genetic transformation, using in vitro technology in ornamentals [300]. About 40 genera have been reported on creating transgenic ornamental species using *Agrobacterium tumefaciens*.

ciens-mediated transformation [301]; however, only a few ornamentals, such as *Phalaenopsis* and petunia, have suitable and efficient transformation techniques. Some studies have revealed that many genes and transcriptions are involved in the in vitro organogenic callus, shoot, root, somatic embryos, and PLBs, and the transcriptions of those genes are also regulated by the exogenous application of different growth regulators [302].

It is believed that plant tissue culture generates genetically identical genotypes or somaclonal variants. Recent studies in *Arabidopsis* and crop plants, such as rice, wheat, corn, barley, and rye, have suggested that tissue culture can alter the genetic nature by point mutations [303]. In contrast to genetic factors, different epigenetic regulators, such as DNA methylation and histone modifications, are also involved in regulating the success of in vitro plant propagation [302,303]. Most of the genetic and epigenetic studies were conducted in the model plant *Arabidopsis* or crop plants, and this suggests the scope of future study in genetic and epigenetic aspects (Figure 8).

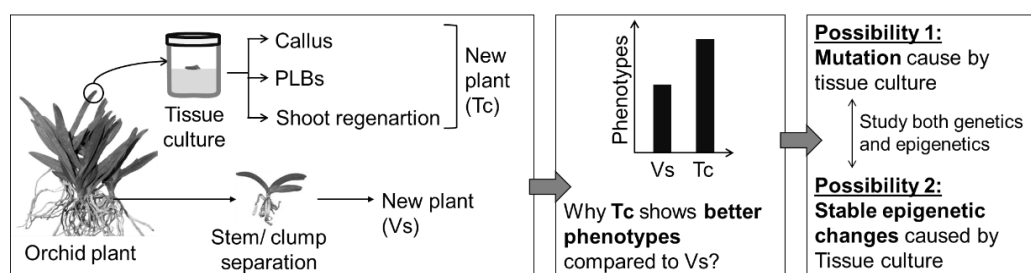


Figure 8. Prospects for advanced molecular research in plant tissue culture using orchid plants as an example. Here, Tc; Tissue culture regenerated plants, Vs; traditional vegetatively propagated plants.

Tissue culture alters genome-wide DNA methylation in the CG, CHG, and CHH contexts (H represents the A, C, or T), and these alterations change the gene expression that might be regulating factors for in vitro plant growth and development. DNA methylation was studied in the callus and somatic embryos of *Arabidopsis* and crop plants, and callus and somatic embryos are vulnerable to the alteration of DNA methylation, leading to changes in gene expression [303,304]. Involvement of di-methylated lysine 4 of histone H3 (H3K4me2) was associated with successful shoot regeneration from callus in *Arabidopsis* [305], while H3K4me3 and H3K27me3 histone marks are involved with the callus tissues in rice [306]. These reports suggest the importance of epigenetic regulation of in vitro regenerated plants. Besides DNA methylation and histone modification, different miRNAs and sRNAs may also be involved in the success of in vitro plant propagation. The expression of transposable elements (TEs) can also be epigenetically regulated in vitro environments; for example, TEs can be activated by the plant tissue culture [307]. However, there has been no significant advancement in the molecular mechanisms controlling in vitro regeneration in ornamentals.

Studies on *Arabidopsis* and crop plants provide fundamental knowledge for disclosing the molecular mechanisms in ornamental plant species. Therefore, it is high time for advanced study of the genetic and epigenetic mechanisms that would provide a breakthrough in the commercialization of in vitro propagation of ornamental plant species.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/plants11233208/s1>, Table S1: Effective plant growth regulators and other factors for the in vitro culture in ornamentals [38,110,111,113,114,123,173,192,308–507]; Table S2: Effective elicitors for the in vitro culture in ornamentals [26,51,215–217,340,404,458,470,482,508–517]; Table S3: Effective additives for the in vitro culture in ornamentals [342,347,350,363,365,504,518–523]; Table S4: Effective light emitting diodes (LEDs) for the in vitro culture in ornamentals [26,31,55,58,61,210,440,467,524–554]; Table S5: Studies in combination of light emitting diodes (LEDs) and plant growth regulators in vitro culture in ornamentals [26,31,55,58,61,62,210,317,440,467,524–559].

Author Contributions: Conceptualization, H.M. (Hasan Mehraj); writing—original draft preparation, H.M. (Hasan Mehraj), A.A., M.A.A., M.S.H.M., M.A.H. and H.M. (Hasan Mehraj); visualization,

H.M. (Hasan Mehraj); writing—review and editing, M.T. and H.M. (Hasan Mehraj). All authors have read and agreed to the published version of the manuscript.

Funding: This research received no external funding.

Institutional Review Board Statement: Not applicable.

Informed Consent Statement: Not applicable.

Data Availability Statement: Not applicable.

Acknowledgments: We thank to our colleagues for accessing, non-open access to us, articles.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Bhojwani, S.S.; Dantu, P.K. Micropropagation. In *Plant Tissue Culture: An Introductory Text*; Bhojwani, S.S., Dantu, P.K., Eds.; Springer: New Delhi, India, 2013; Chapter 17, pp. 245–274.
2. White, P.R. Potentially unlimited growth of excised tomato root tips in a liquid medium. *Plant Physiol.* **1934**, *9*, 585–600. [[CrossRef](#)] [[PubMed](#)]
3. White, P.R. Accessory salts in the nutrition of excised tomato roots. *Plant Physiol.* **1938**, *13*, 391–398. [[CrossRef](#)] [[PubMed](#)]
4. White, P.R. Glycine in the nutrition of excised tomato roots. *Plant Physiol.* **1939**, *14*, 527–538. [[CrossRef](#)] [[PubMed](#)]
5. White, P.R. *A Handbook of Plant Tissue Culture*; The Jaques Cattell Press: Lancaster, PA, USA, 1943; pp. 1–277.
6. Murashige, T.; Skoog, F. A revised medium for rapid growth and bio assays with tobacco tissue cultures. *Physiol. Plant.* **1962**, *15*, 473–497. [[CrossRef](#)]
7. White, P.R. *The Cultivation of Animal and Plant Cells*; Ronald Press, Co.: New York, NY, USA, 1963; p. 239.
8. Linsmaier, E.M.; Skoog, F. Organic growth factor requirements of tobacco tissue cultures. *Physiol. Plant* **1965**, *18*, 100–127. [[CrossRef](#)]
9. Gamborg, O.L.; Miller, R.A.; Ojima, K. Nutrient requirements of suspension culture of soybean root cells. *Exp. Cell. Res.* **1968**, *50*, 15–158. [[CrossRef](#)]
10. Nitsch, J.P.; Nitsch, C. Haploid plants from pollen grains. *Science* **1969**, *163*, 85–87. [[CrossRef](#)]
11. Madke, S.S.; Cherian, K.J.; Badere, R.S. A modified Murashige and Skoog media for efficient multiple shoot induction in *G. arborea* Roxb. *J. For. Res.* **2014**, *25*, 557–564. [[CrossRef](#)]
12. Enoki, S.; Takahara, Y. Application of a modified MS medium for tissue culture with cutting in *Phalaenopsis*-comparison with other conventional media with regard to the survival rate and varietal differences in cultural characteristics. *J. Sci. High Technol. Agric. (Shokubutsu Kankyo Kogaku)* **2014**, *26*, 109–117. [[CrossRef](#)]
13. Yaseen, M.; Ahmad, T.; Sablok, G.; Standardi, A.; Hafiz, I.H. Review: Role of carbon sources for in vitro plant growth and development. *Mol. Biol. Rep.* **2013**, *40*, 2837–2849. [[CrossRef](#)]
14. Calamar, A.; De Klerk, G.J. Effect of sucrose on adventitious root regeneration in apple. *Plant Cell Tissue Organ Cult.* **2002**, *70*, 207–212. [[CrossRef](#)]
15. Kozai, T.; Kubota, C.; Jeong, B.R. Environmental control for the large-scale production of plants through in vitro techniques. *Plant Cell Tissue Organ Cult.* **1997**, *51*, 49–56. [[CrossRef](#)]
16. Borisjuk, L.; Walenta, S.; Rollerscheck, H.; Mueller-Klieser, W.; Wobus, U.; Weber, H. Spatial analysis of plant metabolism: Sucrose imaging within *Vicia faba* in cotyledons reveals specific developmental patterns. *Plant J.* **2003**, *29*, 521–530. [[CrossRef](#)]
17. Stepan-Sarkissian, G.; Fowler, M.W. Carbohydrates by suspension cultures. *Plant Physiol.* **1977**, *59*, 151–181.
18. Neto, V.B.D.P.; Otoni, W.C. Carbon sources and their osmotic potential in plant tissue culture: Does it matter? *Sci. Hortic.* **2003**, *97*, 193–202. [[CrossRef](#)]
19. Tokuhara, K.; Mii, M. Highly-efficient somatic embryogenesis from cell suspension cultures of *Phalaenopsis* orchids by adjusting carbohydrate sources. *Vitr. Cell Dev. Biol. Plant* **2003**, *39*, 635–639. [[CrossRef](#)]
20. Liu, T.H.A.; Lin, J.J.; Wu, R.Y. The effects of using trehalose as a carbon source on the proliferation of *Phalaenopsis* and *Doritaenopsis* protocorm-like-bodies. *Plant Cell Tissue Organ Cult.* **2006**, *86*, 125–129. [[CrossRef](#)]
21. Gibson, S.I. Plant sugar-response pathways. Part of a complex regulatory web. *Plant Physiol.* **2000**, *124*, 1532–1539. [[CrossRef](#)]
22. Baskaran, P.; Jayabalan, N. Role of basal media, carbon sources and growth regulators in micropropagation of *Eclipta alba*—A valuable medicinal herb. *Curr. Appl. Sci. Technol.* **2005**, *5*, 469–482.
23. Javed, F.; Ikram, S. Effect of sucrose induced osmotic stress on callus growth and biochemical aspects of two wheat genotypes. *Pak. J. Bot.* **2008**, *40*, 1487–1495.
24. Saad, A.I.; Elshahed, A.M. Plant tissue culture media. In *Recent Advances in Plant In Vitro Culture*; Leva, A., Rinaldi, L.M.R., Eds.; IntechOpen: London, UK, 2012; Chapter 2, pp. 1–13.
25. Yamaguchi, H.; Sasaki, K.; Shikata, M.; Aida, R.; Ohtsubo, N. Trehalose drastically extends the in vitro vegetative culture period and facilitates maintenance of *Torenia fournieri* plants. *Plant Biotechnol.* **2011**, *28*, 263–266. [[CrossRef](#)]
26. Mehraj, H.; Alam, M.M.; Habiba, S.U.; Mehbub, H. LEDs combined with CHO sources and CCC priming PLB regeneration of *Phalaenopsis*. *Horticulturae* **2019**, *5*, 34. [[CrossRef](#)]

27. Teixeira da Silva, J.A. Ornamental chrysanthemums: Improvement by biotechnology. *Plant Cell Tissue Organ Cult.* **2004**, *79*, 1–18. [\[CrossRef\]](#)
28. Hong, P.I.; Chen, J.T.; Chang, W.C. Promotion of direct somatic embryogenesis of *Oncidium* by adjusting carbon sources. *Biol. Plant.* **2008**, *52*, 597–600. [\[CrossRef\]](#)
29. Blanc, G.; Lardet, L.; Martin, A.; Jacob, J.L.; Carron, M.P. Differential carbohydrate metabolism conducts morphogenesis in embryogenic callus of *Hevea brasiliensis* (Mull. Arg.). *J. Exp. Bot.* **2002**, *53*, 1453–1462. [\[CrossRef\]](#)
30. Capellades, M.; Lemeur, R.; Debergh, P. Effects of sucrose on starch accumulation and rate of photosynthesis in *Rosa* cultured in vitro. *Plant Cell Tissue Organ Cult.* **1991**, *25*, 21–26. [\[CrossRef\]](#)
31. Mehbub, H.; Shimasaki, K.; Mehraj, H. Low concentration of anti-auxin and anti-fungal agent accelerates the PLB regeneration of *Dendrobium okinawense* under green LED. *Plants* **2022**, *11*, 1082. [\[CrossRef\]](#)
32. Jo, E.A.; Tewari, R.K.; Hahn, E.J.; Paek, K.Y. In vitro sucrose concentration affects growth and acclimatization of *Alocasia amazonica* plantlets. *Plant Cell Tissue Organ Cult.* **2009**, *96*, 307–315. [\[CrossRef\]](#)
33. Shahzad, A.; Parveen, S.; Sharma, S.; Shaheen, A.; Saeed, T.; Yadav, V.; Akhtar, R.; Ahmad, Z.; Upadhyay, A. Plant tissue culture: Applications in plant improvement and conservation. In *Plant Biotechnology: Principles and Applications*; Abidin, M., Kiran, U., Ali, A., Eds.; Springer: Singapore, 2017; Chapter 2, pp. 37–72.
34. Che, P.; Lall, S.; Howell, S.H. Developmental steps in acquiring competence for shoot development in *Arabidopsis* tissue culture. *Planta* **2007**, *226*, 1183–1194. [\[CrossRef\]](#)
35. Atta, R.; Laurens, L.; Boucheron-Dubuisson, E.; Guivarc’h, A.; Carnero, E.; Giraudat-Pautot, V.; Rech, P.; Chriqui, D. Pluripotency of *Arabidopsis* xylem pericycle underlies shoot regeneration from root and hypocotyl explants grown in vitro. *Plant J.* **2009**, *57*, 626–644. [\[CrossRef\]](#)
36. Marhavý, P.; Montesinos, J.C.; Abuzeineh, A.; Van Damme, D.; Vermeer, J.E.; Duclercq, J.; Rakusová, H.; Nováková, P.; Friml, J.; Geldner, N.; et al. Targeted cell elimination reveals an auxin-guided biphasic mode of lateral root initiation. *Genes Dev.* **2016**, *30*, 471–483. [\[CrossRef\]](#)
37. Blakesley, D.; Weston, G.; Hall, J. The role of endogenous auxin in root initiation. *Plant Growth Regul.* **1991**, *10*, 341–353. [\[CrossRef\]](#)
38. Roy, J.; Banerjee, N. Induction of callus and plant regeneration from shoot-tip explants of *Dendrobium fimbriatum* Lindl. var. *oculatum* Hk. f. *Sci. Hortic.* **2003**, *97*, 333–340. [\[CrossRef\]](#)
39. Benková, E.; Michniewicz, M.; Sauer, M.; Teichmann, T.; Seifertová, D.; Jürgens, G.; Friml, J. Local, efflux-dependent auxin gradients as a common module for plant organ formation. *Cell* **2003**, *115*, 591–602. [\[CrossRef\]](#)
40. Wang, Y.H.; Irving, H.R. Developing a model of plant hormone interactions. *Plant Signal. Behav.* **2011**, *6*, 494–500. [\[CrossRef\]](#)
41. Ludwig-Müller, J. Auxin conjugates: Their role for plant development and in the evolution of land plants. *J. Exp. Bot.* **2011**, *62*, 1757–1773. [\[CrossRef\]](#)
42. Simon, S.; Petrášek, J. Why plants need more than one type of auxin. *Plant Sci.* **2011**, *180*, 454–460. [\[CrossRef\]](#)
43. Schmülling, T. Cytokinin. In *Encyclopedia of Biological Chemistry*, 2nd ed.; Lennarz, J.W., Lane, D.M., Eds.; Academic Press: Cambridge, MA, USA, 2013; pp. 627–631.
44. Thimann, K.V.; Bonner, J. The mechanism of the action of the growth substance of plants. *Proc. R. Soc. Lond. Ser. B* **1933**, *113*, 126–149.
45. Mares, D.J.; Marschner, H.; Krauss, A. Effect of gibberellic acid on growth and carbohydrate metabolism of developing tubers of potato (*Solanum tuberosum* L.). *Physiol. Plant* **1981**, *52*, 267–274. [\[CrossRef\]](#)
46. Wang, H.; Li, H.; Liu, F.; Xiao, L. Chlorocholine chloride application effects on photosynthetic capacity and photoassimilates partitioning in potato (*Solanum tuberosum* L.). *Sci. Hortic.* **2009**, *119*, 113–116. [\[CrossRef\]](#)
47. Wen, Z.Z.; Lin, Y.; Liu, Y.Q.; Wang, M.; Wang, Y.Q.; Liu, W. Effects of paclobutrazol in vitro on transplanting efficiency and root tip development of *Dendrobium nobile*. *Biol. Plant* **2013**, *57*, 576–580. [\[CrossRef\]](#)
48. Gimenes, R.; Pivetta, K.F.L.; Mazzini-Guedes, R.B.; Ferraz, M.V.; Pereira, S.T.S.; Santos, Á.S.; de Faria, R.T.; de Almeida, L.C.P. Paclobutrazol on in vitro growth and development of *Zygopetalum crinitum* orchid, and on seedling acclimatization. *Am. J. Plant Sci.* **2018**, *9*, 1029–1036. [\[CrossRef\]](#)
49. Murthy, H.N.; Lee, E.J.; Paek, K.Y. Production of secondary metabolites from cell and organ cultures: Strategies and approaches for biomass improvement and metabolite accumulation. *Plant Cell Tissue Organ Cult.* **2014**, *118*, 1–16. [\[CrossRef\]](#)
50. Xu, A.; Zhan, J.C.; Huang, W.D. Effects of ultraviolet C, methyl jasmonate and salicylic acid, alone or in combination, on stilbene biosynthesis in cell suspension cultures of *Vitis vinifera* L. cv. Cabernet Sauvignon. *Plant Cell Tissue Organ Cult.* **2015**, *122*, 197–211. [\[CrossRef\]](#)
51. Podwyszyńska, M.; Kosson, R.; Treder, J. Polyamines and methyl jasmonate in bulb formation of in vitro propagated tulips. *Plant Cell Tissue Organ Cult.* **2015**, *123*, 591–605. [\[CrossRef\]](#)
52. Cardoso, J.C.; Teixeira da Silva, J.A. Micropropagation of gerbera using chlorine dioxide (ClO₂) to sterilize the culture medium. *Vitr. Cell. Dev. Biol.-Plant* **2011**, *48*, 362–368. [\[CrossRef\]](#)
53. Tian, C.; Xie, Z.; Zhao, Y.; Zhang, Z.; Xue, T.; Sheng, W.; Zhao, F.; Duan, Y. Microgram-grade concentration of chlorine dioxide induces one-step plant regeneration in chrysanthemum. *Vitr. Cell Dev. Biol. Plant* **2022**, 1–7. [\[CrossRef\]](#)
54. Rajapakse, N.C.; Shahak, Y. Light-quality manipulation by horticulture industry. In *Annual Plant Reviews, Volume 30: Light and Plant Development IV. Applied Aspects of Photomorphogenesis*; Whitelam, G.C., Halliday, K.J., Eds.; Blackwell Publishing Ltd.: Hoboken, NJ, USA, 2007; Chapter 12, pp. 290–312.

55. Bello-Bello, J.J.; Perez-Sato, J.A.; Cruz-Cruz, C.A.; Martinez-Estrada, E. Light-emitting diodes: Progress in plant micropropagation. In *Chlorophyll*; Jacob-Lopes, E., Zepka, L.Q., Queiroz, M.I., Eds.; IntechOpen: London, UK, 2017; Chapter 6, pp. 93–103.
56. Yeow, L.C.; Chew, B.L.; Sreeramanan, S. Elevation of secondary metabolites production through light-emitting diodes (LEDs) illumination in protocorm-like bodies (PLBs) of *Dendrobium* hybrid orchid rich in phytochemicals with therapeutic effects. *Biotechnol. Rep.* **2020**, *27*, e00497. [\[CrossRef\]](#)
57. Hanus-Fajerska, E.; Wojciechowska, R. Impact of light-emitting diodes (LEDs) on propagation of orchids in tissue culture. In *Light Emitting Diodes for Agriculture*; Dutta Gupta, S., Ed.; Springer: Singapore, 2017; Chapter 13, pp. 305–320.
58. Tanaka, M.; Takamura, T.; Watanabe, H.; Endo, M.; Yanagi, T.; Okamoto, K. In vitro growth of *Cymbidium* plantlets cultured under superbright red and blue light-emitting diodes (LEDs). *J. Hort. Sci. Biotech.* **1998**, *73*, 39–44. [\[CrossRef\]](#)
59. Huan, L.V.T.; Tanaka, M. Callus induction from protocorm-like body segments and plant regeneration in *Cymbidium* (Orchidaceae). *J. Hort. Sci. Biotechnol.* **2004**, *79*, 406–410. [\[CrossRef\]](#)
60. Goins, G.D.; Yorio, N.C.; Sanwo, M.; Brown, C.S. Photomorphogenesis photosynthesis, and seed yield of wheat plants grown under red light-emitting diodes (LED) with and without supplement blue lighting. *J. Exp. Bot.* **1997**, *312*, 1407–1413. [\[CrossRef\]](#) [\[PubMed\]](#)
61. Lin, Y.; Li, J.; Li, B.; He, T. Effects of light quality on growth and development of procorm-like bodied of *Dendrobium officinale* in vitro. *Plant Cell Tissue Organ Cult.* **2011**, *105*, 329–335. [\[CrossRef\]](#)
62. Habiba, S.U.; Shimasaki, K.; Ahasan, M.M.; Alam, M.M. Effects of different light quality on growth and development of protocorm-like bodies (PLBs) in *Dendrobium kingianum* cultured in vitro. *Bangladesh Res. Public J.* **2014**, *10*, 223–227.
63. Xu, Z.G.; Cui, J.; Di, X.R. Effects of different spectral energy distribution on tissue culture of *Oncidium* in vitro. *Int. J. Autom. Comput.* **2009**, *31*, 45–50.
64. Ona, A.F.; Shimasaki, K.; Emteas, M.A.; Uddin, A.F.M.J. Effects of different LED lights on the organogenesis of a *Cymbidium* cultivar. *Environ. Control Biol.* **2021**, *59*, 197–201. [\[CrossRef\]](#)
65. Haberlandt, G. Culturversuehe mit isolierten Pflanzenzellen. *Sitzungsber. Akad. Wiss. Wien Math. Nat.* **1902**, *111*, 69–92.
66. Fehér, A. Callus, dedifferentiation, totipotency, somatic embryogenesis: What these terms mean in the era of molecular plant biology? *Front. Plant Sci.* **2019**, *10*, 536. [\[CrossRef\]](#)
67. Bhatia, S. Plant tissue culture. In *Modern Applications of Plant Biotechnology in Pharmaceutical Sciences*; Bhatia, S., Sharma, K., Dahiya, R., Bera, T., Eds.; Academic Press: Cambridge, MA, USA, 2015; pp. 31–107.
68. Efferth, T. Biotechnology applications of plant callus cultures. *Engineering* **2019**, *5*, 50–59. [\[CrossRef\]](#)
69. Naing, A.H.; Adediji, O.S.; Kim, C.K. Protoplast technology in ornamentals: Current progress and potential applications on genetic improvement. *Sci. Hortic.* **2021**, *283*, 110043. [\[CrossRef\]](#)
70. Thomas, A.; Pujari, I.; Shetty, V.; Joshi, M.B.; Rai, P.S.; Satyamoorthy, K.; Babu, V.S. *Dendrobium* protoplast co-culture promotes phytochemical assemblage in vitro. *Protoplasma* **2017**, *254*, 1517–1528. [\[CrossRef\]](#)
71. Yousuf, S.; Ashraf, F.; Kazmi, S.K.; Khan, S.; Kayani, H.A. A study on the isolation of protoplasts from the callus of *Lilium longiflorum* Overig. *Pak. J. Bot.* **2015**, *47*, 2391–2396.
72. Pati, P.K.; Sharma, M.; Ahuja, P.S. Rose protoplast isolation and culture and heterokaryonselection by immobilization in extra thin alginate film. *Protoplasma* **2008**, *233*, 165–171. [\[CrossRef\]](#)
73. Adediji, O.S.; Naing, A.H.; Kim, C.K. Protoplast isolation and shoot regeneration from protoplast-derived calli of *Chrysanthemum* cv. White ND. *Plant Cell Tissue Organ Cult.* **2020**, *141*, 571–581. [\[CrossRef\]](#)
74. Kang, H.H.; Naing, A.H.; Kim, C.K. Protoplast isolation and shoot regeneration from protoplast-derived callus of *Petunia hybrida* Cv. Mirage Rose. *Biology* **2020**, *9*, 228. [\[CrossRef\]](#) [\[PubMed\]](#)
75. Shiba, T.; Mii, M. Plant regeneration from mesophyll-and cell suspension-derived protoplasts of *Dianthus acicularis* and characterization of regenerated plants. *Vitr. Cell Dev. Biol. Plant* **2005**, *41*, 794. [\[CrossRef\]](#)
76. Liqing, Z.; Bochu, W.; Jing, Z.; Lingxi, C.; Chuanyun, D.; Chuanren, D. Protoplast isolation of callus in *Echinacea augustifolia*. *Colloids Surf. B Biointerfaces* **2005**, *44*, 1–5. [\[CrossRef\]](#)
77. Nassour, M.; Dorion, N. Plant regeneration from protoplasts of micropropagated *Pelargonium x hortorum* 'Alain': Effect of some environmental and medium factors on protoplast system efficiency. *Plant Sci.* **2002**, *163*, 169–176. [\[CrossRef\]](#)
78. Nassour, M.; Chasseriaux, G.; Dorion, N. Optimization of protoplast-to-plant system for *Pelargonium x hortorum* 'Alain' and genetic stability of the regenerated plants. *Plant Sci.* **2003**, *165*, 121–128. [\[CrossRef\]](#)
79. Rahmani, M.S.; Pijut, P.M.; Shabanian, N. Protoplast isolation and genetically true-to-type plant regeneration from leaf-and callus-derived protoplasts of *Albizia julibrissin*. *Plant Cell Tissue Organ Cult.* **2016**, *127*, 475–488. [\[CrossRef\]](#)
80. Lang, I.; Sassmann, S.; Schmidt, B.; Komis, G. Plasmolysis: Loss of turgor and beyond. *Plants* **2014**, *3*, 583–593. [\[CrossRef\]](#)
81. Pan, Z.G.; Liu, C.Z.; Zobayed, S.M.A.; Saxena, P.K. Plant regeneration from mesophyll protoplasts of *Echinacea purpurea*. *Plant Cell Tissue Organ Cult.* **2004**, *77*, 251–255. [\[CrossRef\]](#)
82. Zhou, J.; Wang, B.; Zhu, L. Conditioned culture for protoplasts isolated from *Chrysanthemum*: An efficient approach. *Colloids Surf. B Biointerfaces* **2005**, *45*, 113–119. [\[CrossRef\]](#) [\[PubMed\]](#)
83. Duquenne, B.; Eeckhaut, T.; Werbrouck, S. Effect of enzyme concentrations on protoplast isolation and protoplast culture of *Spathiphyllum* and *Anthurium*. *Plant Cell Tissue Organ Cult.* **2007**, *91*, 165–173. [\[CrossRef\]](#)
84. Pongchawee, K.; Na-Nakorn, U.; Lamseejan, S.; Poempuang, S.; Phansiri, S. Factors affecting the protoplast isolation and culture of *Anubias nana* Engler. *Int. J. Bot.* **2006**, *2*, 193–200. [\[CrossRef\]](#)

85. Meyer, L.; Serek, M.; Winkelmann, T. Protoplast isolation and plant regeneration of different genotypes of *Petunia* and *Calibrachoa*. *Plant Cell Tissue Organ Cult.* **2009**, *99*, 27–34. [\[CrossRef\]](#)
86. Li, J.; Liao, X.; Zhou, S.; Liu, S.; Jiang, L.; Wang, G. Efficient protoplast isolation and transient gene expression system for *Phalaenopsis* hybrid cultivar ‘Ruili Beauty’. *Vitr. Cell Dev. Biol. Plant* **2018**, *54*, 87–93. [\[CrossRef\]](#)
87. Teo, C.K.H.; Neumann, K.H. The culture of protoplasts isolated from *Renantanda* Rosalind Cheok. *Orchid Rev.* **1978**, *86*, 156–158.
88. Teo, C.K.H.; Neumann, K.H. The isolation and hybridization of protoplasts from orchids. *Orchid Rev.* **1978**, *86*, 186–189.
89. Kobayashi, S.; Kameya, T.; Ichihashi, S. Plant regeneration from protoplasts derived from callus of *Phalaenopsis*. *Plant Tiss. Cult. Lett.* **1993**, *10*, 267–270. [\[CrossRef\]](#)
90. Kunasakdakul, K.; Smitamana, P. *Dendrobium* Pratum Red protoplast. *Thai J. Agric. Sci.* **2003**, *36*, 1–8.
91. Khentry, Y.; Paradornuvut, A.; Tantiwiwat, S.; Phansiri, S.; Thaveechai, N. Protoplast isolation and culture of *Dendrobium* Sonia “Bom 17”. *Kasetsart J. (Nat. Sci.)* **2006**, *40*, 361–369.
92. Shrestha, B.R.; Tokuhara, K.; Mii, M. Plant regeneration from cell suspension-derived protoplasts of *Phalaenopsis*. *Plant Cell Rep.* **2007**, *26*, 719–725. [\[CrossRef\]](#) [\[PubMed\]](#)
93. Tee, C.S.; Lee, P.S.; Kiong, A.L.P.; Mahmood, M. Optimisation of protoplast isolation protocols using in vitro leaves of *Dendrobium crumenatum* (pigeon orchid). *Afr. J. Agric. Res.* **2011**, *5*, 2685–2693.
94. Cui, J.; Mackenzie, K.K.; Eeckhaut, T.; Müller, R.; Lütken, H. Protoplast isolation and culture from *Kalanchoë* species: Optimization of plant growth regulator concentration for efficient callus production. *Plant Cell Tissue Organ Cult.* **2019**, *138*, 287–297. [\[CrossRef\]](#)
95. Furuta, H.; Shinoyama, H.; Nomura, Y.; Maeda, M.; Makara, K. Production of intergeneric somatic hybrids of chrysanthemum [*Dendranthema* × *grandiflorum* (Ramat.) Kitamura] and wormwood (*Artemisia sieversiana* JF Ehrh. ex. Willd) with rust (*Puccinia horiana* Henning) resistance by electrofusion of protoplasts. *Plant Sci.* **2004**, *166*, 695–702. [\[CrossRef\]](#)
96. Steward, F.C.; Mapes, M.O.; Mears, K. Growth and organized development of cultured cells. II. Organization in cultures grown from freely suspended cells. *Am. J. Bot.* **1958**, *45*, 705–708. [\[CrossRef\]](#)
97. Reinert, J. Über die kontrolle der morphogenese und die induktion von adventivembryonen an gewebe-kulturen aus karotten. *Planta* **1959**, *53*, 318–333. [\[CrossRef\]](#)
98. Backs-Hüsemann, D.; Reinert, J. Embryobildung durch isolierte Einzelzellen aus Gewebekulturen von *Daucus carota*. *Protoplasma* **1970**, *70*, 49–60. [\[CrossRef\]](#)
99. Hossain, M.M.; Kant, R.; Van, P.T.; Winarto, B.; Zeng, S.; Teixeira da Silva, J.A. The application of biotechnology to orchids. *Crit. Rev. Plant Sci.* **2013**, *32*, 69–139.
100. Mujib, A. *Somatic Embryogenesis in Ornamentals and Its Applications*; Springer: New Delhi, India, 2016; Volume 267, pp. 1–267.
101. Nic-Can, G.I.; Galaz-Ávalos, R.M.; De-la-Peña, C.; AlcazarMagaña, A.; Wrobel, K.; Loyola-Vargas, V.M. Somatic embryogenesis: Identified factors that lead to embryogenic repression. a case of species of the same genus. *PLoS ONE* **2015**, *10*, e0126414. [\[CrossRef\]](#)
102. Loyola-Vargas, V.M.; Ochoa-Alejo, N. *Somatic Embryogenesis: Fundamental Aspects and Applications*; Springer: Cham, Switzerland, 2018; pp. 1–296.
103. Mahendran, G.; Bai, V.N. Direct somatic embryogenesis and plant regeneration from seed derived protocorms of *Cymbidium bicolor* Lindl. *Sci. Hortic.* **2012**, *135*, 40–44. [\[CrossRef\]](#)
104. Deb, C.R.; Pongener, A. Studies on the in vitro regenerative competence of aerial roots of two horticultural important *Cymbidium* species. *J. Plant Biochem. Biotechnol.* **2012**, *21*, 235–241. [\[CrossRef\]](#)
105. Chang, C.; Chang, W.C. Plant regeneration from callus of *Cymbidium ensifolium* var ‘Misericors’. *Plant Cell Rep.* **1998**, *17*, 251–255. [\[CrossRef\]](#) [\[PubMed\]](#)
106. Teixeira da Silva, J.A.; Chan, M.-T.; Sanjaya; Chai, M.-L.; Tanaka, M. Priming abiotic factors for optimal hybrid *Cymbidium* (Orchidaceae) PLB and callus induction, plantlet formation, and their subsequent cytogenetic stability analysis. *Sci. Hortic.* **2006**, *109*, 368–378. [\[CrossRef\]](#)
107. Teixeira da Silva, J.A.; Singh, N.; Tanaka, M. Priming biotic factors for optimal protocorm-like body and callus induction in hybrid *Cymbidium* (Orchidaceae), and assessment of cytogenetic stability in regenerated plantlets. *Plant Cell Tissue Organ Cult.* **2006**, *84*, 135–144. [\[CrossRef\]](#)
108. Teixeira da Silva, J.A.; Winarto, B. Somatic embryogenesis in two orchid genera (*Cymbidium*, *Dendrobium*). In *In Vitro Embryogenesis in Higher Plants. Methods in Molecular Biology*; Germana, M., Lambardi, M., Eds.; Humana Press: Totowa, NJ, USA, 2016; Volume 1359, pp. 371–386.
109. Ishii, Y.; Takamura, T.; Goi, M.; Tanaka, M. Callus induction and somatic embryogenesis of *Phalaenopsis*. *Plant Cell Rep.* **1998**, *17*, 446–450. [\[CrossRef\]](#)
110. Chen, J.T.; Chang, W.C. Direct somatic embryogenesis and plant regeneration from leaf explants of *Phalaenopsis amabilis*. *Biol. Plant.* **2006**, *50*, 169–173. [\[CrossRef\]](#)
111. Gow, W.P.; Chen, J.T.; Chang, W.C. Enhancement of direct somatic embryogenesis and plantlet growth from leaf explants of *Phalaenopsis* by adjusting culture period and explant length. *Acta Physiol. Plant.* **2010**, *32*, 621–627. [\[CrossRef\]](#)
112. Gow, W.P.; Chen, J.T.; Chang, W.C. Influence of growth regulators on direct embryo formation from leaf explants of *Phalaenopsis* orchids. *Acta Physiol. Plant.* **2008**, *30*, 507–512. [\[CrossRef\]](#)
113. Gow, W.P.; Chen, J.T.; Chang, W.C. Effects of genotype, light regime, explant position and orientation on direct somatic embryogenesis from leaf explants of *Phalaenopsis* orchids. *Acta Physiol. Plant.* **2009**, *31*, 363–369. [\[CrossRef\]](#)

114. Niknejad, A.; Kadir, M.A.; Kadzimin, S.B. In vitro plant regeneration from protocorms-like bodies (PLBs) and callus of *Phalaenopsis gigantea* (Epidendroideae: Orchidaceae). *Afr. J. Biotechnol.* **2011**, *10*, 11808–11816.
115. Feng, J.H.; Chen, J.T. A novel in vitro protocol for inducing direct somatic embryogenesis in *Phalaenopsis aphrodite* without taking explants. *Sci. World J.* **2014**, *7*, 263642.
116. Chen, J.T.; Chang, C.; Chang, W.C. Direct somatic embryogenesis on leaf explants of *Oncidium* Gower Ramsey and subsequent plant regeneration. *Plant Cell Rep.* **1999**, *19*, 143–149. [[CrossRef](#)] [[PubMed](#)]
117. Chen, J.T.; Chang, W.C. Effects of tissue culture conditions and explant characteristics on direct somatic embryogenesis in *Oncidium* 'Gower Ramsey'. *Plant Cell Tissue Organ Cult.* **2002**, *69*, 41–44. [[CrossRef](#)]
118. Su, Y.J.; Chen, J.T.; Chang, W.C. Efficient and repetitive production of leaf-derived somatic embryos of *Oncidium*. *Biol. Plant.* **2006**, *50*, 107–110. [[CrossRef](#)]
119. Hong, P.I.; Chen, J.T.; Chang, W.C. Effects of salicylic and acetylsalicylic acid on direct somatic embryogenesis in *Oncidium*. *J. Plant Biochem. Biotechnol.* **2008**, *17*, 149–153. [[CrossRef](#)]
120. Shen, H.J.; Chen, J.T.; Chung, H.H.; Chang, W.C. Plant regeneration via direct somatic embryogenesis from leaf explants of *Tolumnia* Louise Elmore 'Elsa'. *Bot. Stud.* **2018**, *59*, 4. [[CrossRef](#)]
121. Chung, H.H.; Chen, J.T.; Chang, W.C. Cytokinins induce direct somatic embryogenesis of *Dendrobium* Chiengmai Pink and subsequent plant regeneration. *In Vitro Cell. Dev. Biol. Plant* **2005**, *41*, 765–769. [[CrossRef](#)]
122. Chung, H.H.; Chen, J.T.; Chang, W.C. Plant regeneration through direct somatic embryogenesis from leaf explants of *Dendrobium*. *Biol. Plant.* **2007**, *51*, 346–350. [[CrossRef](#)]
123. Asghar, S.; Ahmad, T.; Hafiz, I.A.; Yaseen, M. In vitro propagation of orchid (*Dendrobium nobile*) var. Emma White. *Afr. J. Biotechnol.* **2011**, *10*, 3097–3103.
124. Parthibhan, S.; Rao, M.V.; Teixeira da Silva, J.A.; Kumar, T.S. Somatic embryogenesis from stem thin cell layers of *Dendrobium aqueum*. *Biol. Plant.* **2018**, *62*, 439–450. [[CrossRef](#)]
125. Islam, S.S.; Bhattacharjee, B. Plant regeneration through somatic embryogenesis from leaf and root explants of *Rhynchostylis retusa* (L.) Blume. *Appl. Biol. Res.* **2015**, *17*, 158–165. [[CrossRef](#)]
126. Wu, K.L.; Zeng, S.J.; Teixeira da Silva, J.A.; Chen, Z.L.; Zhang, J.X.; Yang, Y.S.; Duan, J. Efficient regeneration of *Renanthera* Tom Thumb 'Qilin' from leaf explants. *Sci. Hortic.* **2012**, *135*, 194–201. [[CrossRef](#)]
127. Hong, P.I.; Chen, J.T.; Chang, W.C. Plant regeneration via protocormlike body formation and shoot multiplication from seed-derived callus of a maudiae type slipper orchid. *Acta Physiol. Plant.* **2008**, *30*, 755–759. [[CrossRef](#)]
128. Long, B.; Niemiera, A.X.; Cheng, Z.Y.; Long, C.L. In vitro propagation of four threatened *Paphiopedilum* species (Orchidaceae). *Plant Cell Tissue Organ Cult.* **2010**, *101*, 151–162. [[CrossRef](#)]
129. Cheruvathur, M.K.; Abraham, J.; Mani, B.; Thomas, T.D. Adventitious shoot induction from cultured internodal explants of *Malaxis acuminata* D. Don, a valuable terrestrial medicinal orchid. *Plant Cell Tissue Organ Cult.* **2010**, *101*, 163–170. [[CrossRef](#)]
130. Mahendran, G.; Bai, V.N. Direct somatic embryogenesis of *Malaxis densiflora* (A. Rich.) Kuntze. *J. Genet. Eng. Biotechnol.* **2016**, *14*, 77–81. [[CrossRef](#)]
131. Moradi, S.; Daylami, S.D.; Arab, M.; Vahdati, K. Direct somatic embryogenesis in *Epipactis veratrifolia*, a temperate terrestrial orchid. *J. Hortic. Sci. Biotechnol.* **2017**, *92*, 88–97. [[CrossRef](#)]
132. Manokari, M.; Priyadharshini, S.; Shekhawat, M.S. Direct somatic embryogenesis using leaf explants and short term storage of synseeds in *Spathoglottis plicata* Blume. *Plant Cell Tissue Organ Cult.* **2021**, *145*, 321–331. [[CrossRef](#)]
133. Bhadra, S.K.; Hossain, M.M. In vitro germination and micropropagation of *Geodorum densiflorum* (Lam.) Schltr., an endangered orchid species. *Plant Tissue Cult.* **2003**, *13*, 165–171.
134. Sherif, N.A.; Benjamin, J.H.F.; Kumar, T.S.; Rao, M.V. Somatic embryogenesis, acclimatization and genetic homogeneity assessment of regenerated plantlets of *Anoetochilus elatus* Lindl., an endangered terrestrial jewel orchid. *Plant Cell Tissue Organ Cult.* **2018**, *132*, 303–316. [[CrossRef](#)]
135. Zeng, S.J.; Chen, Z.L.; Wu, K.L.; Bai, C.K.; Zhang, J.X.; Teixeira da Silva, J.A.; Duan, J. Asymbiotic seed germination, induction of calli and protocorm-like bodies, and in vitro seedling development of the rare and endangered *Nothodoritis zhejiangensis* Chinese orchid. *HortScience* **2011**, *46*, 460–465. [[CrossRef](#)]
136. Azadi, P.; Kermani, M.J.; Samiei, L. Somatic embryogenesis in *Rosa hybrida*. In *Step Wise Protocols for Somatic Embryogenesis of Important Woody Plants*; Jain, S., Gupta, P., Eds.; Springer: Cham, Switzerland, 2018; Volume II, pp. 161–170.
137. Pati, P.K.; Sharma, M.; Sood, A.; Ahuja, P.S. Direct shoot regeneration from leaf explants of *Rosa damascena* Mill. *Vitr. Cell Dev. Biol. Plant* **2004**, *40*, 192–195. [[CrossRef](#)]
138. Tanaka, K.; Kanno, Y.; Kudo, S.; Suzuki, M. Somatic embryogenesis and plant regeneration in chrysanthemum (*Dendranthema grandiflorum* (Ramat.) Kitamura). *Plant Cell Rep.* **2000**, *19*, 946–953. [[CrossRef](#)]
139. Teixeira da Silva, J.A.; Lema-Rumińska, J.; Tymoszyk, A.; Kulpa, D. Regeneration from chrysanthemum flowers: A review. *Acta Physiol. Plant.* **2015**, *37*, 67–77.
140. Khosravi, S.; Azghandi, A.V.; Hadad, R.; Mojtahedi, N. In vitro micropropagation of *Lilium longiflorum*. *J. Agric. Res. Seed Plant* **2007**, *23*, 159–168.
141. Bakhshaie, M.; Babalar, M.; Mirmasoumi, M.; Khalighi, A. Somatic embryogenesis and plant regeneration of *Lilium ledebourii* (Baker) Boiss., an endangered species. *Plant Cell Tissue Organ Cult.* **2010**, *102*, 229–235. [[CrossRef](#)]

142. Zhang, J.; Gai, M.; Li, X.; Li, T.; Sun, H. Somatic embryogenesis and direct as well as indirect organogenesis in *Lilium pumilum* DC. Fisch., an endangered ornamental and medicinal plant. *Biosci. Biotechnol. Biochem.* **2016**, *80*, 1898–1906. [\[CrossRef\]](#)
143. Fu, L.; Zhu, Y.; Li, M.; Wang, C.; Sun, H. Autopolyploid induction via somatic embryogenesis in *Lilium distichum* Nakai and *Lilium cernuum* Komar. *Plant Cell Tissue Organ Cult.* **2019**, *139*, 237–248. [\[CrossRef\]](#)
144. Priyadharshini, S.; Manokari, M.; Shekhawat, M.S. In vitro conservation strategies for the critically endangered Malabar river lily (*Crinum malabaricum* Lekhak & Yadav) using somatic embryogenesis and synthetic seed production. *S. Afr. J. Bot.* **2020**, *135*, 172–180.
145. Yan, R.; Sun, Y.; Sun, H. Current status and future perspectives of somatic embryogenesis in *Lilium*. *Plant Cell Tissue Organ Cult.* **2020**, *143*, 229–240. [\[CrossRef\]](#)
146. de Almeida, N.V.; Rivas, E.B.; Cardoso, J.C. Somatic embryogenesis from flower tepals of *Hippeastrum* aiming regeneration of virus-free plants. *Plant Sci.* **2022**, *317*, 111191. [\[CrossRef\]](#) [\[PubMed\]](#)
147. Gaber, M.K.; Barakat, A.A. Micropropagation and somatic embryogenesis induction of *Gardenia jasminoides* plants. *Alex. Sci. Exch. J.* **2019**, *40*, 190–202. [\[CrossRef\]](#)
148. Yumbra-Orbes, M.; da Cruz, A.C.F.; Pinheiro, M.V.M.; Rocha, D.I.; Batista, D.S.; Koehler, A.D.; Barbosa, J.G.; Otoni, W.C. Somatic embryogenesis and de novo shoot organogenesis can be alternatively induced by reactivating pericycle cells in *Lisianthus* (*Eustoma grandiflorum* (Raf.) Shinn.) root explants. *Vitr. Cell Dev. Biol. Plant* **2017**, *53*, 209–218. [\[CrossRef\]](#)
149. Yumbra-Orbes, M.; Rocha, D.I.; de Matos, E.M.; Koehler, A.D.; Pinheiro, M.V.M.; Batista, D.S.; Freitas, D.M.S.; da Cruz, A.C.; Barbosa, J.G.; Viccini, L.F.; et al. Somatic embryogenesis induced from vascular tissues in leaf explants of *Lisianthus* (*Eustoma grandiflorum* (Raf.) Shinn) generates true-to-type diploid plants. *Vegetos* **2020**, *33*, 135–144. [\[CrossRef\]](#)
150. Nhut, D.T.; Tuan, N.S.; Ngoc, H.M.; Uyen, P.N.; Don, N.T.; Mai, N.T.; Teixeira da Silva, J.A. Somatic embryogenesis induction from in vitro leaf cultures of *Lisianthus* (*Eustoma grandiflorum* (Raf.) Shinn.). *Propag. Orn. Plants* **2006**, *6*, 121–127.
151. Ruffoni, B.; Bassolino, L. Somatic embryogenesis in *Lisianthus* (*Eustoma russellianum* Griseb.). In *In Vitro Embryogenesis in Higher Plants, Methods in Molecular Biology Series*; Maria, A.G., Maurizio, L., Eds.; Humana Press: Totowa, NJ, USA, 2016; Volume 1359; Chapter 17; pp. 359–370.
152. Iantcheva, A. Somatic embryogenesis and genetic transformation of carnation (*Dianthus caryophyllus* L.). In *Somatic Embryogenesis in Ornamentals and Its Applications*; Mujib, A., Ed.; Springer: New Delhi, India, 2016; Chapter 7, pp. 107–120.
153. Vieitez, A.M.; Barciela, J. Somatic embryogenesis and plant regeneration from embryonic tissues of *Camellia japonica* L. *Plant Cell Tissue Organ Cult.* **1990**, *21*, 267–274. [\[CrossRef\]](#)
154. Ponsamuel, J.; Samson, N.P.; Ganeshan, P.S.; Sathyaprakash, V.; Abraham, G.C. Somatic embryogenesis and plant regeneration from the immature cotyledonary tissues of cultivated tea (*Camellia sinensis* (L.) O. Kuntze). *Plant Cell Rep.* **1996**, *16*, 210–214. [\[CrossRef\]](#)
155. Lü, J.; Chen, R.; Zhang, M.; Teixeira da Silva, J.A.; Ma, G. Plant regeneration via somatic embryogenesis and shoot organogenesis from immature cotyledons of *Camellia nitidissima*. *J. Plant Physiol.* **2013**, *170*, 1202–1211. [\[CrossRef\]](#)
156. San José, M.C.; Couselo, J.L.; Martínez, M.T.; Mansilla, P.; Corredoira, E. Somatic embryogenesis in *Camellia japonica* L.: Challenges and future prospects. In *Somatic Embryogenesis in Ornamentals and Its Applications*; Mujib, A., Ed.; Springer: New Delhi, India, 2016; Chapter 6, pp. 91–105.
157. Gladfelter, H.J.; Johnston, J.; Wilde, H.D.; Markle, S.A. Somatic embryogenesis and cryopreservation of *Stewartia* species. *Plant Cell Tissue Organ Cult.* **2021**, *144*, 211–221. [\[CrossRef\]](#)
158. Sivanesan, I.; Jeong, B.R. Optimizing factors affecting somatic embryogenesis in *Cineraria*. In *Somatic Embryogenesis in Ornamentals and Its Applications*; Mujib, A., Ed.; Springer: New Delhi, India, 2016; Chapter 4, pp. 55–65.
159. Choffe, K.L.; Victor, J.M.; Muruch, S.J.; Saxena, P.K. In vitro regeneration of *Echinacea purpurea* L.: Direct somatic embryogenesis and indirect shoot organogenesis in petiole culture. *Vitr. Cell Dev. Biol. Plant* **2000**, *36*, 30–36. [\[CrossRef\]](#)
160. Dehestani-Ardakani, M.; Hejazi, M.; Aliabad, K.K. Indirect somatic embryogenesis of purple coneflower (*Echinacea purpurea* (L.) Moench): A medicinal-ornamental plant: Evaluation of antioxidant enzymes activity and histological study. *Mol. Biol. Rep.* **2020**, *47*, 6621–6633. [\[CrossRef\]](#) [\[PubMed\]](#)
161. Sivanesan, I.; Son, M.S.; Jana, S.; Jeong, B.R. Secondary somatic embryogenesis in *Crocus vernus* (L.) Hill. *Propag. Orn. Plants* **2012**, *12*, 163–170.
162. Mitrofanova, I.; Ivanova, N.; Kuzmina, T.; Mitrofanova, O.; Zubkova, N. In vitro regeneration of clematis plants in the Nikita Botanical Garden via somatic embryogenesis and organogenesis. *Front. Plant Sci.* **2021**, *12*, 541171. [\[CrossRef\]](#)
163. Verma, S.K.; Das, A.K.; Cingoz, G.S.; Uslu, E.; Gurel, E. Influence of nutrient media on callus induction, somatic embryogenesis and plant regeneration in selected Turkish crocus species. *Biotechnol. Rep.* **2016**, *10*, 66–74. [\[CrossRef\]](#) [\[PubMed\]](#)
164. Sevindik, B.; Mendi, Y.Y. Somatic embryogenesis in *Crocus sativus* L. In *In Vitro Embryogenesis in Higher Plants, Methods in Molecular Biology Series*; Germana, M.A., Lambardi, K., Eds.; Humana Press: Totowa, NJ, USA, 2016; Chapter 16, pp. 351–357.
165. Mandegaran, Z.; Sieber, V.K. Somatic embryogenesis in *Clematis integrifolia* × *C. viticella*. *Plant Cell Tissue Organ Cult.* **2000**, *62*, 163–165. [\[CrossRef\]](#)
166. Mitrofanova, I.V.; Galaev, A.V.; Sivolap, Y.M. Investigation of molecular-genetic heterogeneity of clematis plants (*Clematis* L.) obtained by organogenesis and somatic embryogenesis in vitro. *Tsitol. Genet.* **2003**, *37*, 12–26.
167. Hosoi, Y.; Maruyama, T.E. Somatic embryogenesis in Sawara cypress (*Chamaecyparis pisifera* Sieb. et Zucc.). In *Somatic Embryogenesis in Ornamentals and Its Applications*; Mujib, A., Ed.; Springer: New Delhi, India, 2016; Chapter 6, pp. 41–53.

168. Tagipur, M.E.; Seker, G.; Teixeira da Silva, J.A.; Mendi, Y.Y. Somatic embryogenesis, cryopreservation, and in vitro mutagenesis in Cyclamen. In *Somatic Embryogenesis in Ornamentals and Its Applications*; Mujib, A., Ed.; Springer: New Delhi, India, 2016; Chapter 10, pp. 155–167.
169. Sivanesan, I.; Lim, M.Y.; Jeong, B.R. Somatic embryogenesis and plant regeneration from leaf and petiole explants of *Campanula punctata* Lam. var. *rubriflora* Makino. *Plant Cell Tissue Organ Cult.* **2011**, *107*, 365–369. [\[CrossRef\]](#)
170. Pipino, L.; Braglia, L.; Giovannini, A.; Fascella, G.; Mercuri, A. In vitro regeneration of *Passiflora* species with ornamental value. *Propag. Ornam. Plants* **2008**, *8*, 47–49.
171. Correa, C.M.; de Oliveira, G.N.; Astariata, L.V.; Santarem, E.R. Plant regeneration through somatic embryogenesis of yacon [*Smallanthus sonchifolius* (Poepp. and Endl.) H. Robinson]. *Braz. Arch. Biol. Technol.* **2009**, *52*, 549–554. [\[CrossRef\]](#)
172. Salma, U.; Kundu, S.; Ali, M.N.; Mandal, N. Somatic embryogenesis-mediated plant regeneration of *Eclipta alba* (L.) Hassk. and its conservation through synthetic seed technology. *Acta Physiol. Plant.* **2019**, *41*, 103. [\[CrossRef\]](#)
173. Podwyszyńska, M.; Marasek-Ciolakowska, A. Micropropagation of tulip via somatic embryogenesis. *Agronomy* **2020**, *10*, 1857. [\[CrossRef\]](#)
174. Mujib, A.; Ali, M.; Isah, T.; Dipti, T. Somatic embryo mediated mass production of *Catharanthus roseus* in culture vessel (bioreactor)—A comparative study. *Saudi J. Biol. Sci.* **2014**, *21*, 442–449. [\[CrossRef\]](#)
175. Jana, S.; Sivanesan, I.; Lim, M.Y.; Jeong, B.R. In vitro zygotic embryo germination and somatic embryogenesis through cotyledonary explants of *Paeonia lactiflora* Pall. *Kor. Soc. Floricult. Sci.* **2013**, *21*, 17–22. [\[CrossRef\]](#)
176. Du, Y.; Cheng, F.; Zhong, Y. Induction of direct somatic embryogenesis and shoot organogenesis and histological study in tree peony (*Paeonia* sect. *Moutan*). *Plant Cell Tissue Organ Cult.* **2020**, *141*, 557–570. [\[CrossRef\]](#)
177. Kuehnle, A.R.; Chen, F.C.; Sugii, N. Somatic embryogenesis and plant regeneration in *Anthurium andraeanum* hybrids. *Plant Cell Rep.* **1992**, *11*, 438–442. [\[CrossRef\]](#)
178. Pinheiro, M.V.M.; Martins, F.B.; da Cruz, A.C.F.; de Carvalho, A.C.P.P.; Ventrella, M.C.; Otoni, W.C. Somatic embryogenesis in anthurium (*Anthurium andraeanum* cv. Eidibel) as affected by different explants. *Acta Sci. Agron.* **2014**, *36*, 87–98. [\[CrossRef\]](#)
179. Teixeira da Silva, J.A.; Dobránszki, J.; Winarto, B.; Zeng, S. *Anthurium* in vitro: A review. *Sci. Hortic.* **2015**, *186*, 266–298. [\[CrossRef\]](#)
180. Bhattacharya, C.; Dam, A.; Karmakar, J.; Bandyopadhyay, T.K. Direct somatic embryogenesis and genetic homogeneity assessment of regenerated plants of *Anthurium andraeanum* Linden cv. Fantasia. *Vitr. Cell Dev. Biol. Plant* **2016**, *52*, 512–519. [\[CrossRef\]](#)
181. Wang, G.; Xu, C.; Yan, S.; Xu, B. An efficient somatic embryo liquid culture system for potential use in large-scale and synchronic production of *Anthurium andraeanum* seedlings. *Front. Plant Sci.* **2019**, *10*, 29. [\[CrossRef\]](#)
182. Fiuk, A.; Rybczyński, J.J. Morphogenic capability of *Gentiana kurroo* Royle seedling and leaf explants. *Acta Physiol. Plant.* **2008**, *30*, 157–166. [\[CrossRef\]](#)
183. Fiuk, A.; Rybczyński, J.J. The effect of several factors on somatic embryogenesis and plant regeneration in protoplast cultures of *Gentiana kurroo* (Royle). *Plant Cell Tissue Organ Cult.* **2007**, *91*, 263–271. [\[CrossRef\]](#)
184. Wu, H.J.; Wang, X.X.; Li, Y.; Zhang, D.G.; Zhang, B.W.; Xin, Y. Propagation of *Gentiana macrophylla* (Pall) from hairy root explants via indirect somatic embryogenesis and gentiopicroside content in obtained plants. *Acta Physiol. Plant.* **2011**, *33*, 2229–2237. [\[CrossRef\]](#)
185. Vinterhalter, B.; Mitić, N.; Vinterhalter, D.; Uzelac, B.; Krstić-Milošević, D. Somatic embryogenesis and in vitro shoot propagation of *Gentiana utriculosa*. *Biologia* **2016**, *71*, 139–148. [\[CrossRef\]](#)
186. da Silva, V.; Eeswara, J.P. Induction of somatic embryogenesis from leaf explants of *Exacum trinervium* (L.) Druce (Binara). *J. Natl. Sci. Found. Sri Lanka* **2022**, *50*, 27–33. [\[CrossRef\]](#)
187. Mahendran, D.; Kavi Kishor, P.B.; Geetha, N.; Venkatachalam, P. Phycomolecule-coated silver nanoparticles and seaweed extracts induced high-frequency somatic embryogenesis and plant regeneration from *Gloriosa superba* L. *J. Appl. Phycol.* **2018**, *30*, 1425–1436. [\[CrossRef\]](#)
188. Balamurugan, V.; Amal, T.C.; Karthika, P.; Selvakumar, S.; Vasanth, K. Somatic embryogenesis and plant regeneration in *Gloriosa superba* L.: An endangered medicinal plant. In *In Vitro Plant Breeding Towards Novel Agronomic Traits*; Kumar, M., Muthusamy, A., Kumar, V., Bhalla-Sarin, N., Eds.; Springer: Singapore, 2019; Chapter 2, pp. 27–42.
189. Ren, Z.; Lv, X.; Zhang, D.; Xia, Y. Efficient somatic embryogenesis and bulblet regeneration of the endangered bulbous flower *Griffinia liboniana*. *Plant Cell Tissue Organ Cult.* **2018**, *135*, 523–533. [\[CrossRef\]](#)
190. Vejsadová, H.; Matiska, P.; Obert, B.; Ůrgeová, E.; Pret'ová, A. Somatic embryogenesis in *Phlox paniculata*—Histological analysis. *Biologia* **2016**, *71*, 763–768. [\[CrossRef\]](#)
191. Simonović, A.D.; Trifunović-Momčilov, M.; Filipović, B.K.; Marković, M.P.; Bogdanović, M.D.; Subotić, A.R. Somatic embryogenesis in *Centaureum erythraea* Rafn—Current status and perspectives: A review. *Plants* **2021**, *10*, 70. [\[CrossRef\]](#)
192. Kumar, V.; Moyo, M.; Van Staden, J. Enhancing plant regeneration of *Lachenalia viridiflora*, a critically endangered ornamental geophyte with high floricultural potential. *Sci. Hortic.* **2016**, *211*, 263–268. [\[CrossRef\]](#)
193. von Aderkas, P.; Label, P.; Lelu, M.A. Charcoal affects early development and hormonal concentrations of somatic embryos of hybrid larch. *Tree Physiol.* **2002**, *22*, 431–434. [\[CrossRef\]](#) [\[PubMed\]](#)
194. Nunes, S.; Marum, L.; Farinha, N.; Pereira, V.T.; Almeida, T.; Sousa, D.; Mano, N.; Figueiredo, J.; Dias, M.C.; Santos, C. Somatic embryogenesis of hybrid *Pinus elliottii* var. *elliottii* × *P. caribaea* var. *hondurensis* and ploidy assessment of somatic plants. *Plant Cell Tissue Organ Cult.* **2018**, *132*, 71–84. [\[CrossRef\]](#)

195. Abrahamsson, M.; Clapham, D.; Arnold, S. Somatic embryogenesis in *Scots pine* (L.). In *Step Wise Protocols for Somatic Embryogenesis of Important Woody Plants, Forestry Sciences*; Jain, S.M., Gupta, P., Eds.; Springer: Cham, Switzerland, 2018; Volume 84, pp. 123–133.
196. Aalifar, M.; Arab, M.; Aliniaefard, S.; Dianati, S.; Mehrjerdi, M.Z.; Limpens, E.; Serek, M. Embryogenesis efficiency and genetic stability of *Dianthus caryophyllus* embryos in response to different light spectra and plant growth regulators. *Plant Cell Tissue Organ Cult.* **2019**, *139*, 479–492. [[CrossRef](#)]
197. Maruyama, T.E.; Hosoi, Y. Progress in somatic embryogenesis of Japanese pines. *Front. Plant Sci.* **2019**, *10*, 31. [[CrossRef](#)] [[PubMed](#)]
198. Rodríguez-Garay, B.; Gutiérrez-Mora, A.; Acosta-Dueñas, B. Somatic embryogenesis of *Agave victoria-reginae* Moore. *Plant Cell Tissue Organ Cult.* **1996**, *46*, 85–87. [[CrossRef](#)]
199. Tejavathi, D.H.; Rajanna, M.D.; Sowmya, R.; Gayathamma, K. Induction of somatic embryos from cultures of *Agave vera-cruz* Mill. *Vitr. Cell Dev. Biol. Plant* **2007**, *43*, 423–428. [[CrossRef](#)]
200. Portillo, L.; Santacruz-Ruvalcaba, F.; Gutiérrez-Mora, A.; Rodríguez-Garay, B. Somatic embryogenesis in *Agave tequilana* Weber cultivar azul. *Vitr. Cell Dev. Biol. Plant* **2007**, *43*, 569–575. [[CrossRef](#)]
201. Reyes-Díaz, J.I.; Arzate-Fernández, A.M.; Pina-Escutia, J.L.; Vázquez-García, L.M. Media culture factors affecting somatic embryogenesis in *Agave angustifolia* Haw. *Ind. Crops Prod.* **2017**, *108*, 81–85. [[CrossRef](#)]
202. Kim, D.H.; Sivanesan, I. Somatic embryogenesis in *Hosta minor* (Baker) Nakai. *Propag. Ornament. Plants* **2017**, *19*, 24–29.
203. Morel, G.M. Producing virus-free cymbidiums. *Amer. Orchid Soc. Bull.* **1960**, *29*, 495–497.
204. Lee, Y.I.; Hsu, S.T.; Yeung, E.C. Orchid protocorm-like bodies are somatic embryos. *Am. J. Bot.* **2013**, *100*, 2121–2213. [[CrossRef](#)] [[PubMed](#)]
205. Cardoso, J.C.; Zanello, C.A.; Chen, J.T. An overview of orchid protocorm-like bodies: Mass propagation, biotechnology, molecular aspects, and breeding. *Int. J. Mol. Sci.* **2020**, *21*, 985. [[CrossRef](#)] [[PubMed](#)]
206. Chugh, S.; Guha, S.; Rao, I.U. Micropropagation of orchids: A review on the potential of different explants. *Sci. Hortic.* **2009**, *122*, 507–520. [[CrossRef](#)]
207. Yam, T.W.; Arditti, J. History of orchid propagation: A mirror of the history of biotechnology. *Plant Biotechnol. Rep.* **2009**, *3*, 1–56. [[CrossRef](#)]
208. Yeung, E.C. A perspective on orchid seed and protocorm development. *Bot. Stud.* **2017**, *58*, 33. [[CrossRef](#)] [[PubMed](#)]
209. Habiba, S.U.; Shimasaki, K.; Hasan, K.M.; Mehraj, H.; Alam, M.M.; Sharma, S.; Ahasan, M.M. Very low and high temperature act as stress factor on organogenesis in protocorm-like bodies (PLBs) of *Dendrobium kingianum*. *World Appl. Sci. J.* **2016**, *34*, 278–282.
210. Habiba, S.U.; Shimasaki, K.; Ahasan, M.M.; Alam, M.M. Effect of 6-benzylaminopurine (BA) and hyaluronic acid (HA) under white light emitting diode (LED) on organogenesis in protocorm-like bodies (PLBs) of *Dendrobium kingianum*. *Am. Eurasian J. Agric. Environ. Sci.* **2014**, *14*, 605–609.
211. Habiba, S.U.; Shimasaki, K.; Ahasan, M.M.; Kamal, M.M.; Alam, M.M. 5-aminolevulinic acid regulates growth and development of protocorm-like bodies (PLBs) in *Dendrobium kingianum* cultured in vitro. *Middle East J. Sci. Res.* **2014**, *22*, 279–283.
212. Habiba, S.U.; Shimasaki, K.; Ahasan, M.M.; Uddin, A.F.M.J. Effect of two bio polysaccharides on organogenesis of PLBs in *Dendrobium kingianum* cultured in vitro. *Acta Hortic.* **2017**, *1167*, 127–132. [[CrossRef](#)]
213. Habiba, S.U.; Shimasaki, K.; Ahasan, M.M.; Uddin, A.F.M.J. Effect of ethylene precursor 1-aminocyclopropane-1-carboxylic acid and ethylene inhibitor, silver thiosulfate on organogenesis of PLBs in *Dendrobium kingianum* cultured in vitro. *Acta Hortic.* **2017**, *1167*, 133–138. [[CrossRef](#)]
214. Habiba, S.U.; Shimasaki, K.; Ahasan, M.M. Effects of ethrel on organogenesis of protocorm-like bodies in *Dendrobium kingianum* in vitro. *Plant Tissue Cult. Biotech.* **2018**, *28*, 141–146. [[CrossRef](#)]
215. Sultana, K.S.; Hasan, K.M.; Hasan, K.M.; Sultana, S.; Mehraj, H.; Ahasan, M.; Shimasaki, K.; Habiba, S.U. Effect of two elicitors on organogenesis in protocorm-like-bodies (PLBs) of *Phalaenopsis* 'Fmk02010' cultured in vitro. *World Appl. Sci. J.* **2015**, *33*, 1528–1532.
216. Sultana, K.S.; Hasan, K.M.; Hasan, K.M.; Sultana, S.; Mehraj, H.; Ahasan, M.; Shimasaki, K.; Habiba, S.U. Effect of hyaluronic acid (HA) on organogenesis in protocorm-like bodies (PLBs) of *Phalaenopsis* 'Fmk02010' cultured in vitro. *Am. Eurasian J. Agric. Environ. Sci.* **2015**, *15*, 1721–1724.
217. Mehraj, H.; Shimasaki, K. In vitro PLBs organogenesis of *Phalaenopsis* using different concentrations of HA9 and HA12 combination. *J. Biosci. Agric. Res.* **2017**, *12*, 1036–1040. [[CrossRef](#)]
218. Hannig, E. Zur physiologie pflanzlicher embryonen. I. Ueber die cultur von cruciferen-embryonen ausserhalb des embryosacks. *Bot. Ztg.* **1904**, *62*, 45–80.
219. Dieterich, K. Ueber kultur von Eembryonen ausserhalb des samens. *Flora* **1924**, *117*, 379–417.
220. Laibach, F. Das taubwerden von bastardsamen und die kunstliche Aufzucht fruh absterbender bastardembryonen. *Z. Bot.* **1925**, *17*, 417–459.
221. Raghavan, V. One hundred years of zygotic embryo culture investigations. *Vitr. Cell Dev. Biol. Plant* **2003**, *39*, 437–442. [[CrossRef](#)]
222. Marasek-Ciolakowska, A.; Nishikawa, T.; Shea, D.J.; Okazaki, K. Breeding of lilies and tulips-Interspecific hybridization and genetic background. *Breed. Sci.* **2018**, *68*, 35–52. [[CrossRef](#)]
223. Sharma, D.R.; Kaur, R.; Kumar, K. Embryo rescue in plants: A review. *Euphytica* **1996**, *89*, 325–337. [[CrossRef](#)]

224. Cheng, X.; Chen, S.M.; Chen, F.D.; Fang, W.M.; Deng, Y.M.; She, L.F. Interspecific hybrids between *Dendranthema morifolium* (Ramat.) Kitamura and *D. nankingense* (Nakai) Tzvel. achieved using ovary rescue and their cold tolerance characteristics. *Euphytica* **2010**, *172*, 101–108. [\[CrossRef\]](#)
225. Deng, Y.; Teng, N.; Chen, S.; Guan, Z.; Song, A.; Chang, Q. Reproductive barriers in the intergeneric hybridization between *Chrysanthemum grandiflorum* (Ramat.) Kitam. and *Ajania przewalskii* Poljak. (Asteraceae). *Euphytica* **2010**, *174*, 41–50. [\[CrossRef\]](#)
226. Sahijram, L.; Rao, B.M. Hybrid embryo rescue in crop improvement. In *Plant Biology and Biotechnology*; Bahadur, B., Venkat Rajam, M., Sahijram, L., Krishnamurthy, K., Eds.; Springer: New Delhi, India, 2015; Chapter 18, pp. 363–384.
227. Zulkarnain, Z.; Tapingkae, T.; Taji, A. Applications of in vitro techniques in plant breeding. In *Advances in Plant Breeding Strategies: Breeding, Biotechnology and Molecular Tools*; Al-Khayri, J.M., Jain, S.M., Johnson, D.V., Eds.; Springer: Cham, Switzerland, 2015; Chapter 10, pp. 293–328.
228. Pramanik, K.; Sahoo, J.P.; Mohapatra, P.P.; Acharya, L.K.; Jena, C. Insights into the embryo rescue—A modern in-vitro crop improvement approach in horticulture. *Plant Cell Biotechnol. Mol. Biol.* **2021**, *22*, 20–33.
229. Caser, M.; Dente, F.; Ghione, G.G.; Mansuino, A.; Giovannini, A.; Scariot, V. Shortening of selection time of *Rosa hybrida* by in vitro culture of isolated embryos and immature seeds. *Propag. Ornament. Plants* **2014**, *14*, 139–144.
230. Yuan, M.S.; Wu, M.C.; Shii, C.T. Shortening breeding cycles of spider lilies (*Lycoris* spp.) through embryo culture and dikaryotype hybridization between *Lycoris aurea* and “a” karyotype species. *Acta Hortic.* **2003**, *620*, 345–352. [\[CrossRef\]](#)
231. Deng, Y.; Chen, S.; Chen, F.; Cheng, X.; Zhang, F. The embryo rescue derived intergeneric hybrid between chrysanthemum and *Ajania przewalskii* shows enhanced cold tolerance. *Plant Cell Rep.* **2011**, *30*, 2177–2186. [\[CrossRef\]](#) [\[PubMed\]](#)
232. Cheng, X.; Chen, S.; Chen, F.; Deng, Y.; Fang, W.; Tang, F.; Liu, Z.; Shao, W. Creating novel chrysanthemum germplasm via interspecific hybridization and backcrossing. *Euphytica* **2011**, *177*, 45–53. [\[CrossRef\]](#)
233. Sun, C.Q.; Chen, F.D.; Teng, N.J.; Liu, Z.L.; Fang, W.M.; Hou, X.L. Factors affecting seed set in the crosses between *Dendranthema grandiflorum* (Ramat.) Kitamura and its wild species. *Euphytica* **2009**, *171*, 181–192. [\[CrossRef\]](#)
234. Sun, C.Q.; Chen, F.D.; Teng, N.J.; Liu, Z.L.; Fang, W.M.; Hou, X.L. Interspecific hybrids between *Chrysanthemum grandiflorum* (Ramat.) Kitamura and *C. indicum* (L.) Des Moul. and their drought tolerance evaluation. *Euphytica* **2010**, *174*, 51–60. [\[CrossRef\]](#)
235. Zhu, W.Y.; Jiang, J.F.; Chen, S.M.; Wang, L.; Xu, L.L.; Wang, H.B.; Li, P.L.; Guan, Z.Y.; Chen, F.D. Intergeneric hybrid between *Chrysanthemum* × *morifolium* and *Artemisia japonica* achieved via embryo rescue shows salt tolerance. *Euphytica* **2013**, *191*, 109–119. [\[CrossRef\]](#)
236. Deng, Y.M.; Chen, S.M.; Lu, A.M.; Chen, F.D.; Tang, F.P.; Guan, Z.Y.; Teng, N.J. Production and characterisation of the intergeneric hybrids between *Dendranthema morifolium* and *Artemisia vulgaris* exhibiting enhanced resistance to chrysanthemum aphid (*Macrosiphoniella sanbourni*). *Planta* **2010**, *231*, 693–703. [\[CrossRef\]](#)
237. Tang, F.; Chen, F.; Chen, S.; Teng, N.; Fang, W. Intergeneric hybridization and relationship of genera within the tribe Anthemideae Cass. (I. *Dendranthema crissum* (kitam.) kitam. × *Crossostephium chinense* (L.) Makino). *Euphytica* **2009**, *169*, 133–140. [\[CrossRef\]](#)
238. Röper, A.C.; Lütken, H.; Hegelund, J.N.; Petersen, K.K.; Christensen, B.; Müller, R. Effect of different ovule isolation times on the embryo development of *Campanula* hybrids. *Acta Hortic.* **2012**, *953*, 161–166. [\[CrossRef\]](#)
239. Holeman, D.J. *Simple Embryo Culture for Plant Breeders: A Manual of Technique for the Extraction and In-Vitro Germination of Mature Plant Embryos with Emphasis on the Rose*, 1st ed.; Rose Hybridizers Association: Hartford, CT, USA, 2009; pp. 1–34.
240. Shen, X.; Gmitter, F.G.; Grosser, J.W. Immature embryo rescue and culture. In *Plant Embryo Culture, Methods in Molecular Biology Series*; Thorpe, T., Yeung, E., Eds.; Humana Press: Totowa, NJ, USA, 2011; Volume 710, Chapter 7, pp. 75–92.
241. Abdolmohammadi, M.; Kermani, M.J.; Zakizadeh, H.; Hamidoghli, Y. In vitro embryo germination and interploidy hybridization of rose (*Rosa* sp). *Euphytica* **2014**, *198*, 255–264. [\[CrossRef\]](#)
242. Puangkrit, T.; Nontaswatsri, C. Intersubgeneric hybridization between *Paracurcuma* and *Eucurcuma* via embryo rescue. *Acta Hortic.* **2014**, *1025*, 37–42. [\[CrossRef\]](#)
243. Wang, Q.; Zhang, Y.; Kawabata, S.; Li, Y. Double fertilization and embryogenesis of *Eustoma grandiflorum*. *J. Jap. Soc. Hortic. Sci.* **2011**, *80*, 351–357. [\[CrossRef\]](#)
244. Marasek-Ciolakowska, A.; Sochacki, D.; Marciniak, P. Breeding aspects of selected ornamental bulbous crops. *Agronomy* **2021**, *11*, 1709. [\[CrossRef\]](#)
245. Li, Z.; Pinkham, L.; Campbell, N.F.; Espinosa, A.C.; Conev, R. Development of triploid daylily (*Heemerocallis*) germplasm by embryo rescue. *Euphytica* **2009**, *169*, 313–318. [\[CrossRef\]](#)
246. Yao, J.L.; Cohen, D. Production of triploid *Zantedeschia* hybrids using embryo rescue. *N. Z. J. Crop Hortic. Sci.* **1996**, *24*, 297–301. [\[CrossRef\]](#)
247. Burchi, G.; Mercuri, A.; Bianchini, C.; Bregliano, R.; Schiva, T. New interspecific hybrids of *Alstroemeria* obtained through in vitro embryo-rescue. *Acta Hortic.* **2000**, *508*, 233–236. [\[CrossRef\]](#)
248. Bridgen, M.; Kollman, E.; Lu, C. Interspecific hybridization of *Alstroemeria* for the development of new, ornamentals. *Acta Hortic.* **2009**, *836*, 73–78. [\[CrossRef\]](#)
249. Lim, S.S.; Lee, S.I.; Kang, S.C.; Kim, J.B. *Alstroemeria* plants and its biotechnological applications. *J. Plant Biotechnol.* **2012**, *39*, 219–224. [\[CrossRef\]](#)
250. Aros, D.; Suazo, M.; Rivas, C.; Zapata, P.; Úbeda, C.; Bridgen, M. Molecular and morphological characterization of new interspecific hybrids of *alstroemeria* originated from *A. caryophylleae* scented lines. *Euphytica* **2019**, *215*, 93. [\[CrossRef\]](#)

251. Kato, J.; Mii, M. Production of interspecific hybrid plants in *Primula*. In *Plant Cell Culture Protocols, Methods in Molecular Biology Series*; Loyola-Vargas, V.M., Vázquez-Flota, F., Eds.; Humana Press: Totowa, NJ, USA, 2006; Volume 318, Chapter 21, pp. 253–262.
252. Amano, J.; Kato, J.; Nakano, M.; Mii, M. Production of inter-section hybrids between *Primula filchnerae* and *P. sinensis* through ovule culture. *Sci. Hortic.* **2006**, *110*, 223–227. [\[CrossRef\]](#)
253. Benega-Garcia, R.; Cisneros, A.; Schneider, B.; Tel-Zur, N. Gynogenesis in the vine cacti *Hylocereus* and *Selenicereus* (Cactaceae). *Plant Cell Rep.* **2009**, *28*, 719–726. [\[CrossRef\]](#)
254. Cisneros, A.; Tel-Zur, N. Embryo rescue and plant regeneration following interspecific crosses in the genus *Hylocereus* (Cactaceae). *Euphytica* **2010**, *174*, 73–82. [\[CrossRef\]](#)
255. Cisneros, A.; Garcia, R.B.; Tel-Zur, N. Creation of novel interspecific-interploid *Hylocereus* hybrids (Cactaceae) via embryo rescue. *Euphytica* **2013**, *189*, 433–443. [\[CrossRef\]](#)
256. Nishihara, M.; Tasaki, K.; Sasaki, N.; Takahashi, H. Development of basic technologies for improvement of breeding and cultivation of Japanese gentian. *Breed. Sci.* **2018**, *68*, 14–24. [\[CrossRef\]](#)
257. Takamura, Y.; Asano, C.; Hikage, T.; Hatakeyama, K.; Takahata, Y. Production of interspecific hybrids between Japanese gentians and wild species of *Gentiana*. *Breed. Sci.* **2019**, *69*, 680–687. [\[CrossRef\]](#)
258. Takamura, Y.; Takahashi, R.; Hikage, T.; Hatakeyama, K.; Takahata, Y. Production of haploids and doubled haploids from unfertilized ovule culture of various wild species of gentians (*Gentiana* spp.). *Plant Cell Tissue Organ Cult.* **2021**, *146*, 505–514. [\[CrossRef\]](#)
259. Nishimoto, S.I.; Shimizu, K.; Hashimoto, F.; Sakata, Y. Interspecific hybrids of *Camellia chrysantha* × *C. japonica* by ovule culture. *J. Jpn. Soc. Hortic. Sci.* **2003**, *72*, 236–242. [\[CrossRef\]](#)
260. Chen, Y.M.; Mii, M. Inter-sectional hybrids obtained from reciprocal crosses between *Begonia semperflorens* (section *Begonia*) and *B. 'Orange Rubra'* (section *Gaerdita* × section *Pritzelia*). *Breed. Sci.* **2012**, *62*, 113–123. [\[CrossRef\]](#) [\[PubMed\]](#)
261. Morgan, E.; Burge, G.; Seelye, J.; Hopping, M.E.; Grant, J.E.; Warren, A.G.F.; Brundell, D. Wide crosses in the Colchicaceae: *Sandersonia aurantiaca* (Hook.) × *Littonia modesta* (Hook.). *Euphytica* **2001**, *121*, 343–348. [\[CrossRef\]](#)
262. Sato, S.; Katoh, N.; Yoshida, H.; Iwai, S.; Hagimori, M. Production of doubled haploid plants of carnation (*Dianthus caryophyllus* L.) by pseudo fertilized ovule culture. *Sci. Hortic.* **2000**, *83*, 301–310. [\[CrossRef\]](#)
263. Nimura, M.; Kato, J.; Mii, M.; Morioka, M. Unilateral compatibility and genotypic difference in crossability in interspecific hybridization between *Dianthus caryophyllus* L. and *Dianthus japonicus* Thunb. *Theor. Appl. Genet.* **2003**, *106*, 1164–1170. [\[CrossRef\]](#)
264. Kishi, F.; Kagami, Y.; Shinohara, M.; Hatano, S.; Tsurushima, H. Production of interspecific hybrid in *Gypsophila* by ovule-embryo culture. *Euphytica* **1994**, *74*, 85–90. [\[CrossRef\]](#)
265. Eeckhaut, T.; De Keyser, E.; Van Huylenbroeck, J.; de Riek, J.; van Bockstaele, E. Application of embryo rescue after interspecific crosses in the genus *Rhododendron*. *Plant Cell Tiss. Org. Cult.* **2007**, *89*, 29–35. [\[CrossRef\]](#)
266. Ishizaka, H. Interspecific hybridization by embryo rescue in the genus *Cyclamen*. *Plant Biotechnol.* **2008**, *25*, 511–519. [\[CrossRef\]](#)
267. Nomura, Y.; Maeda, M.; Tsuchiya, T.; Makara, K. Efficient production of interspecific hybrids between *Allium chinense* and edible *Allium* spp. through ovary culture and pollen storage. *Breed. Sci.* **1994**, *44*, 151–155. [\[CrossRef\]](#)
268. Dubouzet, J.G.; Arisumi, K.I.; Takeomi, E.; Maeda, M.; Sakata, Y. Studies on the development of new ornamental *Allium* through interspecific hybridization III. Hybridization of autumn-flowering species through pull-style pollination, cutflower culture and embryo rescue. *Mem. Fac. Agric. Kagoshima Univ.* **1994**, *30*, 35–42.
269. Wilcock, C.; Neiland, R. Pollination failure in plants: Why it happens and when it matters. *Trends Plant Sci.* **2002**, *7*, 270–277. [\[CrossRef\]](#) [\[PubMed\]](#)
270. Kinoshita, T. Reproductive barrier and genomic imprinting in the endosperm of flowering plants. *Genes Genet. Syst.* **2007**, *82*, 177–186. [\[CrossRef\]](#) [\[PubMed\]](#)
271. Murthy, K.S.R.; Kondamudi, R.; Rao, P.V.C.; Pullaiah, T. In vitro flowering—A review. *J. Agric. Technol.* **2012**, *8*, 1517–1536.
272. Yamashita, Y.; Terada, R.; Nishibayashi, S.; Shimamoto, K. Asymmetric somatic hybrids of *Brassica*: Partial transfer of *B. campestris* genome into *B. oleracea* by cell fusion. *Theor. Appl. Genet.* **1989**, *77*, 189–194. [\[CrossRef\]](#)
273. Trick, H.; Zelcer, A.; Bates, G.W. Chromosome elimination in asymmetric somatic hybrids: Effect of gamma dose and time in culture. *Theor. Appl. Genet.* **1994**, *88*, 965–972. [\[CrossRef\]](#) [\[PubMed\]](#)
274. Anthony, P.; Marchant, R.; Blackhall, N.W.; Power, J.B.; Davey, M.R. Chemical fusion of protoplasts. In *Plant Tissue Culture Manual*; Lindsey, K., Ed.; Springer: Berlin, Germany, 1995; Chapter 1, pp. 1–15.
275. Smith, H.H.; Kao, K.N.; Combatti, N.C. Interspecific hybridization by protoplast fusion in *Nicotiana*. Confirmation and extension. *J. Hered.* **1976**, *67*, 123–128. [\[CrossRef\]](#)
276. Dudits, D.; Fejer, O.; Hadlaczk, G.; Koncz, C.; Lazar, G.B.; Horvath, G. Intergeneric gene transfer mediated by protoplast fusion. *Mol. Gen. Genet.* **1980**, *179*, 283–288. [\[CrossRef\]](#)
277. Wang, J.; Jiang, J.; Wang, Y. Protoplast fusion for crop improvement and breeding in China. *Plant Cell Tissue Organ Cult.* **2013**, *112*, 131–142. [\[CrossRef\]](#)
278. Ranghoo-Sanmukhiya, V.M. Somaclonal variation and methods used for its detection. In *Propagation and Genetic Manipulation of Plants*; Siddique, I., Ed.; Springer: Singapore, 2021; Chapter 1, pp. 1–18.
279. Kanchanapoom, K.; Jantaro, S.; Rakchad, D. Isolation and fusion of protoplasts from mesophyll cells of *Dendrobium pompadour*. *ScienceAsia* **2001**, *27*, 29–34. [\[CrossRef\]](#)

280. Nakano, M.; Mii, M. Somatic hybridization between *Dianthus chinensis* and *D. barbatus* through protoplast fusion. *Theor. Appl. Genet.* **1993**, *86*, 1–5. [\[CrossRef\]](#)
281. Tomiczak, K.; Sliwinska, E.; Rybczyński, J.J. Protoplast fusion in the genus *Gentiana*: Genomic composition and genetic stability of somatic hybrids between *Gentiana kurroo* Royle and *G. cruciata* L. *Plant Cell Tissue Organ Cult.* **2017**, *131*, 1–14. [\[CrossRef\]](#)
282. Tomiczak, K. Molecular and cytogenetic description of somatic hybrids between *Gentiana cruciata* L. and *G. tibetica* King. *J. Appl. Genet.* **2020**, *61*, 13–24. [\[CrossRef\]](#) [\[PubMed\]](#)
283. Shimizu, K.; Miyabe, Y.; Nagaike, H.; Yabuya, T.; Adachi, T. Production of somatic hybrid plants between *Iris ensata* Thunb. and *I. germanica*. *Euphytica* **1999**, *107*, 105–113. [\[CrossRef\]](#)
284. Horita, M.; Morohashi, H.; Komai, F. Production of fertile somatic hybrid plants between Oriental hybrid lily and *Lilium × formolongi*. *Planta* **2003**, *217*, 597–601. [\[CrossRef\]](#) [\[PubMed\]](#)
285. Power, J.B.; Berry, S.F.; Chapman, J.V.; Cocking, E.C. Somatic hybridization of sexually incompatible petunias: *Petunia parodii*, *Petunia parviflora*. *Theor. Appl. Genet.* **1980**, *57*, 1–4. [\[CrossRef\]](#)
286. Rode, C.; Winkelmann, T.; Meyer, L.; Debener, T. The ethylene 2 receptor gene as a robust molecular marker for intergeneric somatic hybrids between *Petunia* and *Calibrachoa*. *Plant Breed.* **2010**, *129*, 448–453.
287. Kästner, U.; Klocke, E.; Abel, S. Regeneration of protoplasts after somatic hybridisation of *Hydrangea*. *Plant Cell Tissue Organ Cult.* **2017**, *129*, 359–373. [\[CrossRef\]](#)
288. Prange, A.N.S.; Bartsch, M.; Meiners, J.; Serek, M.; Winkelmann, T. Interspecific somatic hybrids between *Cyclamen persicum* and *C. coum*, two sexually incompatible species. *Plant Cell Rep.* **2012**, *31*, 723–735. [\[CrossRef\]](#)
289. Al-Atabee, J.S.; Mulligan, B.J.; Power, J.B.; Afkhami-Sarvestani, R.; Serek, M.; Winkelmann, T. Interspecific somatic hybrids of *Rudbeckia hirta* and *R. laciniata* (Compositae). *Plant Cell Rep.* **1990**, *8*, 517–520. [\[CrossRef\]](#)
290. Afkhami-Sarvestani, R.; Serek, M.; Winkelmann, T. Protoplast isolation and culture from *Streptocarpus*, followed by fusion with *Saintpaulia ionantha* protoplasts. *Europ. J. Hort. Sci.* **2012**, *77*, S249–S260.
291. Chin, C.K.; Lee, Z.H.; Mubbarakh, S.A.; Antony, J.J.J.; Chew, B.L.; Subramaniam, S. Effects of plant growth regulators and activated charcoal on somaclonal variations of protocorm-like bodies (PLBs) of *Dendrobium* Sabin Blue orchid. *Biocatal. Agric. Biotechnol.* **2019**, *22*, 101426. [\[CrossRef\]](#)
292. Qahtan, A.A.; Abdel-Salam, E.M.; Alatar, A.A.; Wang, Q.C.; Faisal, M. An introduction to synthetic seeds: Production, techniques, and applications. In *Synthetic Seeds*; Faisal, M., Alatar, A.A., Eds.; Springer: Cham, Switzerland, 2019; Chapter 1, pp. 1–20.
293. Maqsood, M.; Khusrau, M.; Mujib, A.; Kaloo, Z.A. Synthetic seed technology in some ornamental and medicinal plants: An overview. In *Propagation and Genetic Manipulation of Plants*; Siddique, I., Ed.; Springer: Singapore, 2021; Chapter 2, pp. 19–31.
294. Touchell, D.H.; Palmer, I.E.; Ranney, T.G. In vitro ploidy manipulation for crop improvement. *Front. Plant Sci.* **2020**, *11*, 722. [\[CrossRef\]](#) [\[PubMed\]](#)
295. Dhooghe, E.; van Laere, K.; Eeckhaut, T.; Leus, L.; van Huylbroeck, J. Mitotic chromosome doubling of plant tissues in vitro. *Plant Cell Tissue Organ Cult.* **2011**, *104*, 359–373. [\[CrossRef\]](#)
296. Habibi, M.; Shukurova, M.K.; Watanabe, K.N. Testing two chromosome doubling agents for in vitro tetraploid induction on ginger lilies, *Hedychium gardnerianum* Shepard ex Ker Gawl and *Hedychium coronarium* J. Koenig. *Vitr. Cell Dev. Biol. Plant* **2022**, *58*, 489–497. [\[CrossRef\]](#)
297. Cai, X.; Cao, Z.; Xu, S.; Deng, Z. Induction, regeneration and characterization of tetraploids and variants in ‘Tapestry’ caladium. *Plant Cell Tissue Organ Cult.* **2015**, *120*, 689–700. [\[CrossRef\]](#)
298. Talebi, S.F.; Saharkhiz, M.J.; Kermani, M.J.; Sharafi, Y.; Raouf Fard, F. Effect of different antimitotic agents on polyploid induction of anise hyssop (*Agastache foeniculum* L.). *Caryologia* **2017**, *70*, 184–193. [\[CrossRef\]](#)
299. Miguel, T.P.; Leonhardt, K.W. In vitro polyploid induction of orchids using oryzalin. *Sci. Hortic.* **2011**, *130*, 314–319. [\[CrossRef\]](#)
300. Giovannini, A.; Laura, M.; Nesi, B.; Savona, M.; Cardi, T. Genes and genome editing tools for breeding desirable phenotypes in ornamentals. *Plant Cell Rep.* **2021**, *40*, 461–478. [\[CrossRef\]](#)
301. Koetle, M.J.; Finnica, J.F.; Balázsab, E.; Staden, J.V. A review on factors affecting the *Agrobacterium*-mediated genetic transformation in ornamental monocotyledonous geophytes. *S. Afr. J. Bot.* **2015**, *98*, 37–44. [\[CrossRef\]](#)
302. Bull, T.; Micheltore, R. Molecular determinants of in vitro plant regeneration: Prospects for enhanced manipulation of lettuce (*Lactuca sativa* L.). *Front. Plant Sci.* **2022**, *13*, 1211. [\[CrossRef\]](#)
303. Bednarek, P.T.; Orłowska, R. Plant tissue culture environment as a switch-key of (epi)genetic changes. *Plant Cell Tissue Organ Cult.* **2020**, *140*, 245–257. [\[CrossRef\]](#)
304. Ghosh, A.; Igamberdiev, A.U.; Debnath, S.C. Tissue culture-induced DNA methylation in crop plants: A review. *Mol. Biol. Rep.* **2021**, *48*, 823–841. [\[CrossRef\]](#) [\[PubMed\]](#)
305. Ishihara, H.; Sugimoto, K.; Tarr, P.T.; Temman, H.; Kadokura, S.; Inui, Y.; Sakamoto, T.; Sasaki, T.; Aida, M.; Suzuki, T.; et al. Primed histone demethylation regulates shoot regenerative competency. *Nat. Commun.* **2019**, *10*, 1786. [\[CrossRef\]](#) [\[PubMed\]](#)
306. Zhang, K.; Xu, W.; Wang, C.; Yi, X.; Zhang, W.; Su, Z. Differential deposition of H2A.Z in combination with histone modifications within related genes in *Oryza sativa* callus and seedling. *Plant J.* **2017**, *89*, 264–277. [\[CrossRef\]](#)
307. Azman, A.S.; Mhiri, C.; Grandbastien, M.A.; Tam, S.M. Transposable elements and the detection of somaclonal variation in plant tissue culture: A review. *Malays. Appl. Biol.* **2014**, *43*, 1–12.
308. Mitra, G.C.; Prasad, R.N.; Choudhury, R.A. Inorganic salts & differentiation of protocorms in seed callus of an orchid & correlated changes in its free amino acid content. *Indian J. Exp. Biol.* **1976**, *14*, 350–351.

309. Knudson, L. A new nutrient solution for the germination of orchid seed. *Amer. Orchid Soc. Bull.* **1946**, *15*, 214–217.
310. Van der Salm, T.P.; Van der Toorn, C.J.; Ten Cate, C.H.H.; Dubois, L.A.; De Vries, D.P.; Dons, H.J. Importance of the iron chelate formula for micropropagation of *Rosa hybrida* L. ‘Moneyway’. *Plant Cell Tissue Organ Cult.* **1994**, *37*, 73–77. [\[CrossRef\]](#)
311. Driver, J.A.; Kuniyuki, A.H. In vitro propagation of Paradox walnut rootstock. *Hort. Sci.* **1984**, *19*, 507–509.
312. Teixeira da Silva, J.A. Response of hybrid *Cymbidium* (Orchidaceae) protocorm-like bodies to 26 plant growth regulators. *Bot. Lith.* **2014**, *20*, 3–13.
313. Nayak, N.R.; Chand, P.K.; Rath, S.P.; Patnaik, S.N. Influence of some plant growth regulators on the growth and organogenesis of *Cymbidium aloifolium* (L.) Sw. seed-derived rhizomes in vitro. *Vitr. Cell Dev. Biol. Plant* **1998**, *34*, 185. [\[CrossRef\]](#)
314. Nayak, N.R.; Sahoo, S.; Patnaik, S.; Rath, S.P. Establishment of thin cross section (TCS) culture method for rapid micropropagation of *Cymbidium aloifolium* (L.) Sw. and *Dendrobium nobile* Lindl. (Orchidaceae). *Sci. Hortic.* **2002**, *94*, 107–116. [\[CrossRef\]](#)
315. Lukatkin, A.S.; Mokshin, E.V.; Bolshakova, E.V.; Teixeira da Silva, J.A. Effects of inorganic salts concentration and alternative plant growth regulators on the in vitro organogenesis of a new hybrid *Cymbidium*. *BioTechnologia* **2019**, *100*, 279–288. [\[CrossRef\]](#)
316. Kaewjampa, N.; Shimasaki, K.; Nahar, S.J. Hyaluronic acid can be a new plant growth regulator for hybrid *Cymbidium* micropropagation. *Plant Tissue Cult. Biotech.* **2012**, *22*, 59–64. [\[CrossRef\]](#)
317. Nahar, S.J.; Shimasaki, K.; Haque, S.M. Chondroitin sulfate can be a new plant growth regulator for *Cymbidium* micropropagation. *Acta Hortic.* **2013**, *1014*, 449–455. [\[CrossRef\]](#)
318. Tao, J.; Yu, L.; Kong, F.; Zhao, D. Effects of plant growth regulators on in vitro propagation of *Cymbidium faberi* Rolfe. *Afr. J. Biotechnol.* **2011**, *10*, 15639–15646. [\[CrossRef\]](#)
319. Nahar, S.J.; Shimasaki, K.; Huang, C.L.; Naruemo, K. Effect of plant growth regulators on organogenesis in protocorm-like body (PLBs) of *Cymbidium dayanum* in vitro. *ARPJ. Agric. Biol. Sci.* **2011**, *6*, 28–33.
320. Pant, B.; Swar, S. Micropropagation of *Cymbidium iridioides*. *Nepal J. Sci. Technol.* **2011**, *12*, 91–96. [\[CrossRef\]](#)
321. Islam, S.S.; Islam, T.; Bhattacharjee, B.; Mondal, T.K.; Subramaniam, S. In vitro pseudobulb based micropropagation for mass development of *Cymbidium finlaysonianum* Lindl. *Emir. J. Food Agric.* **2015**, *27*, 469–474. [\[CrossRef\]](#)
322. Khatun, H.; Khatun, M.; Biswas, M.; Kabir, M.; Al-Amin, M. In vitro growth and development of *Dendrobium* hybrid orchid. *Bangladesh J. Agric. Res.* **2010**, *35*, 507–514. [\[CrossRef\]](#)
323. Khatun, M.; Khatun, H.; Khanam, D.; Al-Amin, M. In vitro root formation and plantlet development in *Dendrobium* orchid. *Bangladesh J. Agric. Res.* **2010**, *35*, 257–265. [\[CrossRef\]](#)
324. Martin, K.P.; Madassery, J. Rapid in vitro propagation of *Dendrobium* hybrids through direct shoot formation from foliar explants, and protocorm-like bodies. *Sci. Hortic.* **2006**, *108*, 95–99. [\[CrossRef\]](#)
325. Goswami, K.; Yasmin, S.; Nasiruddin, K.M.; Khatun, F.; Akte, J. In vitro regeneration of *Dendrobium* sp. of orchid using leaf tip as explant. *J. Environ. Sci. Nat. Resour.* **2015**, *8*, 75–78. [\[CrossRef\]](#)
326. Hossen, M.M.; Saha, S.; Khatun, F. Effects of plant growth regulators on in vitro growth and development of orchid (*Dendrobium* sp.) from protocorm like bodies (PLBs). *J. Bangladesh Agric. Univ.* **2021**, *193*, 294–301. [\[CrossRef\]](#)
327. Luo, J.P.; Wang, Y.; Zha, X.Q.; Huang, L. Micropropagation of *Dendrobium densiflorum* Lindl. ex Wall. through protocorm-like bodies: Effects of plant growth regulators and lanthanoids. *Plant Cell Tissue Organ Cult.* **2008**, *93*, 333. [\[CrossRef\]](#)
328. Pradhan, S.; Paudel, Y.P.; Pant, B. Efficient regeneration of plants from shoot tip explants of *Dendrobium densiflorum* Lindl., a medicinal orchid. *Afr. J. Biotechnol.* **2013**, *12*, 1378–1383.
329. Sheela, V.L.; Sarada, S.; Anitha, S. Development of protocorm-like bodies and shoots in *Dendrobium* cv. Sonia following gamma irradiation. *J. Trop. Agric.* **2006**, *44*, 86–87.
330. Bhattacharyya, P.; Kumaria, S.; Tandon, P. High frequency regeneration protocol for *Dendrobium nobile*: A model tissue culture approach for propagation of medicinally important orchid species. *S. Afr. J. Bot.* **2016**, *104*, 232–243. [\[CrossRef\]](#)
331. Malabadi, R.B.; Mulgund, G.S.; Kallappa, N. Micropropagation of *Dendrobium nobile* from shoot tip sections. *J. Plant Physiol.* **2005**, *162*, 473–478. [\[CrossRef\]](#)
332. Tikendra, L.; Potshangbam, A.M.; Dey, A.; Devi, T.R.; Sahoo, M.R.; Nongdam, P. RAPD, ISSR, and SCoT markers based genetic stability assessment of micropropagated *Dendrobium fimbriatum* Lindl. var. *oculatum* Hk. f.- an important endangered orchid. *Physiol. Mol. Biol. Plants* **2021**, *27*, 341–357. [\[CrossRef\]](#)
333. Bhowmik, T.K.; Rahman, M.M. Micropropagation of commercially important orchid *Dendrobium palpebrae* Lindl. through in vitro developed pseudobulb culture. *J. Adv. Biotechnol. Exp. Ther.* **2020**, *3*, 225–232. [\[CrossRef\]](#)
334. Shiau, Y.J.; Nalawade, S.M.; Hsia, C.N.; Mulabagal, V.; Tsay, H.S. In vitro propagation of the Chinese medicinal plant, *Dendrobium candidum* wall. ex lindl., from axenic nodal segments. *Vitr. Cell Dev. Biol. Plant* **2005**, *41*, 666–670. [\[CrossRef\]](#)
335. Zhao, P.; Wu, F.; Feng, F.S.; Wang, W.J. Protocorm-like body (PLB) formation and plant regeneration from the callus culture of *Dendrobium candidum* Wall ex Lindl. *Vitr. Cell Dev. Biol. Plant* **2008**, *44*, 178–185. [\[CrossRef\]](#)
336. Longchar, T.B.; Deb, C.R. Optimization of in vitro propagation protocol of *Dendrobium heterocarpum* Wall. ex. Lindl. and clonal genetic fidelity assessment of the regenerates: An orchid of horticultural and medicinal importance. *S. Afr. J. Bot.* **2022**, *149*, 67–78. [\[CrossRef\]](#)
337. Pant, B.; Thapa, D. In vitro mass propagation of an epiphytic orchid, *Dendrobium primulinum* Lindl. through shoot tip culture. *Afr. J. Biotechnol.* **2012**, *11*, 9970–9974.
338. Tikendra, L.; Koiyam, A.S.; Nongdam, P. Molecular markers based genetic fidelity assessment of micropropagated *Dendrobium chrysotoxum* Lindl. *Meta Gene* **2019**, *20*, 100562. [\[CrossRef\]](#)

339. Hajong, S.; Kumaria, S.; Tandon, P. Effect of plant growth regulators on regeneration potential of axenic nodal segments of *Dendrobium chrysanthum* Wall. ex Lindl. *J. Agric. Sci. Tech.* **2013**, *15*, 1425–1435.
340. Bhattacharyya, P.; Kumaria, S.; Job, N.; Tandon, P. Phyto-molecular profiling and assessment of antioxidant activity within micropropagated plants of *Dendrobium thyrsiflorum*: A threatened, medicinal orchid. *Plant Cell Tissue Organ Cult.* **2015**, *122*, 535–550. [[CrossRef](#)]
341. Zhao, D.; Hu, G.; Chen, Z.; Shi, Y.; Zheng, L.; Tang, A.; Long, C. Micropropagation and in vitro flowering of *Dendrobium wangliangii*: A critically endangered medicinal orchid. *J. Med. Plants Res.* **2013**, *7*, 2098–2110.
342. Chen, B.; Trueman, S.J.; Li, J.; Li, Q.; Fan, H.; Zhang, J. Micropropagation of the endangered medicinal orchid, *Dendrobium officinale*. *Life Sci. J.* **2014**, *11*, 526–530.
343. Nasiruddin, K.M.; Begum, R.; Yasmin, S. Protocorm like bodies and plantlet regeneration from *Dendrobium formosum* leaf callus. *Asian J. Plant Sci.* **2003**, *2*, 955–957. [[CrossRef](#)]
344. Riva, S.S.; Islam, A.; Hoque, M.E. In vitro regeneration and rapid multiplication of *Dendrobium bensoniae*, an indigenous ornamental orchid. *Agriculturists* **2016**, *14*, 24–31. [[CrossRef](#)]
345. Khatun, K.; Nath, U.K.; Rahman, M.S. Tissue culture of *Phalaenopsis*: Present status and future prospects. *J. Adv. Biotechnol. Exp. Therap.* **2020**, *3*, 273–285. [[CrossRef](#)]
346. Zanello, C.A.; Cardoso, J.C. PLBs induction and clonal plantlet regeneration from leaf segment of commercial hybrids of *Phalaenopsis*. *J. Hort. Sci. Biotechnol.* **2019**, *94*, 627–631. [[CrossRef](#)]
347. Mose, W.; Daryono, B.S.; Indrianto, A.; Purwantoro, A.; Semiarti, E. Direct somatic embryogenesis and regeneration of an Indonesian orchid *Phalaenopsis amabilis* (L.) Blume under a variety of plant growth regulators, light regime, and organic substances. *Jordan J. Biol. Sci.* **2020**, *13*, 509–518.
348. Balilashaki, K.; Vahedi, M.; Karimi, R. In vitro direct regeneration from node and leaf explants of *Phalaenopsis* cv. ‘Surabaya’. *Plant Tissue Cult. Biotech.* **2015**, *25*, 193–205. [[CrossRef](#)]
349. Kuo, H.L.; Chen, J.T.; Chang, W.C. Efficient plant regeneration through direct somatic embryogenesis from leaf explants of *Phalaenopsis* ‘Little Steve’. *Vitr. Cell Dev. Biol. Plant* **2005**, *41*, 453–456. [[CrossRef](#)]
350. Sinha, P.; Jahan, M.A.A. Clonal propagation of *Phalaenopsis amabilis* (L.) BL. cv. ‘Golden Horizon’ through In vitro culture of leaf segments. *Bangladesh J. Sci. Ind. Res.* **2011**, *46*, 163–168. [[CrossRef](#)]
351. Rittirat, S.; Kongruk, S.; Te-chato, S. Induction of protocorm-like bodies (PLBs) and plantlet regeneration from wounded protocorms of *Phalaenopsis cornucervi* (Breda) Blume & Rchb. f. *Int. J. Agric. Technol.* **2012**, *8*, 2397–2407.
352. Kalimuthu, K.; Senthilkumar, R.; Vijayakumar, S. In vitro micropropagation of orchid, *Oncidium* sp. (Dancing Dolls). *Afr. J. Biotechnol.* **2007**, *6*, 1171–1174.
353. Chen, J.T.; Chang, W.C. TIBA affects the induction of direct somatic embryogenesis from leaf explants of *Oncidium*. *Plant Cell Tissue Organ Cult.* **2004**, *79*, 315–320. [[CrossRef](#)]
354. Mata-Rosas, M.; Baltazar-García, R.J.; Chávez-Avila, V.M. In vitro regeneration through direct organogenesis from protocorms of *Oncidium tigrinum* Llave & Lex. (Orchidaceae), an endemic and threatened Mexican species. *Hort. Sci.* **2011**, *46*, 1132–1135.
355. Mayer, J.L.S.; Stancato, G.C.; Appezzato-Da-Glória, B. Direct regeneration of protocorm-like bodies (PLBs) from leaf apices of *Oncidium flexuosum* Sims (Orchidaceae). *Plant Cell Tissue Organ Cult.* **2010**, *103*, 411–416. [[CrossRef](#)]
356. Bhattacharjee, B.; Islam, S.S. Effects of plant growth regulators on multiple shoot induction in *Vanda tessellata* (Roxb.) Hook. Ex G. Don an endangered medicinal orchid. *Int. J. Sci. Nat.* **2014**, *5*, 707–712.
357. Roy, A.R.; Patel, R.S.; Patel, V.V.; Sajeev, S.; Deka, B.C. Asymbiotic seed germination, mass propagation and seedling development of *Vanda coerulea* Griff ex. Lindl. (Blue Vanda): An in vitro protocol for an endangered orchid. *Sci. Hort.* **2011**, *128*, 325–331. [[CrossRef](#)]
358. Decruse, S.W.; Gangaprasad, A.; Seeni, S.; Menon, V.S. A protocol for shoot multiplication from foliar meristem of *Vanda spatulata* (L.) Spreng. *Indian J. Exp. Biol.* **2003**, *41*, 924–927.
359. Naing, A.H.; Myint, K.T.; Hwang, Y.J.; Park, I.S.; Chung, J.D.; Lim, K.B. Micropropagation and conservation of the wild medicinal orchid, *Coelogyne cristata*. *Horti. Environ. Biotechnol.* **2010**, *51*, 109–114.
360. Singh, N.; Kumaria, S. A combinational phytomolecular-mediated assessment in micropropagated plantlets of *Coelogyne ovalis* Lindl.: A horticultural and medicinal orchid. *Proc. Natl. Acad. Sci. India Sect. B Biol. Sci.* **2020**, *90*, 455–466. [[CrossRef](#)]
361. Kaur, S.; Bhutani, K.K. In vitro mass propagation of ornamentally and medicinally important *Coelogyne flaccida* Lindl. through pseudobulb segments. *Plant Tissue Cult. Biotech.* **2013**, *23*, 39–47. [[CrossRef](#)]
362. Kalyan, K.D.; Sil, S. Protocorm-like bodies and plant regeneration from foliar explants of *Coelogyne flaccida*, a horticulturally and medicinally important endangered orchid of eastern himalaya. *Lankesteriana* **2015**, *15*, 151–158.
363. Aung, W.T.; Bang, K.S.; Yoon, S.A.; Ko, B.; Bae, J.H. Effects of different natural extracts and plant growth regulators on plant regeneration and callus induction from pseudobulbs explants through in vitro seed germination of endangered orchid *Bulbophyllum auricomum* Lindl. *J. Bio. Environ. Con.* **2022**, *31*, 133–141. [[CrossRef](#)]
364. Prasad, G.; Seal, T.; Mao, A.A.; Vijayan, D.; Lokho, A. Assessment of clonal fidelity and phytomedicinal potential in micropropagated plants of *Bulbophyllum odoratissimum*-An endangered medicinal orchid of Indo Burma megabiodiversity hotspot. *S. Afr. J. Bot.* **2021**, *141*, 487–497. [[CrossRef](#)]
365. Ng, C.Y.; Saleh, N.M. In vitro propagation of *Paphiopedilum* orchid through formation of protocorm-like bodies. *Plant Cell Tissue Organ Cult.* **2011**, *105*, 193–202. [[CrossRef](#)]

366. Masnoddin, M.; Repin, R.; Abd Aziz, Z. Micropropagation of an endangered Borneo orchid, *Paphiopedilum rothschildianum* callus using temporary immersion bioreactor system. *Thai Agric. Res. J.* **2016**, *34*, 161–171.
367. Coello, C.Y.; Miceli, C.L.; Orantes, C.; Dendooven, L.; Gutiérrez, F.A. Plant growth regulators optimization for in vitro cultivation of the orchid *Guarianthe skinneri* (Bateman) Dressier & WE Higgins. *Gayana Bot.* **2010**, *67*, 19–26.
368. Baker, A.; Kaviani, B.; Nematzadeh, G.; Negahdar, N. Micropropagation of *Orchis catasetum*—A rare and endangered orchid. *Acta Sci. Pol. Hortorum Cultus* **2014**, *13*, 197–205.
369. Chauhan, S.; Promila Pathak, A.; Sharma, S.K. Teepol regeneration of *Eulophia dabia* through rhizome explants and flowering: A study in vitro. *J. Orchid Soc. India* **2015**, *29*, 61–65.
370. Sopalun, K.; Thammasiri, K.; Ishikawa, K. Micropropagation of the Thai orchid *Grammatophyllum speciosum* blume. *Plant Cell Tissue Organ Cult.* **2010**, *101*, 143–150. [\[CrossRef\]](#)
371. Jainol, J.E.; Gansau, J.A. Effect of growth regulators and explant orientation on shoot tip culture of Borneo endemic orchid, *Dimorphorchis lowii*. *Trans. Sci. Technol.* **2016**, *3*, 306–312.
372. Acemi, A. Chitosan versus plant growth regulators: A comparative analysis of their effects on in vitro development of *Serapias vomeracea* (Burm.f.) Briq. *Plant Cell Tissue Organ Cult.* **2020**, *141*, 327–338. [\[CrossRef\]](#)
373. Sunitibala, D.Y.; Neelashree, N. Micropropagation of the monopodial orchid, *Rhynchostylis retusa* (L.). *Int. J. Life Sci.* **2018**, *6*, 181–186.
374. Gantait, S.; Sinniah, U.R. Rapid micropropagation of monopodial orchid hybrid (*Aranda Wan Chark Kuan* ‘Blue’ × *Vanda coerulea* Griffth. ex. Lindl.) through direct induction of protocorm-like bodies from leaf segments. *Plant Growth Regul.* **2012**, *68*, 129–140. [\[CrossRef\]](#)
375. Paudel, M.R.; Pant, B. In vitro micropropagation of rare orchid (*Esmeralda clarkei* Rchb. f.) from shoot tip section. *Int. J. Biol. Pharm. Allied Sci.* **2012**, *1*, 1587–1597.
376. Sherif, N.A.; Senthil Kumar, T.; Rao, M.V. DNA barcoding and genetic fidelity assessment of micropropagated *Aenhenrya rotundifolia* (Blatt.) C.S. Kumar and F.N. Rasm.: A critically endangered jewel orchid. *Physiol. Mol. Biol. Plants* **2020**, *26*, 2391–2405. [\[CrossRef\]](#) [\[PubMed\]](#)
377. Bustam, B.M.; Dixon, K.; Bunn, E. Ex situ germplasm preservation and plant regeneration of a threatened terrestrial orchid, *Caladenia huegelii*, through micropropagation and cryopreservation. *Aust. J. Bot.* **2016**, *64*, 659–663. [\[CrossRef\]](#)
378. Picolotto, D.R.N.; Paiva, V.B.D.; Barros, F.D.; Padilha, D.R.C.; Cruz, A.C.F.D.; Otoni, W.C. Micropropagation of *Cyrtopodium paludicolum* (Orchidaceae) from root tip explants. *Crop Breed. Appl. Biotechnol.* **2017**, *17*, 191–197. [\[CrossRef\]](#)
379. Saleh-E-In, M.M.; Bhattacharya, P.; Van Staden, J. Chemical composition and cytotoxic activity of the essential oil and oleoresins of in vitro micropropagated *Ansellia africana* Lindl: A vulnerable medicinal orchid of Africa. *Molecules* **2021**, *26*, 4556. [\[CrossRef\]](#)
380. Chookoh, N.; Chiu, Y.T.; Chang, C.; Hu, W.H.; Dai, T.E. Micropropagation of *Tolumnia* orchids through induction of protocorm-like bodies from leaf segments. *Hort. Sci.* **2019**, *54*, 1230–1236. [\[CrossRef\]](#)
381. Guo, W.L.; Chang, Y.C.A.; Kao, C.Y. Protocorm-like bodies initiation from root tips of *Cyrtopodium paranaense* (Orchidaceae). *Hort. Sci.* **2010**, *45*, 1365–1368. [\[CrossRef\]](#)
382. Xu, J.; Beleski, D.G.; Vendrame, W.A. Effects of culture methods and plant growth regulators on in vitro propagation of *Brassavola nodosa* (L.) Lindl. hybrid. *Vitr. Cell Dev. Biol. Plant* **2022**. [\[CrossRef\]](#)
383. Ncube, B.; Finnie, J.F.; Van Staden, J. In vitro regeneration of *Cyrtanthus* species: Ornamental plants with medicinal benefits. *Vitr. Cell Dev. Biol. Plant* **2015**, *51*, 42–51. [\[CrossRef\]](#)
384. Matand, K.; Shoemake, M.; Li, C. High frequency in vitro regeneration of adventitious shoots in daylilies (*Heemerocallis* sp) stem tissue using thidiazuron. *BMC Plant Biol.* **2020**, *20*, 31. [\[CrossRef\]](#) [\[PubMed\]](#)
385. Youssef, N.M.; Shaaban, S.A.; Ghareeb, Z.F.; Taha, L.S. In vitro bulb formation of direct and indirect regeneration of *Lilium orientalis* cv. “Starfighter” plants. *Bull. Natl. Res. Cent.* **2019**, *43*, 211. [\[CrossRef\]](#)
386. Javaheri, N.; Kaviani, B. Effect of hormonal combination of auxin and cytokinin on micropropagation of eastern lily (*Lilium* oriental hybrid ‘Casablanca’) plant using bulb scale explant. *J. Hort. Sci.* **2022**, *36*, 57–69.
387. Han, B.H.; Yae, B.W.; Yu, H.J.; Peak, K.Y. Improvement of in vitro micropropagation of *Lilium* oriental hybrid ‘Casablanca’ by the formation of shoots with abnormally swollen basal plates. *Sci. Hortic.* **2005**, *103*, 351–359. [\[CrossRef\]](#)
388. Ptak, A.; Bach, A. Somatic embryogenesis in tulip (*Tulipa gesneriana* L.) flower stem cultures. *Vitr. Cell Dev. Biol. Plant* **2007**, *43*, 35–39. [\[CrossRef\]](#)
389. Kritskaya, T.A.; Kashin, A.S.; Kasatkin, M.Y. Micropropagation and somaclonal variation of *Tulipa suaveolens* (Liliaceae) in vitro. *Russ. J. Dev. Biol.* **2019**, *50*, 209–215. [\[CrossRef\]](#)
390. Mašlanka, M.; Bach, A. Induction of bulb organogenesis in in vitro cultures of tarda tulip (*Tulipa tarda* Stapf.) from seed-derived explants. *Vitr. Cell Dev. Biol. Plant* **2014**, *50*, 712–721. [\[CrossRef\]](#)
391. Ibrahim, M.A.; Draaj, I.A. The effect of explant source and cytokinin concentration on the direct bulb formation of tulip (*Tulipa gesneriana* L.) by plant tissue culture technique. *Plant Cell Biotechnol. Mol. Biol.* **2020**, *21*, 111–119.
392. Wang, G.Y.; Yuan, M.F.; Hong, Y. In vitro flower induction in roses. *Vitr. Cell Dev. Biol. Plant* **2002**, *38*, 513–518. [\[CrossRef\]](#)
393. Oo, K.T.; Lwin, K.M.; Khai, A.A. In vitro micropropagation of rose (*Hybrid Rosa* spp.) through plant tissue culture technique. *J. Sci. Innov. Res.* **2021**, *10*, 1–4. [\[CrossRef\]](#)
394. Tawfik, A.A.; Ibrahim, O.H.M.; Abdul-Hafeez, E.Y.; Ibrahim, S.A. Optimizing micropropagation protocol for *Rosa hybrida* cv. Eiffel Tower with improved in vitro rooting ability. *Egypt. J. Hort.* **2018**, *45*, 323–335.

395. Tirkey, D.S.; Nirala, D.P.; Kumari, D.P.N.P. Micropropagation from nodal explants of rose (*Rosa hybrida* L.) at different concentration of BAP (6-Benzyl Amino Purine). *Int. J. Chem. Stud.* **2019**, *SP6*, 427–430.
396. Khaskheli, A.J.; Khaskheli, M.I.; Khaskheli, M.A.; Shar, T.; Ahmad, W.; Lighari, U.A.; Khaskheli, M.A.; Khaskheli, A.A.; Makan, F.H. Proliferation, multiplication and improvement of micro-propagation system for mass clonal production of rose through shoot tip culture. *Am. J. Plant Sci.* **2018**, *9*, 296–310. [[CrossRef](#)]
397. Kanchanapoom, K.; Posayapisit, N.; Kanchanapoom, K. In vitro flowering from cultured nodal explants of rose (*Rosa hybrida* L.). *Not. Bot. Horti Agrobot. Cluj Napoca* **2009**, *37*, 261–263.
398. Kanchanapoom, K.; Sakpeth, P.; Kanchanapoom, L. In vitro flowering of shoots regenerated from cultured nodal explants of *Rosa hybrida* cv. 'Heirloom'. *ScienceAsia* **2010**, *36*, 161–164. [[CrossRef](#)]
399. Afrin, S.; Rahman, M.A.; Khalekuzzaman, M.; Hasan, M.M.; Fahim, A.H.F.; Alam, M.A. Study on in vitro micropropagation of *Rosa* sp. *Bangladesh J. Agric.* **2022**, *47*, 66–74. [[CrossRef](#)]
400. Wojtania, A.; Matysiak, B. In vitro propagation of *Rosa* 'Konstancin' (*R. rugosa* × *R. beggeriana*), a plant with high nutritional and pro-health value. *Folia Hort.* **2018**, *30*, 259–267. [[CrossRef](#)]
401. Ali, M.; Baloch, S.K.; Seema, N.; Yaeen, S.; Kaleri, A.A.; Kaleri, R.R.; Nizamani, G.S.; Subhapoto, G.F.; Kaleri, M.A.; Shahani, F.; et al. Influence of phytohormones on callus induction and micropropagation on rose (*Rosa indica* L.). *J. Basic Appl. Sci.* **2018**, *14*, 9–11.
402. Shabbir, A.; Hameed, N.; Ali, A.; Bajwa, R. Effect of different cultural conditions on micropropagation of rose (*Rosa indica* L.). *Pak. J. Bot.* **2009**, *41*, 2877–2882.
403. Chhalgri, M.A.; Khan, M.T.; Nizamani, G.S.; Yasmeen, S.; Khan, I.A.; Aslam, M.M.; Rajpar, A.A.; Tayyaba, T.; Nizamani, F.; Nizamani, M.R.; et al. Effect of plant growth hormones on shoot and root regeneration in rose under in vitro conditions. *Adv. Life Sci.* **2020**, *8*, 93–97.
404. Quynh, N.P.D.; Pha, N.T. Effect of culture media on micropropagation and in vitro flowering of red Eden Rose (*Rosa* 'Red Eden'). *Dong Thap Univ. J. Sci.* **2020**, *9*, 93–99.
405. Maheswari, N.U.; Vaishnavi, K. In vitro micropropagation of *Rosa damascena* Mill. *Asian J. Multidimen. Res.* **2018**, *7*, 107–114.
406. Nikbakht, A.; Kafi, M.; Mirmasoudi, M.; Babalar, M. Micropropagation of damask rose (*Rosa damascena* Mill.) cvs Azaran and Ghamsar. *Int. J. Agric. Biol.* **2005**, *7*, 535–538.
407. Kumar, A.; Sood, A.; Palni, U.; Gupta, A.; Palni, L.M. Micropropagation of *Rosa damascena* Mill. from mature bushes using thidiazuron. *J. Hort. Sci. Biotechnol.* **2001**, *76*, 30–34. [[CrossRef](#)]
408. Alsemaan, T. Micro-propagation of Damask rose (*Rosa damascena* Mill.) cv. Almarah. *Int. J. Agric. Res.* **2013**, *8*, 172–177. [[CrossRef](#)]
409. Jabbarzadeh, Z.; Khosh-Khui, M. Factors affecting tissue culture of Damask rose (*Rosa damascena* Mill.). *Sci. Hortic.* **2005**, *105*, 475–482. [[CrossRef](#)]
410. Mirzaei, S.; Zare, A.G.; Jafary, S. Evaluating micropropagation of Kashan Damask rose, Yasooj aromatic rose and their hybrid. *Int. J. Environ. Agric. Biotech.* **2019**, *4*, 1407–1413.
411. Tibkwang, A.; Junkasiraporn, S.; Chotikadachanarong, K. Effects of cytokinin and sucrose on tissue culture of *Rosa chinensis* Jacq. var. *minima* Voss. *Burapha Sci. J.* **2018**, *23*, 712–721.
412. Kumar, M.; Sirohi, U.; Malik, S.; Kumar, S.; Ahirwar, G.K.; Chaudhary, V.; Yadav, M.K.; Singh, J.; Kumar, A.; Pal, V.; et al. Methods and factors influencing in vitro propagation efficiency of ornamental tuberose (*Polianthes* species): A systematic review of recent developments and future prospects. *Horticulturae* **2022**, *8*, 998. [[CrossRef](#)]
413. Ali, M.R.; Akand, M.; Homayra, H.; Mehraj, H.; Uddin, A.F.M.J. In vitro regeneration and rapid multiplication of tuberose. *Int. J. Bus. Soc. Sci. Res.* **2015**, *3*, 35–38.
414. Ali, M.R.; Mehraj, H.; Uddin, A.F.M.J. Kinetin (KIN) and indole-3-acetic acid (IAA) on in vitro shoot and root initiation of tuberose. *Int. J. Sust. Agril. Technol.* **2014**, *10*, 1–4.
415. Daneshvar, M.H.; Havil, M.; Lotfi Jalal-Abadi, A. Micropropagation of *Polianthes tuberosa* L. through direct organogenesis. *J. Plant Prod.* **2022**, *45*.
416. Singh, K.; Madhavan, J.; Sadhukhan, R.; Chandra, S.; Rao, U.; Mandal, P.K. Production of nematode free plantlets in *Polianthes tuberosa* using in vitro culture techniques. *Hortic. Environ. Biotechnol.* **2020**, *61*, 929–937. [[CrossRef](#)]
417. Gajbhiye, S.S.; Tripathi, M.K.; Vidya, M.S.; Singh, M.; Baghel, B.S.; Tiwari, S. Direct shoot organogenesis from cultured stem disc explants of tuberose (*Polianthes tuberosa* Linn.). *J. Agric. Technol.* **2011**, *7*, 695–709.
418. Raghuvanshi, S.; Tripathi, M.K.; Vidhya-Sankar, M.; Singh, O.P. Establishment of low-cost effective protocol for massive in vitro propagation in *Polianthes tuberosa* Linn. *Plant Cell Biotech. Mol. Biol.* **2013**, *14*, 49–59.
419. Sangavai, C.; Chellapandi, P. In vitro propagation of a tuberose plant (*Polianthes tuberosa* L.). *Electron. J. Biol.* **2008**, *4*, 98–101.
420. Khanchana, K.; Kannan, M.; Hemaprabha, K.; Ganga, M. Standardization of protocol for sterilization and in vitro regeneration in tuberose (*Polianthes tuberosa* L.). *Int. J. Chem. Stu.* **2019**, *7*, 236–241.
421. Surendranath, R.; Ganga, M.; Jawaharlal, M. In vitro propagation of tuberose. *Environ. Ecol.* **2015**, *34*, 2556–2560.
422. Hernández-Mendoza, F.; Carrillo-Castañeda, G.; García-Gaytán, V.; Pedraza-Santos, M.; de la Cruz-Torres, E.; Mendoza-Castillo, M. In vitro plant regeneration of *Polianthes tuberosa* L. from leaf and flower buds tissue. *Trop. Subtrop. Agroecosyst.* **2021**, *24*, 55.
423. Memon, N.; Qasim, M.; Jaskani, M.J.; Ahmad, R. In vitro cormel production of gladiolus. *Pak. J. Agric. Sci.* **2010**, *47*, 115–123.
424. Torabi-Giglou, M.; Hajieghrari, B. In vitro study on regeneration of *Gladiolus grandiflorus* corm calli as affected by plant growth regulators. *Pak. J. Biol. Sci.* **2008**, *1*, 1147–1154. [[CrossRef](#)] [[PubMed](#)]

425. Tripathi, M.K.; Malviya, R.K.; Vidhyashankar, M.; Patel, R.P. Effect of plant growth regulators on in vitro morphogenesis in gladiolus (*Gladiolus hybridus* Hort.) from cultured corm slice. *Int. J. Agric. Tech.* **2017**, *13*, 583–599.
426. Deshmukh, V.D.; Kharde, A.V.; Talekar, B.K. Interactive effects of BA and IAA on shoot proliferation of gladiolus (*Gladiolus grandiflorus*) var. White Prosperity. *J. Oriental. Res. Madras* **2021**, *XC*, II–VII.
427. Mateen, R.M. Development and optimization of micro-propagation, in vitro methodology for gladiolus. *BioSci. Rev.* **2019**, *1*, 21–36. [\[CrossRef\]](#)
428. Devi, P.; Kumar, P.; Sengar, R.S.; Yadav, M.K.; Kumar, M.; Singh, S.K.; Singh, S. In-vitro multiple shoots production from cormel shoot buds in gladiolus (*Gladiolus hybrida*). *Int. J. Curr. Microbiol. Appl. Sci.* **2019**, *8*, 1345–1350. [\[CrossRef\]](#)
429. Kumar, A.; Kumar, A.; Sharma, V.; Mishra, A.; Singh, S.; Kumar, P. In vitro regeneration of gladiolus (*Gladiolus hybrida* L.): Optimization of growth media and assessment of genetic fidelity. *Int. J. Curr. Microbiol. Appl. Sci.* **2018**, *7*, 2900–2909. [\[CrossRef\]](#)
430. Wang, H.Y.; He, S.L.; Tanaka, M.; Van, P.T.; Teixeira da Silva, J.A. Effect of IBA concentration, carbon source, substrate, and light source on root induction ability of tree peony (*Paeonia suffruticosa* Andr.) plantlets in vitro. *Europ. J. Hort. Sci.* **2012**, *77*, S122–S128.
431. Parida, R.; Mohanty, S.; Nayak, S. In vitro propagation of *Hedychium coronarium* Koen. through axillary bud proliferation. *Plant Biosyst.* **2013**, *147*, 905–912. [\[CrossRef\]](#)
432. Jalali, N.; Naderi, R.; Shahi-Gharahlar, A.; Teixeira da Silva, J.A. Tissue culture of *Cyclamen* spp. *Sci. Hortic.* **2012**, *137*, 11–19. [\[CrossRef\]](#)
433. İzgü, T.; Sevindik, B.; Çürük, P.; Şimşek, Ö.; Kaçar, Y.A.; Teixeira da Silva, J.A.; Mendi, Y. Development of an efficient regeneration protocol for four *Cyclamen* species endemic to Turkey. *Plant Cell Tissue Organ Cult.* **2016**, *127*, 95–113. [\[CrossRef\]](#)
434. Yamaner, Ö.; Erdag, B. Direct shoot formation and microtuberization from aseptically seedlings of *Cyclamen mirabile* Hildebr. *Biotechnology* **2008**, *7*, 328–332. [\[CrossRef\]](#)
435. Abu-Qaoud, H. Direct regeneration in *Cyclamen persicum* Mill. using seedling tissues. *An Najah Univ. J. Res.-A* **2004**, *18*, 147–156.
436. Kanwar, J.K.; Kumar, S. Influence of growth regulators and explants on shoot regeneration in carnation. *Hort. Sci.* **2009**, *36*, 140–146. [\[CrossRef\]](#)
437. Lukatkin, A.S.; Mokshin, E.V.; Teixeira da Silva, J.A. Use of alternative plant growth regulators and carbon sources to manipulate *Dianthus caryophyllus* L. shoot induction in vitro. *Rend. Fis. Acc. Lincei* **2017**, *28*, 583–588. [\[CrossRef\]](#)
438. Thokchom, R.; Maitra, S. Micropopagation of *Anthurium andreanum* cv. Jewel from leaf explants. *J. Crop Weed* **2017**, *13*, 23–27.
439. Cardoso, J.C.; Habermann, G. Adventitious shoot induction from leaf segments in *Anthurium andreanum* is affected by age of explant, leaf orientation and plant growth regulator. *Hortic. Environ. Biotechnol.* **2014**, *55*, 56–62. [\[CrossRef\]](#)
440. Gu, A.; Liu, W.; Ma, C.; Cui, J.; Henny, R.J.; Chen, J. Regeneration of *Anthurium andraeanum* from leaf explants and evaluation of microcutting rooting and growth under different light qualities. *Hort. Sci.* **2012**, *47*, 88–92. [\[CrossRef\]](#)
441. Ülfer, R.; Türkoğlu, N.; Özdemir, F.A. Micropopagation of *Zinnia elegans* L. *Int. J. Agri. For. Life Sci.* **2020**, *4*, 161–166.
442. Mei-Yin, C.; Sani, H. In vitro plantlet regeneration from nodal explant and callus induction of *Vernonia amygdalina* Delile. *J. Plant Sci.* **2018**, *6*, 1–6.
443. Khalafalla, M.M.; Elgaali, E.I.; Ahmed, M.M. In vitro multiple shoot regeneration from nodal explants of *Vernonia amygdalina*-an important medicinal plant. *Afr. Crop Sci. Confer. Proceed.* **2007**, *8*, 747–752.
444. Nasib, A.; Ali, K.; Khan, S. In vitro propagation of croton (*Codiaeum variegatum*). *Pak. J. Bot.* **2008**, *40*, 99–104.
445. Marconi, P.L.; Radice, S. Organogenesis and somatic embryogenesis in *Codiaeum variegatum* (L.) Blume cv. “Corazón de Oro”. *Vitr. Cell Dev. Biol. Plant* **1997**, *33*, 258–262. [\[CrossRef\]](#)
446. Wei, A.; Xu, Y.; Yang, N.; Jiang, L.; Hu, J.; Yang, H.; Cai, C.; Chen, J.; Chen, G.; Pan, D. In vitro propagation of *Codiaeum variegatum* ‘Golden Queen’. *Chinese J. Trop. Crops* **2019**, *40*, 724–730.
447. Bakheet, G.I.; Soliman, S.S.; Abdelkader, M.A.I.; Elastokhy, M.M.A. Effects of different croton (*Codiaeum variegatum* L.) genotypes and growth regulators on callus induction, micro propagation and antibacterial activities. *Zagazig J. Agric. Res.* **2018**, *45*, 331–347. [\[CrossRef\]](#)
448. Waseem, K.; Jilani, M.S.; Jaskani, M.J.; Khan, M.S.; Kiran, M.; Khan, G.U. Significance of different plant growth regulators on the regeneration of chrysanthemum plantlets (*Dendranthema morifolium* L.) through shoot tip culture. *Pak. J. Bot.* **2011**, *43*, 1843–1848.
449. Naing, A.H.; Jeon, S.M.; Han, J.S.; Lim, S.H.; Lim, K.B.; Kim, C.K. Factors influencing in vitro shoot regeneration from leaf segments of *Chrysanthemum*. *C. R. Biol.* **2014**, *337*, 383–390. [\[CrossRef\]](#)
450. Naing, A.H.; Park, K.I.; Chung, M.Y.; Lim, K.B.; Kim, C.K. Optimization of factors affecting efficient shoot regeneration in *Chrysanthemum* cv. Shinma. *Braz. J. Bot.* **2016**, *39*, 975–984. [\[CrossRef\]](#)
451. Kazeroonian, R.; Mousavi, A.; Jari, S.K.; Tohidfar, M. Factors influencing in vitro organogenesis of *Chrysanthemum morifolium* cv. ‘Resomee Splendid’. *Iranian J. Biotech.* **2018**, *16*, e1454. [\[CrossRef\]](#)
452. Parzymies, M.; Dąbski, M.; Pogorzalet, M.; Kozak, D.; Durlak, W.; Dudkiewicz, M. Rooting of a trumpet creeper (*Campsis radicans* (L.) seem.) microshoots in presence of auxins. *Acta Sci. Pol. Hortorum Cultus* **2014**, *13*, 187–196.
453. Liberman, R.; Shahar, L.; Nissim-Levi, A.; Evenor, D.; Reuveni, M.; Oren-Shamir, M. Shoot regeneration from leaf explants of *Brunfelsia calycina*. *Plant Cell Tissue Organ Cult.* **2010**, *100*, 345–348. [\[CrossRef\]](#)
454. Duhoky, M.M.; Al-Mizory, L.S. In vitro micropopagation of selected *Bougainvillea* sp. through callus induction. *J. Agric. Vet. Sci.* **2014**, *6*, 1–6.
455. Papafiotou, M.; Skylourakis, A. In vitro propagation of *Callistemon citrinus*. *Acta Hortic.* **2010**, *885*, 267–270. [\[CrossRef\]](#)

456. Farooq, I.; Qadri, Z.A.; Rather, Z.A.; Nazki, I.T.; Banday, N.; Rafiq, S.; Mansoor, S. Optimization of an improved, efficient and rapid in vitro micropropagation protocol for *Petunia hybrida* Vilm. Cv. "Bravo". *Saudi J. Biol. Sci.* **2021**, *28*, 3701–3709. [[CrossRef](#)] [[PubMed](#)]
457. Habas, R.R.; Turker, M.; Ozdemir, F.A. In vitro multiple shoot regeneration from *Petunia hybrida*. *Turkish JAF Sci. Technol.* **2019**, *7*, 1554–1560. [[CrossRef](#)]
458. Panigrahi, J.; Dholu, P.; Shah, T.J.; Gantait, S. Silver nitrate-induced in vitro shoot multiplication and precocious flowering in *Catharanthus roseus* (L.) G. Don, a rich source of terpenoid indole alkaloids. *Plant Cell Tissue Organ Cult.* **2018**, *132*, 579–584. [[CrossRef](#)]
459. Hoda, E. In vitro regeneration and somaclonal variation of *Catharanthus roseus* Don. using leaf and internodal explants. *Alex. Sci. Exch. J.* **2013**, *34*, 452–459.
460. Plessis, H.J.D.; Nikolova, R.V.; Egan, B.A.; Kleynhans, R. Preliminary study on in vitro shoot culture of *Hibiscus coddii* subsp. *barnardii*, an indigenous South African flowering plant. *Ornam. Hortic.* **2021**, *27*, 408–416. [[CrossRef](#)]
461. Seo, S.G.; Ryu, S.H.; Zhou, Y.; Kim, S.H. Development of an efficient protocol for high-frequency regeneration system in *Hibiscus syriacus* L. *J. Plant Biotechnol.* **2017**, *44*, 164–170. [[CrossRef](#)]
462. Kumaria, S.; Kehie, M.; Bhowmik, S.S.D.; Singh, M.; Tandon, P. In vitro regeneration of *Begonia rubrovenia* var. *meisneri* CB Clarke—A rare and endemic ornamental plant of Meghalaya, India. *Indian J. Biotechnol.* **2012**, *11*, 300–303.
463. Govindaraju, S.; Arulselvi, P.I. Effect of cytokinin combined elicitors (l-phenylalanine, salicylic acid and chitosan) on in vitro propagation, secondary metabolites and molecular characterization of medicinal herb—*Coleus aromaticus* Benth (L.). *J. Saudi Soc. Agric. Sci.* **2018**, *17*, 435–444. [[CrossRef](#)]
464. Saito, H.; Nakano, M. Plant regeneration from suspension cultures of *Hosta sieboldiana*. *Plant Cell Tissue Organ Cult.* **2002**, *71*, 23–28. [[CrossRef](#)]
465. Choi, H.; Yang, J.C.; Ryu, S.H.; Yoon, S.M.; Kim, S.Y.; Lee, S.Y. In vitro multiplication of *Hosta* Tratt. species native to Korea by shoot-tip culture. *Korean J. Plant Resour.* **2019**, *32*, 53–62.
466. Pe, P.P.W.; Naing, A.H.; Soe, M.T.; Kang, H.; Park, K.I.; Kim, C.K. Establishment of meristem culture for virus-free and genetically stable production of the endangered plant *Hosta capitata*. *Sci. Hortic.* **2020**, *272*, 109591. [[CrossRef](#)]
467. Ku, B.S.; Cho, M.S. In vitro multiplication of *Hosta plantaginea* 'Joseon' by shoot-tip culture. *Flower Res. J.* **2016**, *24*, 328–336. [[CrossRef](#)]
468. Song, K.; Kim, D.H.; Sivanesan, I. Effect of plant growth regulators on micropropagation of *Hosta minor* (Baker) Nakai through shoot tip culture. *Propag. Ornam. Plants* **2020**, *20*, 57–62.
469. Sharma, U.; Kataria, V.; Shekhawat, N.S. In vitro propagation, ex vitro rooting and leaf micromorphology of *Bauhinia racemosa* Lam.: A leguminous tree with medicinal values. *Physiol. Mol. Biol. Plants* **2017**, *23*, 969–977. [[CrossRef](#)]
470. Acemi, A.; Bayrak, B.; Çakır, M.; Demiryürek, E.; Gün, E.; Gueddari, N.E.E.; Özen, F. Comparative analysis of the effects of chitosan and common plant growth regulators on in vitro propagation of *Ipomoea purpurea* (L.) Roth from nodal explants. *Vitr. Cell Dev. Biol. Plant* **2018**, *54*, 537–544. [[CrossRef](#)]
471. Kher, M.M.; Nataraj, M.; Parmar, H.D.; Buchad, H. Micropropagation of *Merremia quinquefolia* (L.) Hallier F. from nodal explants. *J. Hortic. Res.* **2015**, *23*, 13–16. [[CrossRef](#)]
472. Timofeeva, S.N.; Elkonin, L.A.; Tyrnov, V.S. Micropropagation of *Laburnum anagyroides* Medic. through axillary shoot regeneration. *Vitr. Cell Dev. Biol. Plant* **2014**, *50*, 561–567. [[CrossRef](#)]
473. Chavan, J.J.; Nimbalkar, M.S.; Adsul, A.A.; Kamble, S.S.; Gaikwad, N.B.; Dixit, G.B.; Gurav, R.V.; Bapat, V.A.; Yadav, S.R. Micropropagation and in vitro flowering of endemic and endangered plant *Ceropegia attenuata* Hook. *J. Plant Biochem. Biotechnol.* **2011**, *20*, 276–282. [[CrossRef](#)]
474. Dhir, R.; Shekhawat, G.S. Ecorehabilitation and biochemical studies of *Ceropegia bulbosa* Roxb.: A threatened medicinal succulent. *Acta Physiol. Plant* **2014**, *36*, 1335–1343. [[CrossRef](#)]
475. Dhir, R.; Shekhawat, G.S. Production, storability and morphogenic response of alginate encapsulated axillary meristems and genetic fidelity evaluation of in vitro regenerated *Ceropegia bulbosa*: A pharmaceutically important threatened plant species. *Ind. Crops Prod.* **2013**, *47*, 139–144. [[CrossRef](#)]
476. Krishnareddy, P.V.; Pullaiah, T. In vitro conservation of *Ceropegia elegans*, an endemic plant of South India. *Afr. J. Biotechnol.* **2012**, *11*, 12443–12449. [[CrossRef](#)]
477. Reddy, M.C.; Bramhachari, P.V.; Murthy, K.S.R. Optimized plant tissue culture protocol for in vitro morphogenesis of an endangered medicinal herb *Ceropegia ensifolia* Bedd. *Trop. Subtrop. Agroecosystems* **2015**, *18*, 95–101.
478. Chavan, J.J.; Gaikwad, N.B.; Kshirsagar, P.R.; Umdale, S.D.; Bhat, K.V.; Dixit, G.B.; Yadav, S.R. Highly efficient in vitro proliferation and genetic stability analysis of micropropagated *Ceropegia evansii* by RAPD and ISSR markers: A critically endangered plant of Western Ghats. *Plant Biosyst.* **2015**, *149*, 442–450. [[CrossRef](#)]
479. Chavan, J.J.; Nalawade, A.S.; Gaikwad, N.B.; Gurav, R.V.; Dixit, G.B.; Yadav, S.R. An efficient in vitro regeneration of *Ceropegia noorjahaniae*: An endemic and critically endangered medicinal herb of the Western Ghats. *Physiol. Mol. Biol. Plants* **2014**, *20*, 405–410. [[CrossRef](#)]
480. Chavan, J.J.; Gaikwad, N.B.; Yadav, S.R. High multiplication frequency and genetic stability analysis of *Ceropegia panchganiensis*, a threatened ornamental plant of Western Ghats: Conservation implications. *Sci. Hortic.* **2013**, *161*, 134–142. [[CrossRef](#)]

481. Aslam, J.; Mujib, A.; Sharma, M.P. In vitro micropropagation of *Dracaena sanderiana* Sander ex Mast: An important indoor ornamental plant. *Saudi J. Biol. Sci.* **2013**, *20*, 63–68. [\[CrossRef\]](#)
482. Doğan, S.; Çağlar, G.; Palaz, E.B. The effect of different applications on in vitro bulb development of an endemic hyacinth plant (*Hyacinthus orientalis* L. subsp. *chionophyllus* Wendelbo) grown in Turkey. *Turkish JAF Sci. Technol.* **2020**, *8*, 1713–1719. [\[CrossRef\]](#)
483. Shen, X.; Kane, M.E.; Chen, J. Effects of genotype, explant source, and plant growth regulators on indirect shoot organogenesis in *Dieffenbachia* cultivars. *Vitr. Cell Dev. Biol. Plant* **2008**, *44*, 282–288. [\[CrossRef\]](#)
484. Onsa, R.A.H.; Abdellatif, I.A.; Osman, M.G.; Abdullah, T.L. Effect of growth regulators in in vitro micropropagation of *Ixora coccinea*. *Int. J. Sci. Res. Pub.* **2018**, *8*, 144–149. [\[CrossRef\]](#)
485. Wei, X.; Chen, J.; Zhang, C.; Wang, Z. In vitro shoot culture of *Rhododendron fortunei*: An important plant for bioactive phytochemicals. *Ind. Crops Prod.* **2018**, *126*, 459–465. [\[CrossRef\]](#)
486. Veraplakorn, V. In vitro micropropagation and allelopathic effect of lantana (*Lantana camara* L.). *Agric. Nat. Resour.* **2017**, *51*, 478–484. [\[CrossRef\]](#)
487. Vila, I.; Sales, E.; Ollero, J.; Munoz-Bertomeu, J.; Segura, J.; Arrillaga, I. Micropropagation of oleander (*Nerium oleander* L.). *Hort. Sci.* **2010**, *45*, 98–102. [\[CrossRef\]](#)
488. Rahman, M.S.; Mouri, N.J.; Nandi, N.C.; Akter, S.; Khan, M.S. In vitro micropropagation of *Jasminum grandiflorum* L. *Bangladesh J. Sci. Ind. Res.* **2018**, *53*, 277–282. [\[CrossRef\]](#)
489. Rathod, H.P.; Pohare, M.B.; Bhor, S.A.; Jadhav, K.P.; Batule, B.S.; Shahakar, S.B.; Wagh, S.G.; Wadekar, H.B.; Kelatkar, S.K.; Kulkarni, M.R. In vitro micro propagation of blue passion flower (*Passiflora caerulea* L.). *Trends Biosci.* **2014**, *7*, 3079–3082.
490. Osburn, L.D.; Yang, X.; Li, Y.; Cheng, Z.M. Micropropagation of Japanese honeysuckle (*Lonicera japonica*) and Amur honeysuckle (*L. maackii*) by shoot tip culture. *J. Environ. Hort.* **2009**, *27*, 195–199. [\[CrossRef\]](#)
491. Souza, E.H.; Soares, T.L.; Souza, F.V.D.; Santos-Serejo, J.A. Micropropagation of *Heliconia rostrata* and *Heliconia bihai* from mature zygotic embryos. *Acta Hort.* **2008**, *865*, 315–320. [\[CrossRef\]](#)
492. Winhelmann, M.C.; Tedesco, M.; Lucchese, J.R.; Fior, C.S.; Schafer, G. In vitro propagation of *Angelonia integerrima*. *Rodriguésia* **2019**, *70*, e02232017. [\[CrossRef\]](#)
493. Amer, E.M.; Fetouh, M.I.; Rasha, S.E. Micropropagation and acclimatization of *Gardenia jasminoides* Ellis. *J. Biol. Chem. Environ. Sci.* **2019**, *14*, 107–120.
494. Minerva, G.; Kumar, S. Micropropagation of gerbera (*Gerbera jamesonii* Bolus). In *Protocols for Micropropagation of Selected Economically-important Horticultural Plants*; Lambardi, M., Ozudogru, E., Jain, S., Eds.; Humana Press: Totowa, NJ, USA, 2012; Chapter 24, pp. 305–316.
495. Yalcin-Mendi, Y.; Unek, C.; Eldogan, S.; Akakacar, Y.; Serce, S.; Curuk, P.; Kocaman, E. The effects of different hormones on regeneration of gazania (*Gazania rigens*). *Rom. Biotechnol. Lett.* **2009**, *14*, 4728–4732.
496. Haque, S.M.; Ghosh, B. In vitro completion of sexual life cycle: Production of R1 plants of *Ipomoea quamoclit* L. *Propag. Orn. Plants* **2013**, *13*, 19–24.
497. Kulus, D.; Miler, N. Application of plant extracts in micropropagation and cryopreservation of bleeding heart: An ornamental-medicinal plant species. *Agriculture* **2021**, *11*, 542. [\[CrossRef\]](#)
498. Ghareeb, Z.F.; Taha, L.S. Micropropagation protocol for *Antigonon leptopus* an important ornamental and medicinal plant. *J. Genet. Eng. Biotechnol.* **2018**, *16*, 669–675. [\[CrossRef\]](#)
499. Tour, J.; Ikram, U.; Bilal, M.; Ali, M.; Zaheer, U.; Nawaz, M.A. Efficient in vitro propagation of *Amaranthus viridis* L. using node explants. *Acta Sci. Pol. Hortorum Cultus* **2020**, *19*, 41–51.
500. Bhatt, A.; Stanly, C.; Keng, C.L. In vitro propagation of five *Alocasia* species. *Hortic. Bras.* **2013**, *31*, 210–215. [\[CrossRef\]](#)
501. Belokurova, V.; Lystvan, K.; Volga, D.; Vasylenko, M.; Kuchuk, M. In vitro culture and some biochemical characteristics of *Fittonia albivenis* (Lindl. ex Veitch) Brummitt. *Agrbiobio. Impr. Nut. Health Life Qual.* **2019**, *3*, 186–194.
502. Qu, L.; Chen, J.; Henny, R.J.; Huang, Y.; Caldwell, R.D.; Robinson, C.A. Thidiazuron promotes adventitious shoot regeneration from pothos (*Epipremnum aureum*) leaf and petiole explants. *Vitr. Cell Dev. Biol. Plant* **2014**, *50*, 561–567. [\[CrossRef\]](#)
503. Hung, C.Y.; Zhang, J.; Bhattacharya, C.; Li, H.; Kittur, F.S.; Oldham, C.E.; Wei, X.; Burkey, K.O.; Chen, J.; Xie, J. Transformation of long-lived albino *Epipremnum aureum* ‘Golden Pothos’ and restoring chloroplast development. *Front. Plant Sci.* **2021**, *12*, 647507. [\[CrossRef\]](#)
504. Khatri, P.; Rana, J.S.; Sindhu, A.; Jamdagni, P. Effect of additives on enhanced in-vitro shoot multiplication and their functional group identification of *Chlorophytum borivillianum* Sant. Et Fernand. *SN Appl. Sci.* **2019**, *1*, 1105. [\[CrossRef\]](#)
505. Faisal, M.; Ahmad, N.; Anis, M.; Alatar, A.A.; Qahtan, A.A. Auxin-cytokinin synergism in vitro for producing genetically stable plants of *Ruta graveolens* using shoot tip meristems. *Saudi J. Biol. Sci.* **2018**, *25*, 273–277. [\[CrossRef\]](#) [\[PubMed\]](#)
506. Faisal, M.; Ahmad, N.; Anis, M. In vitro regeneration and mass propagation of *Ruta graveolens* L.—A multipurpose shrub. *Hort. Sci.* **2005**, *40*, 1478–1480. [\[CrossRef\]](#)
507. Nowakowska, K.; Pacholczak, A.; Tepper, W. The effect of selected growth regulators and culture media on regeneration of *Daphne mezereum* L. ‘Alba’. *Rend. Fis. Acc. Lincei* **2019**, *30*, 197–205. [\[CrossRef\]](#)
508. Nahar, S.J.; Shimasaki, K. Application of 5-aminolevulinic acid for the in vitro micropropagation of *Cymbidium* as a potential novel plant regulator. *Environ. Control Biol.* **2014**, *52*, 117–121. [\[CrossRef\]](#)
509. Nahar, S.J.; Syed, M.H.; Shimasaki, K. Organogenesis of *Cymbidium* orchid using elicitors. *J. Plant Develop* **2015**, *22*, 13–20.

510. Teixeira da Silva, J.A. The effect of ethylene inhibitors (AgNO₃, AVG), an ethylene-liberating compound (CEPA) and aeration on the formation of protocorm-like bodies of hybrid *Cymbidium* (Orchidaceae). *Front. Biol.* **2013**, *8*, 606–610. [\[CrossRef\]](#)
511. Restanto, D.P.; Santoso, B.; Kriswanto, B.; Supardjono, S. The application of chitosan for protocorm like bodies (PLB) induction of orchid (*Dendrobium* sp) in vitro. *Agric. Agric. Sci. Procedia* **2016**, *9*, 462–468. [\[CrossRef\]](#)
512. Pornpienpakdee, P.; Singhasurasak, R.; Chaiyasap, P.; Pichyangkura, R.; Bunjongrat, R.; Chadchawan, S.; Limpanavech, P. Improving the micropropagation efficiency of hybrid *Dendrobium* orchids with chitosan. *Sci. Hortic.* **2010**, *124*, 490–499. [\[CrossRef\]](#)
513. Nge, K.L.; Nwe, N.; Chandkrachang, S.; Stevens, W.F. Chitosan as a growth stimulator in orchid tissue culture. *Plant Sci.* **2006**, *170*, 1185–1190. [\[CrossRef\]](#)
514. Kananont, N.; Pichyangkura, R.; Chanprame, S.; Chadchawan, S.; Limpanavech, P. Chitosan specificity for the in vitro seed germination of two *Dendrobium* orchids (Asparagales: Orchidaceae). *Sci. Hortic.* **2010**, *124*, 239–247. [\[CrossRef\]](#)
515. Soares, J.D.R.; Pasqual, M.; Rodrigues, F.A.; Villa, F.; Araujo, A.G.D. Silicon sources in the micropropagation of the *Cattleya* group orchid. *Acta Sci. Agron.* **2011**, *33*, 503–507.
516. Matos, A.V.C.D.S.D.; Oliveira, B.S.D.; Oliveira, M.E.B.S.D.; Cardoso, J.C. AgNO₃ improved micropropagation and stimulate in vitro flowering of rose (*Rosa x hybrida*) cv. Sena. *Ornam. Hortic.* **2020**, *27*, 33–40. [\[CrossRef\]](#)
517. Cardoso, J.C. Silver nitrate enhances in vitro development and quality of shoots of *Anthurium andraeanum*. *Sci. Hortic.* **2019**, *253*, 358–363. [\[CrossRef\]](#)
518. Zahara, M.; Datta, A.; Boonkorkaew, P.; Mishra, A. The effects of different media, sucrose concentrations and natural additives on plantlet growth of *Phalaenopsis* hybrid 'Pink'. *Braz. Arch. Biol. Technol.* **2017**, *60*, 1–15. [\[CrossRef\]](#)
519. Pyati, A.N.; Murthy, H.N.; Hahn, E.J.; Paek, K.Y. In vitro propagation of *Dendrobium macrostachyum* Lindl.—A threatened orchid. *Indian J. Exp. Biol.* **2002**, *40*, 620–623.
520. Pant, B.; Chand, K.; Paudel, M.R.; Joshi, P.R.; Thapa, B.B.; Park, S.Y.; Shakya, S.; Thakuri, L.S.; Rajbahak, S.; Sah, A.K.; et al. Micropropagation, antioxidant and anticancer activity of pineapple orchid: *Dendrobium densiflorum* Lindl. *J. Plant Biochem. Biotechnol.* **2022**, *31*, 399–409. [\[CrossRef\]](#)
521. Sinha, P.; Roy, S.K. Regeneration of an indigenous orchid, *Vanda teres* (Roxb.) Lindl. through In vitro culture. *Plant Tissue Cult.* **2004**, *14*, 55–61.
522. Samiei, L.; Pahnehkolayi, M.D.; Tehranifar, A.; Karimian, Z. Organic and inorganic elicitors enhance in vitro regeneration of *Rosa canina*. *J. Genet. Eng. Biotechnol.* **2021**, *19*, 60. [\[CrossRef\]](#)
523. Zayed, R.; El-Shamy, H.; Berkov, S.; Bastida, J.; Codina, C. In vitro micropropagation and alkaloids of *Hippeastrum vittatum*. *Vitr. Cell Dev. Biol. Plant* **2011**, *47*, 695–701. [\[CrossRef\]](#)
524. Le, V.T.; Tanaka, M. Effects of red and blue light-emitting diodes on callus induction, callus proliferation, and protocorm-like body formation from callus in *Cymbidium* orchid. *Environ. Control Biol.* **2004**, *42*, 57–64.
525. Kaewjampa, N.; Shimasaki, K. Effects of green LED lighting on organogenesis and superoxide dismutase (SOD) activities in protocorm-like bodies (PLBs) of *Cymbidium* cultured in vitro. *Environ. Control Biol.* **2012**, *50*, 247–254. [\[CrossRef\]](#)
526. Teixeira da Silva, J.A. The response of protocorm-like bodies of nine hybrid *Cymbidium* cultivars to light-emitting diodes. *Environ. Exp. Biol.* **2014**, *12*, 155–159.
527. Wongnok, A.; Piluek, C.; Techasilpitak, T.; Tantivivat, S. Effects of light emitting diodes on micropropagation of *Phalaenopsis* orchids. *Acta Hortic.* **2008**, *788*, 149–156. [\[CrossRef\]](#)
528. Billore, V.; Jain, M.; Suprasanna, P. Monochromatic radiation through light-emitting diode (LED) positively augments in vitro shoot regeneration in Orchid (*Dendrobium sonia*). *Can. J. Biotech.* **2017**, *1*, 50. [\[CrossRef\]](#)
529. Billore, V.; Mirajkar, S.J.; Suprasanna, P.; Jain, M. Gamma irradiation induced effects on in vitro shoot cultures and influence of monochromatic light regimes on irradiated shoot cultures of *Dendrobium sonia* orchid. *Biotechnol. Rep.* **2019**, *22*, e00343. [\[CrossRef\]](#) [\[PubMed\]](#)
530. Cybularz-Urban, T.; Hanus-Fajerska, E.; Swiderski, A. Effect of light wavelength on in vitro organogenesis of a *Cattleya* hybrid. *Acta Biol. Crac. Ser. Bot.* **2007**, *49*, 113–118.
531. Mengxi, L.; Zhigang, X.; Yang, Y.; Yijie, F. Effects of different spectral lights on *Oncidium* PLBs induction, proliferation, and plant regeneration. *Plant Cell Tissue Organ Cult.* **2011**, *106*, 1–10. [\[CrossRef\]](#)
532. Luan, V.Q.; Huy, N.P.; Nam, N.B.; Huong, T.T.; Hien, V.T.; Hien, N.T.T.; Hai, N.T.; Tinh, D.K.; Nhut, D.T. Ex vitro and in vitro *Paphiopedilum delenatii* Guillaumin stem elongation under light-emitting diodes and shoot regeneration via stem node culture. *Acta Physiol. Plant* **2015**, *37*, 1–11. [\[CrossRef\]](#)
533. Godo, T.; Fujiwara, K.; Guan, K.; Miyoshi, K. Effects of wavelength of LED-light on in vitro asymbiotic germination and seedling growth of *Bletilla ochracea* Schltr. (Orchidaceae). *Plant Biotechnol.* **2011**, *28*, 398–400. [\[CrossRef\]](#)
534. Baque, A.M.; Shin, Y.K.; Elshamari, T.; Lee, E.J.; Paek, K.Y. Effect of light quality, sucrose and coconut water concentration on the microporpagation of *Calanthe* hybrids ('Bukduseong' 'Hyesung' and 'Chunkwang' 'Hyesung'). *Aust. J. Crop Sci.* **2011**, *5*, 1247–1254.
535. Shin, K.S.; Murthy, H.N.; Heo, J.W.; Hahn, E.J.; Paek, K.Y. The effect of light quality on the growth and development of in vitro cultured *Doritaenopsis* plants. *Acta Physiol. Plant.* **2008**, *30*, 339–343. [\[CrossRef\]](#)
536. Favetta, V.; Colombo, R.C.; Mangili Júnior, J.F.; de Faria, R.T. Light sources and culture media in the in vitro growth of the Brazilian orchid *Microlaelia lundii*. *Semin. Cienc. Agrar.* **2017**, *38*, 1775–1784. [\[CrossRef\]](#)

537. Azmi, N.S.; Ahmad, R.; Ibrahim, R. Fluorescent light (FL), red led and blue led spectrums effects on in vitro shoots multiplication. *J. Teknol.* **2016**, *78*, 6. [\[CrossRef\]](#)
538. Azmi, N.S.; Ahmad, R.; Ibrahim, R. Effects of red and blue (RB) LED on the in vitro growth of *Rosa kordesii* in multiplication phase. In *2nd International Conference on Agriculture and Biotechnology*; IACSIT Press: Singapore, 2014; Volume 79.
539. Miler, N.; Kulus, D.; Woźny, A.; Rymarz, D.; Hajzer, M.; Wierzbowski, K.; Nelke, R.; Szeffs, L. Application of wide-spectrum light-emitting diodes in micropropagation of popular ornamental plant species: A study on plant quality and cost reduction. *Vitr. Cell Dev. Biol. Plant* **2019**, *55*, 99–108. [\[CrossRef\]](#)
540. Kurilčik, A.; Miklušytė-Čanova, R.; Dapkūnienė, S.; Žilinskaitė, S.; Kurilčik, G.; Tamulaitis, G.; Duchovskis, P.; Žukauskas, A. In vitro culture of *Chrysanthemum* plantlets using light-emitting diodes. *Cent. Eur. J. Biol.* **2008**, *3*, 161–167. [\[CrossRef\]](#)
541. Kim, S.J.; Hahn, E.J.; Heo, J.W.; Paek, K.Y. Effects of LEDs on net photosynthetic rate, growth and leaf stomata of chrysanthemum plantlets in vitro. *Sci. Hortic.* **2004**, *101*, 143–151. [\[CrossRef\]](#)
542. Cioć, M.; Kalisz, A.; Żupnik, M.; Pawłowska, B. Different LED light intensities and 6-benzyladenine concentrations in relation to shoot development, leaf architecture, and photosynthetic pigments of *Gerbera jamesonii* Bolus in vitro. *Agronomy* **2019**, *9*, 358. [\[CrossRef\]](#)
543. Pawłowska, B.; Cioć, M.; Prokopiuk, B. How LED light rooting in vitro affected *Gerbera* acclimatization efficiency. *Acta Hortic.* **2018**, *1201*, 583–590. [\[CrossRef\]](#)
544. Pawłowska, B.; Żupnik, M.; Szewczyk-Taranek, B.; Cioć, M. Impact of LED light sources on morphogenesis and levels of photosynthetic pigments in *Gerbera jamesonii* grown in vitro. *Hortic. Environ. Biotechnol.* **2018**, *59*, 115–123. [\[CrossRef\]](#)
545. Martínez-Estrada, E.; Caamal-Velázquez, J.H.; Morales-Ramos, V.; Bello-Bello, J.J. Light emitting diodes improve in vitro shoot multiplication and growth of *Anthurium andreanum* Lind. *Propag. Orn. Plants* **2016**, *16*, 3–8.
546. Budiarto, K. Spectral quality affects morphogenesis on anthurium plantlet during in vitro culture. *AGRIVITA J. Agric. Sci.* **2010**, *32*, 234–240.
547. Rodrigues, P.H.V.; Arruda, F.; Forti, V.A. Slow-grown in vitro conservation of *Heliconia champneiana* cv. Splash under different light spectra. *Sci. Agric.* **2018**, *75*, 163–166. [\[CrossRef\]](#)
548. Cho, K.H.; Laux, V.Y.; Wallace-Springer, N.; Clark, D.G.; Folta, K.M.; Colquhoun, T.A. Effects of light quality on vegetative cutting and in vitro propagation of coleus (*Plectranthus scutellarioides*). *Hort. Sci.* **2019**, *54*, 926–935. [\[CrossRef\]](#)
549. Dewir, Y.H.; Chakrabarty, D.; Kim, S.J.; Hahn, E.J.; Paek, K.Y. Effect of light-emitting diode on growth and shoot proliferation of *Euphorbia millii* and *Spathiphyllum cannifolium*. *J. Kor. Soc. Hort. Sci.* **2005**, *46*, 375–379.
550. Lian, M.L.; Murthy, H.N.; Paek, K.Y. Effects of light emitting diodes (LEDs) on the in vitro induction and growth of bulblets of *Lilium* oriental hybrid ‘Pesaro’. *Sci. Hortic.* **2002**, *94*, 365–370. [\[CrossRef\]](#)
551. Wu, H.C.; Lin, C.C. Red light-emitting diode light irradiation improves root and leaf formation in difficult-to-propagate *Protea cynaroides* L. plantlets in vitro. *Hort. Sci.* **2012**, *47*, 1490–1494. [\[CrossRef\]](#)
552. Pinheiro, M.V.M.; Schmidt, D.; Diel, M.I.; Santos, J.D.; Thiesen, L.A.; Azevedo, G.C.V.D.; Holz, E. In vitro propagation of alpinia cultivars in different light sources. *Ornam. Hortic.* **2019**, *25*, 49–54. [\[CrossRef\]](#)
553. Moon, H.K.; Park, S.Y.; Kim, Y.W.; Kim, C.S. Growth of Tsuru-rindo (*Tripterospermum japonicum*) cultured in vitro under various sources of light-emitting diode (LED) irradiation. *J. Plant Biol.* **2006**, *49*, 174–179. [\[CrossRef\]](#)
554. Kwon, A.R.; Cui, H.Y.; Lee, H.; Lee, H.; Shin, H.; Kang, K.S.; Park, S.Y. Light quality affects shoot regeneration, cell division, and wood formation in elite clones of *Populus euramericana*. *Acta Physiol. Plant* **2015**, *37*, 65. [\[CrossRef\]](#)
555. Nahar, S.J.; Haque, S.M.; Kazuhiko, S. Application of chondroitin sulfate on organogenesis of two *Cymbidium* spp. under different sources of lights. *Not. Sci. Biol.* **2016**, *8*, 156–160. [\[CrossRef\]](#)
556. Nahar, S.J.; Haque, S.M.; Shimasaki, K. Effect of light quality and plant growth regulator on organogenesis of orkid *Cymbidium dayanum*. *Bangladesh J. Agric. Res.* **2017**, *42*, 185–190. [\[CrossRef\]](#)
557. Gabryszewska, E.; Rudnicki, R. The influence of light quality on the shoot proliferation and rooting of *Gerbera jamesonii* in vitro. *Acta Agrobot.* **1995**, *48*, 105–111. [\[CrossRef\]](#)
558. Cioć, M.; Szewczyk, A.; Żupnik, M.; Kalisz, A.; Pawłowska, B. LED lighting affects plant growth, morphogenesis and phytochemical contents of *Myrtus communis* L. in vitro. *Plant Cell Tissue Organ Cult.* **2018**, *132*, 433–447. [\[CrossRef\]](#)
559. Zielińska, S.; Piątczak, E.; Kozłowska, W.; Bohater, A.; Jezierska-Domaradzka, A.; Kolniak-Ostek, J.; Matkowski, A. LED illumination and plant growth regulators’ effects on growth and phenolic acids accumulation in *Moluccella laevis* L. in vitro cultures. *Acta Physiol. Plant* **2020**, *42*, 72. [\[CrossRef\]](#)