

DAFTAR PUSTAKA

- Ali, D., Alarifi, S., & Pandian, A. (2021). Somatic embryogenesis and in vitro plant regeneration of *Bacopa monnieri* (Linn.) Wettst., a potential medicinal water hyssop plant. *Saudi Journal of Biological Sciences*, 28(1), 353–359. <https://doi.org/10.1016/j.sjbs.2020.10.013>
- Angio, M. H., Rifqi, E., Kebun, F., Purwodadi, R., Riset, P., Tumbuhan, K., & Raya -Brin, K. (2021). Kepel (*Stelechocarpus burahol* (Blume) Hook & Thompson), buah langka khas Keraton Yogyakarta: sebuah koleksi Kebun Raya Purwodadi. Dalam *Warta Kebun Raya* (Vol. 19, Nomor 2). <http://www.plantsoftheworldonline.org/taxon/urn:lsid:ipni.org:names:75160-1#distribution->
- Anwar, N., & Isda, M. N. (2021). Respons Pembentukan Kalus Daun Pegagan (*Centella asiatica* (L.) Urb.) dengan Penambahan Naphtalene Acetic Acid dan Benzyl Amino Purin Secara In Vitro. *Biota : Jurnal Ilmiah Ilmu-Ilmu Hayati*, 136–142. <https://doi.org/10.24002/biota.v5i3.3232>
- Chen, K., Qu, C., Zhang, X. Y., Wang, W., Gu, C. R., Liu, G. F., Yu, Q. Bin, Yang, C. P., & Jiang, J. (2022). Molecular mechanism of leaf adaxial upward curling caused by BpPIN3 suppression in *Betula pendula*. *Frontiers in Plant Science*, 13. <https://doi.org/10.3389/fpls.2022.1060228>
- Danish, S., Rehman, R. A., Maqbool, A., Ali, M., Idrees, M., Irshad, I., Munir, S., Alahmadi, T. A., & Ansari, M. J. (2024). Effects of benzyl amino purine on growth, antioxidants, and chlorophyll contents of *Phaseolus vulgaris* L. cultivated under heat stress. *Pakistan Journal of Botany*, 56(5), 1687–1696. [https://doi.org/10.30848/pjb2024-5\(29\)](https://doi.org/10.30848/pjb2024-5(29))
- Deswiniyanti, N. W., & Lestari, N. K. D. (2020). In Vitro Propagation of *Lilium longiflorum* Bulbs Using NAA and BAP Plant Growth Regulator Treatment. *KnE Life Sciences*. <https://doi.org/10.18502/cls.v5i2.6437>

- Fehér, A. (2023). A common molecular signature indicates the pre-meristematic state of plant calli. Dalam *International Journal of Molecular Sciences* (Vol. 24, Nomor 17). Multidisciplinary Digital Publishing Institute (MDPI). <https://doi.org/10.3390/ijms241713122>
- Fitrianingsih, A. (2021). *Morfologi, Taksonomi, dan Filosofi Tumbuhan*. Yayasan Insan Cendekia.
- Ginting, N. B. P. O., Restiani, R., Prasetyaningsih, A., & Semarayani, C. I. M. (2023). Effect of Ascorbic Acid, Activated Charcoal and Dark Incubation on Browning Intensity of *Saurauia bracteosa* In Vitro Culture. *Biosaintifika*, 15(3), 401–411. <https://doi.org/10.15294/biosaintifika.v15i3.48439>
- Habibah, N. A., Sumadi, & Ambar, S. (2013). Optimasi sterilisasi permukaan daun dan eliminasi endofit pada Burahol. *Biosaintifika*, 5(2), 94–99. <http://journal.unnes.ac.id/nju/index.php/biosaintifika>
- Handayani, A. T., Sandra, E., & Faizah, H. (2022). Optimasi sterilisasi eksplan daun tanaman lidah mertua (*Sansevieria* sp.) pada kultur in vitro. *Bioscientist : Jurnal Ilmiah Biologi*, 10(1), 109. <https://doi.org/10.33394/bioscientist.v10i1.4808>
- Handayani, E., Parjanto, -, Cahyani, V. R., & Nandariyah, -. (2021). Diversity of morphologically vegetative characters of kepel (*Stelechocarpus burahol*): study in Yogyakarta Palace Region, Indonesia. *International Journal on Advanced Science, Engineering and Information Technology*, 11(4), 1633. <https://doi.org/10.18517/ijaseit.11.4.15938>
- Joshi, S., Hill, K., Chakrabarti, M., & Perry, S. E. (2023). Regulatory mechanisms of the LBD40 transcription factor in *Arabidopsis thaliana* somatic embryogenesis. *Plant Direct*, 7(12). <https://doi.org/10.1002/pld3.547>
- Joshi, S., Paul, P., Hartman, J. M., & Perry, S. E. (2022). AGL15 Promotion of somatic embryogenesis: role and molecular mechanism. Dalam *Frontiers in Plant Science* (Vol. 13). Frontiers Media S.A. <https://doi.org/10.3389/fpls.2022.861556>

- Kurniasari, D., Astuti, Yulianti, E., Suyitno, Sugiyarto, L., & Sartika Mercuriani, I. (2019). Increasing rhynchosyilis retusa's callus formation by immersing explant in ascorbic acid and planting on activated charcoal contained medium. *Journal of Physics: Conference Series*, 1241(1). <https://doi.org/10.1088/1742-6596/1241/1/012060>
- Lee, K., Yoon, H., Park, O.-S., Lim, J., Kim, S.-G., & Seo, P. J. (2024). ESR2–HDA6 complex negatively regulates auxin biosynthesis to delay callus initiation in Arabidopsis leaf explants during tissue culture. *Plant Communications*, 5(7). <https://doi.org/10.1016/j.xplc.2024.100892>
- Li, M., Li, X. T., Zhang, X. H., Ai, J., Shi, G. L., Wang, Z. X., Liang, L. J., Liu, J. S., & Sun, D. (2025). Optimization of somatic embryogenesis system and accumulation of secondary metabolites in callus of Schisandra chinensis (Turcz.) Baill. *Industrial Crops and Products*, 225. <https://doi.org/10.1016/j.indcrop.2025.120572>
- Liu, C., Fan, H., Zhang, J., Wu, J., Zhou, M., Cao, F., Tao, G., & Zhou, X. (2024). Combating browning: mechanisms and management strategies in *in vitro* culture of economic woody plants. *Forestry Research*, 4(1), 0–0. <https://doi.org/10.48130/forres-0024-0026>
- Mahood, H. E., Sarropoulou, V., & Tzatzani, T. T. (2022). Effect of explant type (leaf, stem) and 2,4-D concentration on callus induction: influence of elicitor type (biotic, abiotic), elicitor concentration and elicitation time on biomass growth rate and costunolide biosynthesis in gazania (Gazania rigens) cell suspension cultures. *Bioresources and Bioprocessing*, 9(1). <https://doi.org/10.1186/s40643-022-00588-2>
- Nic-Can, G. I., & Loyola-Vargas, V. M. (2016). The role of the auxins during somatic embryogenesis. Dalam *Somatic Embryogenesis: Fundamental Aspects and Applications* (hlm. 171–182). Springer International Publishing. https://doi.org/10.1007/978-3-319-33705-0_10
- Pais, M. S. (2019). Somatic embryogenesis induction in woody species: The future after OMICs data assessment. Dalam *Frontiers in Plant Science* (Vol. 10). Frontiers Media S.A. <https://doi.org/10.3389/fpls.2019.00240>

- Pardede, Y., Mursyanti, E., & Sidharta, B. R. (2021). Pengaruh hormon terhadap induksi embrio somatik kacapiring (*Gardenia jasminoides*) dan potensi aplikasinya dalam pembuatan benih sintetik. *Biota : Jurnal Ilmiah Ilmu-Ilmu Hayati*, 6(3), 162–177. <https://doi.org/10.24002/biota.v6i3.4093>
- Ponmurugan, P., & Kumar, S. K. (2012). *Applications of Plant Tissue Culture* (1 ed.). New Age International Publishers.
- Ramadhina, I. A., Adriani, L., & Sujana, E. (2019). Pengaruh pemberian ekstrak daun kepel (*Stelechocarpus burahol*) terhadap kadar kolesterol darah dan telur puyuh (*Coturnix-coturnix japonica*). *JNTTIP: Jurnal Nutrisi Ternak Tropis dan Ilmu Pakan*, 1(1), 34–40.
- Ramírez-Mosqueda, M. A. (2022). *Overview of Somatic Embryogenesis* (hlm. 1–8). https://doi.org/10.1007/978-1-0716-2485-2_1
- Rocha, D. I., Kurczyńska, E., Potocka, I., Steinmacher, D. A., & Otoni, W. C. (2016). Histology and histochemistry of somatic embryogenesis. Dalam *Somatic Embryogenesis: Fundamental Aspects and Applications* (hlm. 471–494). Springer International Publishing. https://doi.org/10.1007/978-3-319-33705-0_26
- Salaün, C., Lepiniec, L., & Dubreucq, B. (2021). Genetic and molecular control of somatic embryogenesis. *Plants*, 10(7). <https://doi.org/10.3390/plants10071467>
- Shadrina, N. A., Widyanengsih, E., Berliana Eiko, N., Aulia Putri, N., Sulastri, N., Dzulfiana, N., Rajebi, O., & Sulvita, W. (2022). Analisis fitokimia dan aktivitas farmakologi tanaman kepel (*Stelechocarpus burahol*) terhadap beberapa penyakit : review. *Jurnal Ilmiah Farmasi*, 2(3), 14–21.
- Sibarani, D. S., Restiani, R., & Prasetyaningsih, A. (2024). Browning Prevention Method in Kepel (*Stelechocarpus burahol* (Blume) Hook.f. & Thomson) in Vitro Culture. *JURNAL PEMBELAJARAN DAN BIOLOGI NUKLEUS*, 10(1), 243–253. <https://doi.org/10.36987/jpbn.v10i1.5464>

- Soeroto, E. H., Priatmodjo, D., Wisnubudi, G., & Sukartono, I. G. S. (2018). *Pembibitan dan Pengembangan Tanaman Buah Lokal* (1 ed.). Pusat Pemberdayaan Masyarakat Universitas Nasional.
- Solórzano-Cascante, P., Sánchez-Chiang, N., & Jiménez, V. M. (2018). Explant type, culture system, 6-benzyladenine, meta-topolin and encapsulation affect indirect somatic embryogenesis and regeneration in carica papaya l. *Frontiers in Plant Science*, 871. <https://doi.org/10.3389/fpls.2018.01769>
- Suwarni Wahyudiningsih, T., Farid, N., Dilli Novianto, E., & Tia Noviantika. (2022). Induksi kalus dari eksplan biji immature kepel (*Stelechocarpus burahol* (Bl.) Hook.f. & Th.) secara in vitro. Dalam *Jurnal Pemuliaan Tanaman Hutan* (Vol. 16, Nomor 1).
- Vijayalakshmi, U., & Shourie, A. (2016). Remedial effect of ascorbic acid and citric acid on oxidative browning of *Glycyrrhiza glabra* callus cultures. *Biotechnologia*, 97(3), 179–186. <https://doi.org/10.5114/bta.2016.62355>
- Wang, J., & Fang, S. (2023). Effects of different anti-browning agents on enzyme activity and growth in callus of *Cyclocarya paliurus* | 不同抗褐化剂对青钱柳愈伤组织 酶活性和生长的影响. *Journal of Nanjing Forestry University (Natural Sciences Edition)*, 47(6), 167–174. <https://doi.org/10.12302/j.issn.1000-2006.202203071>
- Xu, X., Zhu, D., Huan, Z., Geng, X., & Ran, J. (2023). Mechanisms of tissue culture browning in five Magnoliaceae family species. *Plant Cell, Tissue and Organ Culture*. <https://doi.org/10.1007/s11240-023-02568-6>
- Zhai, N., & Xu, L. (2021). Pluripotency acquisition in the middle cell layer of callus is required for organ regeneration. *Nature Plants*, 7(11), 1453–1460. <https://doi.org/10.1038/s41477-021-01015-8>

LAMPIRAN

Tabel 6. Hasil “Two-Way Anova” terhadap perlakuan vitamin C dan waktu imersi terhadap *survival rate* eksplan.

Sumber variansi	Jumlah kuadrat	Derajat kebebasan	Rataan kuadrat	F _{hitung}	Signifikansi
Model terkoreksi	59,400 ^a	19	3,126	7,816	<0,001
Nilai intersep	504,600	1	504,600	1261,500	<0,001
Vitamin C	35,900	4	8,975	22,438	<0,001
Waktu Imersi	2,733	3	0,911	2,278	0,094
Vitamin C*Waktu Imersi	20,767	12	1,731	4,326	<0,001
Error	16,000	40	0,400		
Total	580,000	60			
	75,400	59			

a. R kuadrat = 0,788 (R kuadrat terkoreksi = 0,687)

Tabel 7. Hasil “Two-Way Anova” terhadap kombinasi hormon BAP dan 2,4-D untuk induksi kalus daun kepel.

Sumber variansi	Jumlah kuadrat	Derajat kebebasan	Rataan kuadrat	F _{hitung}	Signifikansi
Model terkoreksi	32,320 ^a	14	2,309	9,894	<0,001
Nilai intersep	7,680	1	7,680	32,914	<0,001
BAP	6,720	2	3,360	14,400	<0,001
2,4-D	12,053	4	3,013	12,914	<0,001
BAP*2,4-D	13,547	8	1,693	7,257	<0,001
Error	14,000	60	0,233		
Total	54,000	75			
Corrected Total	46,320	74			

a. R kuadrat = 0,698 (R kuadrat terkoreksi = 0,627)

Tabel 8. Hari Pertama Terbentuk Kalus

Perlakuan	Kode Kalus	Hari Pertama Terbentuk Kalus	Rata-rata
2,4-D 4 ppm dan BAP 0 ppm	D4BAP01	17	20,330
	D4BAP02	17	
	D4BAP03	17	
	D4BAP04	21	
	D4BAP05	25	
	D4BAP06	25	
2,4-D 4 ppm dan BAP 0,5 ppm	D4BAP051	17	21,38
	D4BAP052	17	
	D4BAP053	17	
	D4BAP054	17	
	D4BAP055	25	
	D4BAP056	25	
	D4BAP057	25	
	D4BAP058	28	
2,4-D 5 ppm dan BAP 0,5 ppm	D5BAP051	17	22,00
	D5BAP052	17	
	D5BAP053	21	
	D5BAP054	21	
	D5BAP055	21	
	D5BAP056	21	
	D5BAP057	21	
	D5BAP058	25	
	D5BAP059	28	
	D5BAP0510	28	

Tabel 9. Hasil pengamatan perlakuan asam askorbat dan waktu imersi terhadap persentase *survival rate* eksplan

Perlakuan		%Survival rate					Rata-rata
Asam askorbat (ppm)	Waktu Imersi (menit)	Ulangan					
		1	2	3	4	5	
50	10	40%	40%	20%	40%	20%	32%
	20	20%	40%	40%	40%	20%	32%
	30	20%	20%	20%	20%	20%	20%
	40	0%	20%	0%	20%	0%	8%
75	10	60%	40%	40%	60%	40%	48%
	20	40%	20%	0%	20%	20%	20%
	30	20%	20%	40%	20%	40%	28%
	40	40%	40%	60%	60%	40%	48%
100	10	20%	60%	40%	40%	40%	40%
	20	20%	40%	40%	20%	40%	32%
	30	20%	60%	40%	20%	60%	40%
	40	40%	40%	40%	40%	40%	40%
125	10	60%	20%	40%	40%	40%	40%
	20	40%	60%	60%	40%	60%	52%
	30	60%	60%	40%	60%	40%	52%
	40	20%	40%	20%	40%	20%	28%
150	10	60%	60%	60%	60%	60%	60%
	20	40%	40%	60%	40%	20%	40%
	30	100%	100%	100%	100%	100%	100%
	40	60%	80%	80%	80%	60%	72%

Tabel 10. Hasil pengamatan kombinasi hormon BAP dan 2,4-D terhadap persentase pembentukan kalus daun kepel

Perlakuan Hormon		Persentase Pembentukan Kalus					Rata-rata
BAP (ppm)	2,4-D (ppm)	Ulangan					
		1	2	3	4	5	
0	1	0%	0%	0%	0%	0%	0%
	2	0%	0%	0%	0%	0%	0%
	3	0%	0%	0%	0%	0%	0%
	4	50%	0%	25%	25%	50%	30%
	5	0%	0%	0%	0%	0%	0%
0,5	1	0%	0%	0%	0%	0%	0%
	2	0%	0%	0%	0%	0%	0%
	3	0%	0%	0%	0%	0%	0%
	4	25%	50%	25%	50%	50%	40%
	5	75%	100%	25%	50%	0%	50%
1	1	0%	0%	0%	0%	0%	0%
	2	0%	0%	0%	0%	0%	0%
	3	0%	0%	0%	0%	0%	0%
	4	0%	0%	0%	0%	0%	0%
	5	0%	0%	0%	0%	0%	0%

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