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Title: **Axenic cultivation of bryophytes: cultivated species checklist**

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Supplementary material caption:

A document listing all references (enumerated) that served as the original sources of data analyzed in this study.

1. Sabovljevic A, Sabovljevic M & Jockovic N. 2009. In vitro culture and secondary metabolite isolation in bryophytes. *Methods in Molecular Biology (Clifton, N.J.)*, **547**: 117–128. https://doi.org/10.1007/978-1-60327-287-2_10
2. Sabovljevic M, Bijelovic A & Dragicevic I. 2003. In vitro culture of mosses: *Aloina aloides* (K.F. Schultz) Kindb., *Brachythecium velutinum* (Hedw.) B.S.G., *Ceratodon purpureus* (Hedw.) Brid., *Eurhynchium praelongum* (Hedw.) B.S.G. and *Grimmia pulvinata* (Hedw.) Sm. *Turkish Journal of Botany* **27**: 441–446.
3. Zinsmeister HD, Becker H & Eicher T. 1991. Bryophytes, a source of biologically active, naturally occurring material? *Angewandte Chemie* **30**(2): 130–147. <https://doi.org/10.1002/anie.199101301>
4. Rowntree JK. 2006. Development of novel methods for the initiation of in vitro bryophyte cultures for conservation. *Plant Cell, Tissue and Organ Culture* **87**(2): 191–201. <https://doi.org/10.1007/s11240-006-9154-7>
5. Saboljević A, Soković M, Glamoclija J, Ćirić A, Vujičić M, Pejin B & Saboljević M. 2010. Comparison of extract bio-activities of *in-situ* and *in vitro* grown selected bryophyte species. *African Journal of Microbiology Research* **4**: 808–812.
6. Sabovljevic A, Sabovljevic M, Grubisic, D., & Konjevic R. (2005). The effect of sugars on development of two moss species (*Bryum argenteum* and *Atrichum undulatum*) during *in vitro* culture (Hedw.) P.Beauv.). *Belgian journal of botany* **138**: 79-84. <https://doi.org/10.2307/20794569>
7. Beike AK, Horst NA & Rensing SA. 2010. Axenic bryophyte *in vitro* cultivation. *Journal of Endocytobiosis and Cell Research* **20**: 102-108.
8. Wohl J & Petersen M. 2020. Functional expression and characterization of cinnamic acid 4-hydroxylase from the hornwort *Anthoceros agrestis* in *Physcomitrella patens*. *Plant Cell Reports* **39**(5): 597–607. <https://doi.org/10.1007/s00299-020-02517-z>
9. Vujičić M, Sabovljević A & Sabovljević M. 2009. Axenically culturing the bryophytes: a case study of the moss *Dicranum scoparium* Hedw. (Dicranaceae, Bryophyta). *Botanica Serbica* **33**(2): 137-140.
10. Mallón R, Barros P, Luzardo A & María Fernández-González. 2006. Encapsulation of moss buds: an efficient method for the *in vitro* conservation and regeneration of the endangered moss *Splachnum ampullaceum*. *Plant Cell Tissue and Organ Culture* **88**(1): 41–49. <https://doi.org/10.1007/s11240-006-9176-1>

11. Vujičić M, Cvetić T, Sabovljević A & Sabovljević M. 2010. Axenically culturing the bryophytes: A case study of the liverwort *Marchantia polymorpha* L. ssp. *ruderalis* Bischl. & Boisselier (Marchantiophyta, Marchantiaceae). *Kragujevac Journal of Science* **32**: 73–81.
12. Vujičić M, Sabovljević A & Sabovljević M. 2010. Axenically culturing the bryophytes: establishment and propagation of the moss *Hypnum cupressiforme* Hedw. (Bryophyta Hypnaceae) in *in vitro* conditions. *Botanica Serbica* **35**(1): 71–77.
13. Cvetić T, Sabovljević A, Sabovljević M & Grubišić D. 2007. Development of the moss *Pogonatum urnigerum* (Hedw.) P. Beauv. under *in vitro* culture conditions. *Archives of Biological Sciences* **59**(1): 57–61. <https://doi.org/10.2298/abs0701057c>
14. Sabovljević M, Bijelović A & Dragičević I. 2002. Effective and easy way of establishing *in vitro* culture of mosses, *Bryum argenteum* Hedw. and *Bryum capillare* Hedw. -Bryaceae. *Archives of Biological Sciences* **54**(1-2): 7P8P. <https://doi.org/10.2298/abs0202001s>
15. Cove DJ, Perroud P-F, Charron AJ, McDaniel SF, Khandelwal A & Quatrano RS. 2009. Culturing the moss *Physcomitrella patens*. *Cold Spring Harbor Protocols* **2009**(2): pdb.prot5136–pdb.prot5136. <https://doi.org/10.1101/pdb.prot5136>
16. Sabovljević M, Papp B, Vujičić M, Szurdoki E, Segarra Moragues JG & Sabovljević A. 2012. *In vitro* micropropagation of rare and endangered moss *Entosthodon hungaricus* (Funariaceae). *Bioscience Journal* **28**(4): 632–640.
17. Sabovljević A, Cvetić T & Sabovljević M. 2006. Establishment and development of the Catherine's moss *Atrichum undulatum* (Hedw.) P. Beauv. (Polytrichaceae) in *in vitro* conditions. *Archives of Biological Sciences (Beograd)* **58**(2): 87–93. <https://doi.org/10.2298/abs0602087s>
18. Silva-e-Costa J da C, Luiz-Ponzo AP, Resende CF de & Peixoto PHP. 2017. Spore germination, early development and some notes on the effects of *in vitro* culture medium on *Frullania ericoides* (Nees) Mont. (Frullaniaceae, Marchantiophyta). *Acta Botanica Brasilica* **31**: 19–28. <https://doi.org/10.1590/0102-33062016abb0336>
19. Cvetić T, Sabovljević M, Sabovljević A & Grubišić D. 2005. *In vitro* culture and apogamy: Alternative pathway in the life cycle of the moss *Amblystegium serpens* (Amblystegiaceae). *Archives of Biological Sciences* **57**(4): 267–272. <https://doi.org/10.2298/abs0504267c>
20. González ML, Mallón R, Reinoso J & Rodríguez-Oubiña J. 2006. *In vitro* micropropagation and long-term conservation of the endangered moss *Splachnum ampullaceum*. *Biologia Plantarum* **50**(3): 339–345. <https://doi.org/10.1007/s10535-006-0047-8>
21. Gao B, Li X, Zhang D, Liang Y, Yang H, Chen M, Zhang Y, Zhang J & Wood AJ. 2017. Desiccation tolerance in bryophytes: The dehydration and rehydration transcriptomes in the desiccation-tolerant bryophyte *Bryum argenteum*. *Scientific Reports* **7**(1). <https://doi.org/10.1038/s41598-017-07297-3>
22. Sabovljević A, Vujičić M, Skorić M & Sabovljević M. 2012. Axenically culturing the bryophytes: establishment and propagation of the pleurocarpous moss *Thamnobryum alopecurum* Nieuwland ex Gangulee (Bryophyta, Neckeraaceae) in *in vitro* conditions. *Pakistan Journal of Botany* **44**: 339 – 344.
23. Ros RM, Werner O & Pérez-Álvarez JR. 2013. *Ex situ* conservation of rare and threatened Mediterranean bryophytes. *Flora Mediterranea* **23**: 223–235. <https://doi.org/10.7320/FlMedit23.223>
24. Vujičić M, Sabovljević A, Šinžar-Sekulić J, Skorić M & Sabovljević M. 2012. *In vitro* development of the rare and endangered moss *Molendoa hornschuchiana* (Hook.) Lindb. ex Limpr. (Pottiaceae, Bryophyta). *HortScience* **47**(1): 84–87. <https://doi.org/10.21273/hortsci.47.1.84>
25. Chattopadhyay A, Erland LAE, Jones AMP & Saxena PK. 2018. Indoleamines and phenylpropanoids modify development in the bryophyte *Plagiomnium cuspidatum* (Hedw.) T.J. Kop. *In Vitro Cellular & Developmental Biology - Plant* **54**(4): 454–464. <https://doi.org/10.1007/s11627-018-9904-3>

26. Vujičić M, Sabovljević A, Milošević S, Segarra-Moragues JG & Sabovljević M. 2015. Effects of abscisic acid (ABA) on the development of selected bryophyte species. *Plant Biosystems* **150**(5): 1023–1029. <https://doi.org/10.1080/11263504.2014.1000423>
27. Ćosić M, Vujičić M, Sabovljević M & Sabovljević A. 2020. Effects of salt on selected bryophyte species tested under controlled conditions. *Botanica Serbica* **44**(1): 27–35. <https://doi.org/10.2298/botserb2001027c>
28. Beike AK, Spagnuolo V, Lüth VM, Steinhart F, Ramos-Gómez J, Joosten H, Adamo P, Rey-Asensio AI, Fernández JF, Giordano S, Decker EL & Reski R. 2015. Clonal in vitro propagation of peat mosses (*Sphagnum* L.) as novel green resources for basic and applied research. *Plant Cell, Tissue and Organ Culture* **120**(3): 1037–1049. <https://doi.org/10.1007/s11240-014-0658-2>
29. Vujičić M, Sabovljević A & Sabovljević M. 2010. Axenically culturing the bryophytes: a case study of the moss *Herzogiella seligeri* (Brid.) Z. Iwats. (Plagiotheciaceae). *Biologica Nyssana* **1**: 1-2.
30. Singh VJ, Gupta D, Sahu V & Asthana AK. 2020. *In vitro* growth pattern of moss *Drummondia stricta* (Mitt.) Müll. Hal. (Orthotrichaceae) in different hormonal concentrations. In: Alam A (ed.), Contemporary Research on Bryophytes **1**, pp. 1-7, *Bentham science publishers EBooks*. <https://doi.org/10.2174/9789811433788120010005>
31. Munasinghe NN, Liyanage NS, Saputhanthri P. 2014. A protocol for *in vitro* culture of two *Pogonatum* species. *Conference: 34th Annual Sessions of the Institute of Biology*. <https://doi.org/10.13140/RG.2.1.5163.5683>
32. Ahmed Md GU, Shin SL & Lee CH. (2011). In vitro culture responses of *Cratoneuron decipiens* (Brid.) G. Roth gametophyte for micropropagation. *Horticulture, Environment, and Biotechnology* **52**(6): 614–620. <https://doi.org/10.1007/s13580-011-0217-2>
33. Awasthi V & Pande N. 2015. In vitro culture of an endangered and endemic Indian liverwort: *Stephensoniella brevipedunculata* Kashyap (Marchantiophyta). *National Academy Science Letters* **38**(6): 517–519. <https://doi.org/10.1007/s40009-015-0371-7>
34. Canivet L, Dubot P, Garçon G & Denayer FO. 2015. Effects of engineered iron nanoparticles on the bryophyte, *Physcomitrella patens* (Hedw.) Bruch & Schimp, after foliar exposure. *Ecotoxicology and Environmental Safety* **113**: 499–505. <https://doi.org/10.1016/j.ecoenv.2014.12.035>
35. Awasthi V, Asthana AK & Nath V. 2012. *In vitro* propagation of an epiphytic pleurocarpous moss *Erythrodontium julaceum* (Schwaegr.) Par.. *Journal of Bryology* **34**(2): 140–144. <https://doi.org/10.1179/1743282011y.0000000048>
36. Sabovljević A, Sabovljević M & Grubišić D. 2010. Gibberellin influence on the morphogenesis of the moss *Bryum argenteum* Hedw. in *in vitro* conditions. *Archives of Biological Sciences* **62**(2): 373–380. <https://doi.org/10.2298/abs1002373s>
37. Sabovljević M, Nikolić N, Vujičić M, Šinžar-Sekulić J, Pantovic J, Papp B & Sabovljevic A. 2018. Ecology, distribution, propagation *in vitro*, *ex situ* conservation and native population strengthening of rare and threatened halophyte moss *Entosthodon hungaricus* in Serbia. *Wulfenia* **25**: 117–130.
38. Sabovljević MS, Weidinger M, Sabovljević AD, Adlassnig W & Lang I. 2018. Is the binding pattern of zinc(II) equal in different bryophyte species? *Microscopy and Microanalysis* **24**(1): 69–74. <https://doi.org/10.1017/s143192761800003x>
39. Krishnan R & Murugan K. 2014. Axenic culture of bryophytes: A case study of liverwort *Marchantia linearis* Lehm. & Lindenb. *Indian Journal of Biotechnology* **13**: 131-135.
40. Sabovljević A, Sabovljević M & Vukojevic V. 2010b. Effects of different cytokinins on chlorophyll retention in the moss *Bryum argenteum* (Bryaceae). *Periodicum Biologorum* **112**(3): 301-305.
41. von Schwartzenberg K, Núñez MF, Blaschke H, Dobrev PI, Novák O, Motyka V & Strnad M. 2007. Cytokinins in the bryophyte *Physcomitrella patens*: Analyses of activity, distribution, and cytokinin

oxidase/dehydrogenase overexpression reveal the role of extracellular cytokinins. *Plant Physiology* **145**(3): 786–800. <https://doi.org/10.1104/pp.107.103176>

42. Debén S, Aboal JR, Giráldez P, Varela Z & Fernández JÁ. 2019. Developing a biotechnological tool for monitoring water quality: In vitro clone culture of the aquatic moss *Fontinalis antipyretica*. *Water* **11**(1): 145. <https://doi.org/10.3390/w11010145>
43. Hirano K, Nakajima M, Asano K, Nishiyama T, Sakakibara H, Kojima M, Katoh E, Xiang H, Tanahashi T, Hasebe M, Banks JA, Ashikari M, Kitano H, Ueguchi-Tanaka M & Matsuoka M. 2007. The GID1-mediated gibberellin perception mechanism is conserved in the lycophyte *Selaginella moellendorffii* but not in the Bryophyte *Physcomitrella patens*. *The Plant Cell* **19**(10): 3058–3079. <https://doi.org/10.1105/tpc.107.051524>
44. Wiklund K & Rydin H. 2004. Ecophysiological constraints on spore establishment in bryophytes. *Functional Ecology* **18**(6): 907–913. <https://doi.org/10.1111/j.0269-8463.2004.00906.x>
45. Cano MJ, Ros RM & Guerra J. 1996. In vitro culture of *Pterigoneurum compactum* (Musci, Pottiaceae): control of taxonomical characters. *Cryptogamie Bryologie* **17**: 67–70
46. Awasthi V, Asthana AK & Nath V. 2013. In vitro study on the reproductive behavior of the endemic and threatened Indian liverwort: *Cryptomitrium himalayense* Kashyap (Aytoniaceae). *Cryptogamie Bryologie* **34**(3): 313–323. <https://doi.org/10.7872/cryb.v34.iss3.2013.313>
47. Awasthi V, Nath V & Asthana AK. 2012. In vitro regeneration and micropropagation of some liverworts from vegetative ex plants. *National Academy Science Letters* **35**(1): 7–12. <https://doi.org/10.1007/s40009-011-0001-y>
48. Burch J & Wilkinson T. 2002. Cryopreservation of protonemata of *Ditrichum cornubicum* (Paton) comparing the effectiveness of four cryoprotectant pretreatments. *CryoLetters* **23**: 197–208.
49. Liang SF, Sun Y & Zhu RL. 2010. In vitro micropropagation of *Bryum argenteum* Hedw. *Cryptogamie. Bryologie* **31**: 233–239.
50. Giordano S, Alfano F, Basile A & Cobianchi RC. 1999. Toxic effects of the thallus of the lichen on the growth and morphogenesis of bryophytes. *Cryptogamie. Bryologie* **20**(1): 35–41. [https://doi.org/10.1016/s1290-0796\(99\)80005-4](https://doi.org/10.1016/s1290-0796(99)80005-4)
51. Nakagawara S, Katoh K, Kusumi T, Komura J, Nomoto K, Konno H, Huneck S & Takeda R. 1992. Two azulenes produced by the liverwort, *Calypogeia azurea*, during in vitro culture. *Phytochemistry* **31**(5): 1667–1670. [https://doi.org/10.1016/0031-9422\(92\)83125-i](https://doi.org/10.1016/0031-9422(92)83125-i)
52. Minami A, Nagao M, Ikegami K, Koshiha T, Arakawa K, Fujikawa S & Takezawa D. 2004. Cold acclimation in bryophytes: low-temperature-induced freezing tolerance in *Physcomitrella patens* is associated with increases in expression levels of stress-related genes but not with increase in level of endogenous abscisic acid. *Planta* **220**(3): 414–423. <https://doi.org/10.1007/s00425-004-1361-z>
53. Vukojević V, Sabovljević A & Sabovljevic M. 2004. Effect of ferri(III)citrate and potassium hexacyanoferrate(III) on growth of the moss *Bryum argenteum* Hedw. (Bryaceae) in vitro. *Archives of Biological Sciences* **56**(3–4): 75–78. <https://doi.org/10.2298/abs0404075v>
54. Sokal I, Kuta E & Przywara L. 1997. Callus induction and gametophyte regeneration in moss cultures. *Acta Biologica Cracoviensis s. Botanica* **39**: 35–42.
55. Sabovljević M, Vujičić M, Šinžar-Sekulić J, Segarra-Moragues JG, Papp B, Skorić M, Dragačević L & Sabovljevic A. (2012). Reviving, in vitro differentiation, development, and micropropagation of the rare and endangered moss *Bruchia vogesiaca* (Bruchiaceae). *HortScience* **47**(9): 1347–1350. <https://doi.org/10.21273/hortsci.47.9.1347>
56. Xu S, Yin C, He M & Wang Y. 2008. A technology for rapid reconstruction of moss-dominated soil crusts. *Environmental Engineering Science* **25**(8): 1129–1138. <https://doi.org/10.1089/ees.2006.0272>

57. Gang YY, Du GS, Shi DJ, Wang MZ, Li XD, Hua ZL. 2003. Establishment of *in vitro* regeneration system of the *Atrichum* mosses. *Acta Botanica Sinica* **45**: 1475-1480.
58. Krishnan R, Anil S & Murugan K. 2013. Establishment of cell suspension culture in *Marchantia linearis* Lehm & Lindenb. for the optimum production of flavonoids. *3 Biotech* **4**(1): 49-56.
<https://doi.org/10.1007/s13205-013-0123-7>
59. Bijelovic A & Sabovljevic M. 2003. Callus induction and plant regeneration in the moss *Aloina aloides* (Shultz) Kindb. (Pottiaceae, Bryopsida). *Archives of Biological Sciences, Belgrade* **55**: 77 – 80.
60. Sahu V & Asthana AK. 2013. An observation on growth response of *Anomobryum filiforme* var. *concinnum* (Spruce) Aman. (Bryaceae) in different culture media. *National Academy Science Letters* **36**(6): 587-589. <https://doi.org/10.1007/s40009-013-0173-8>
61. Hanke ST & Rensing SA. 2010. *In vitro* association of non-seed plant gametophytes with arbuscular mycorrhiza fungi. *Endocytobiosis and Cell Research* **20**: 95-101.
62. Mallón R, Reinoso J, Rodríguez-Oubiña J, González ML. 2006. *In vitro* development of vegetative propagules in *Splachnum ampullaceum*: brood cells and chloronematal bulbils. *Bryologist* **109**: 215-223. <https://doi.org/10.2307/20110776>
63. Becker H & Blechschmidt M. 1995. Comparison of sesquiterpenes from field collected material and *in vitro* cultures of *Jamesoniella autumnalis* (DC.) Steph.. *Flavour and Fragrance Journal* **10**(3): 187-191.
<https://doi.org/10.1002/ffj.2730100311>
64. Sahu V, Niranjana A & Asthana AK. 2014. In-vitro propagation and identification of phenol compounds of potential medicinal value in the moss *Oxystegus stenophyllus* (Mitt.) Gangulee. *Journal of Bryology* **36**(4): 325-327. <https://doi.org/10.1179/1743282013y.00000000062>
65. Shaaban H, Shabbara H, Farag M & El Saadawi W. 2016. A simple method to obtain microbial-free *in vitro* moss cultures. *Taeckholmia* **36**(1): 17-25. <https://doi.org/10.21608/taec.2016.11937>
66. Gupta R, Singh VJ, Pathak I, Asthana AK. 2018. *In vitro* propagation of Sino-Himalayan liverwort *Solenostoma schaulianum* (Steph.) Vána et D.G. Long. *Geophytology* **48**(1): 41-46.
67. Buczkowska K, Adamczak M, Baczekiewicz A, Chudzinska E & Wachowiak W. 2006. *In vitro* propagation of cryptic species of *Aneura pinguis* (Metzgeriales, Hepaticae). *Cryptogamie, Bryologie* **27**: 241-51.
68. Ahmed, M. G. U., Chang, Y. D., & Lee, C. H. (2010) Factors Affecting on in Vitro Gametophyte Formation from Spore Culture of Four Moss Species. *Korean Journal of Horticultural Science and Technology*, 28(1), 108-114.
69. Awasthi V, Bisht A K & Pande N. 2014. Morphogenetic studies on two mosses, *Bryum dichotomum* and *Entodon macropodus* grown *in vitro*. *Proceedings of the National Academy of Sciences, India, Section B: Biological Sciences* **86**(2): 421-427. <https://doi.org/10.1007/s40011-014-0463-z>
70. Davey ML, Tsuneda A & Currah RS. 2009. Pathogenesis of bryophyte hosts by the ascomycete *Atracidymella muscivora*. *American Journal of Botany* **96**(7): 1274-1280.
<https://doi.org/10.3732/ajb.0800239>
71. Takio S. 1994. Growth characteristics of bryophyte cell cultures. *Journal of the Hattori Botanical Laboratory* **76**: 67-74.
72. Yu Y, Shui-liang G, Jian-Hua C. 2008. Effects of varying sucrose and ammonium nitrate concentrations on protonemal growth of *Polytrichum commune* (Bryopsida: Musei) *in vitro*. *Lindbergia* **33**: 41-46.
<https://doi.org/10.2307/27809540>
73. Krishnan R, Anil S & Murugan K. 2013. Establishment of cell suspension culture in *Marchantia linearis* Lehm & Lindenb. for the optimum production of flavonoids. *3 Biotech* **4**(1): 49-56.
<https://doi.org/10.1007/s13205-013-0123-7>

74. Martinez K & Price M. 2011. Brood cells in the rare, epiphytic moss *Tayloria rudolphiana* (Garov.) Bruch et Schimp. (Splachnaceae). *Cryptogamie, Bryologie*, 32, 3–12. <https://doi.org/10.7872/cryb.v32.iss1.2011.003>
75. Brezeanu A, Cogalnicean G & Raluca M. 2008. Ultrastructural characterization of the *in vitro* gametophyte of *Bucegia romanica* Radian – a rare liverwort. *Romanian Journal of Biology – Plant biology* **53**(2): 49–61.
76. Sassmann S, Wernitznig S, Lichtscheidl IK & Lang I. 2010. Comparing copper resistance in two bryophytes: *Mielichhoferia elongata* Hornsch. versus *Physcomitrella patens* Hedw. *Protoplasma* **246**(1–4): 119–123. <https://doi.org/10.1007/s00709-010-0106-z>
77. Makinde AM, Isa MO & Ayisire BE. 2014. Studies of sterilization protocol development and calli induction of selected tropical mosses. *Journal of Tropical Biology and Conservation* **11**: 33–40.
78. Chen YY, Lou YX, Guo SL & Cao T. 2009. Successful tissue culture of the medicinal moss *Rhodobryum giganteum* and factors influencing proliferation of its protonemata. *Annales Botanici Fennici* **46**(6): 516–524. <https://doi.org/10.5735/085.046.0604>
79. Mukhia S, Mandal P, Singh DK & Singh D. 2019. Comparison of pharmacological properties and phytochemical constituents of *in vitro* propagated and naturally occurring liverwort *Lunularia cruciata*. *BMC Complementary and Alternative Medicine* **19**(1). <https://doi.org/10.1186/s12906-019-2534-4>
80. Vujičić MM, Milošević SM, Sabovljević MS & Sabovljević AD. 2017. Effect of ABA treatment on activities of antioxidative enzymes in selected bryophyte species. *Botanica Serbica* **41**: 11–15. <https://doi.org/10.5281/zenodo.452673>
81. Henrique MACF, Ricardo LLB & Pereira LM. 2006. *Lunularia cruciata*, a potential *in vitro* host for *Glomus proliferum* and *G. intraradices*. *Mycorrhiza (Berlin)* **16**(7): 503–508. <https://doi.org/10.1007/s00572-006-0061-x>
82. Erdağ B, Bağdatlı MN, Kuzu I & Emek Y. 2015. Early developmental stages of *Homalothecium sericeum* (Hew.) Schimp (Brachytheciaceae) under *in vitro* Conditions. *American International Journal of Biology*, **3**(1): 1–18.
83. Beike AK, Jaeger C, Zink F, Decker EL & Reski R. 2013. High contents of very long-chain polyunsaturated fatty acids in different moss species. *Plant Cell Reports* **33**(2): 245–254. <https://doi.org/10.1007/s00299-013-1525-z>
84. Awasthi V, Nath V, Pande N & Asthana AK. 2012d. Morphogenetic studies and *in vitro* propagation of two mosses: *Philonotis thwaitesii* Mitt. and *Brachythecium plumosum* (Hedw.) B.S.G. *Taiwania* **57**(1): 27–36.
85. Liu S, Wei H, Peng X & Li J. 2016. Spore germination and protonemal development of *Dolichomitriopsis diversiformis*. *Brazilian Archives of Biology and Technology* **59**(0). <https://doi.org/10.1590/1678-4324-2016160061>
86. Oliveira BA, de Noveas Pereira AF, Porto KC & Maciel-Silva AS. 2017. Spore germination and young gametophyte development of the endemic Brazilian hornwort *Notothylas vitalii* Udar & Singh (Notothyladaceae - Anthocerotophyta), with insights into sporeling evolution. *Acta Botanica Brasilica* **31**(2): 313–318. <https://doi.org/10.1590/0102-33062016abb438>
87. Ćosić M, Vujičić MM, Sabovljević MS & Sabovljević AD. 2020. Effects of ABA and NaCl on physiological responses in selected bryophyte species. *Botany* **98**(11): 639–650. <https://doi.org/10.1139/cjb-2020-0041>
88. Stanojković J, Ćosić M, Sabovljević M, Čučulović A & Vujičić M. 2023. Does cesium affect enzymatic activity in *Atrichum undulatum* in *in vitro* conditions. *Acta Biologica Plantarum Agriensis* ISSN 2061-6716 (Print), 2063-6725. <https://doi.org/10.21406/abpa.2023.11.2.38>

89. Chiou SY, Su WW & Su YC. 2001. Optimizing production of polyunsaturated fatty acids in *Marchantia polymorpha* cell suspension culture. *Journal of Biotechnology* **85**(3): 247–257. [https://doi.org/10.1016/s0168-1656\(00\)00346-1](https://doi.org/10.1016/s0168-1656(00)00346-1)
90. Davey ML & Currah RS. 2009. *Atracidymella muscivora* gen. et sp. nov. (Pleosporales) and its anamorph *Phoma muscivora* sp. nov.: A new pleomorphic pathogen of boreal bryophytes. *American Journal of Botany* **96**(7): 1281–1288. <https://doi.org/10.3732/ajb.0900010>
91. Zhang R, Peng W, Liu W, Li X & He Y. 2016. From spore germination to gametophyte development: The culture, propagation and anatomical protonemal structure of *Takakia lepidozioides* (Bryophyta) in Tibet Plateau. *Cryptogamie Bryologie* **37**(4): 383–397. <https://doi.org/10.7872/cryb/v37.iss4.2016.383>
92. Post AR, McCall DS & Askew SD. 2016. Preemergence control of silvery threadmoss (*Bryum argenteum*) grown from spores and bulbils in axenic culture. *Weed Technology* **30**(1): 198–206. <https://doi.org/10.1614/wt-d-14-00125.1>
93. Sabovljević MS, Vujičić M, Wang X, Garraffo HM, Bewley CA & Sabovljević A. 2016. Production of the macrocyclic bis-benzyls in axenically farmed and wild liverwort *Marchantia polymorpha* L. subsp. *ruderalis* Bischl. et Boisselier. *Plant Biosystems* **151**(3): 414–418. <https://doi.org/10.1080/11263504.2016.1179692>
94. Ono K, Sakamoto T, Tanaka H & Asakawa Y. 1996. Sesquiterpenoids from a cell suspension culture of the liverwort *Porella vernicosa* Lindb. *Flavour and Fragrance Journal* **11**(1): 53–56. [https://doi.org/10.1002/\(sici\)1099-1026\(199601\)11:1<53::aid-ffj535>3.0.co;2-8](https://doi.org/10.1002/(sici)1099-1026(199601)11:1<53::aid-ffj535>3.0.co;2-8)
95. Krishnan R & Murugan K. 2015. Insecticidal potentiality from cell suspension culture of *Marchantia linearis* Lehm. & Lindenb against *Spodoptera litura*. *International journal of applied biology and pharmaceutical technology* **6**(2): 0976–4550.
96. Nath V, Awasthi V & Asthana AK. 2012. Culture studies and *in vitro* propagation of the moss *Bryum coronatum* Schwaegr. *The Journal of Indian Botanical Society* **91**(4): 391–397.
97. Asthana AK, Tewari SD, Singh VJ, Pathak I & Sahu V. 2018. *In vitro* conservation strategy for endemic and endangered Himalayan liverwort *Stephensoniella brevipedunculata* Kashyap (Marchantiophyta). *International Journal of Plant and Environment* **4**(2): 81–87.
98. Sporle J, Becker H, Allen NS & Gupta, M. P. (1991). Occurrence of (-)- geosmin and other terpenoids in an axenic culture of the liverwort *Symphyogyna brongniartii*. *Zeitschrift für Naturforschung* **46C**: 183–188.
99. Sabovljević MS, Segarra-Moragues JG, Puche F, Vujičić M, Cogoni A & Sabovljević A. 2016. An Eco-physiological and biotechnological approach to conservation of the world-wide rare and endangered aquatic liverwort *Riella helicophylla* (Bory et Mont.) Mont. *Acta Botanica Croatica* **75**(2): 194–198. <https://doi.org/10.1515/botcro-2016-0030>
100. Victoria FC, Oliveira AC & Peters JA. 2011. Establishment of the moss *Polytrichum juniperinum* Hedw. under axenic conditions. *Bioscience Journal, Uberlandia* **27**: 673–676.
101. Melosik I & Săstad SM. 2005. In vitro propagation of selected *Sphagnum* species (section Subsecunda). *Lindbergia*, **30**, 21–31. <https://doi.org/10.2307/20150177>
102. Bassi P, Basile A, Ferraro M, Masi M, Migliaccio D, Morelli G & Napolitano E. 2006. Plasticity of repetitive DNA in response to metal stress in Bryophytes. *Plant Biosystems - an International Journal Dealing with All Aspects of Plant Biology* **140**(1): 80–86. <https://doi.org/10.1080/112635005000511249>
103. Sim-Sim M, Abreu M, Garcia C, Cecília Sérgio & Figueiredo A. 2017. Essential oil composition of two *Sphagnum* species grown in Portugal and their *in vitro* culture establishment. *Natural Product Communications* **12**(8): <https://doi.org/10.1177/1934578x1701200839>
104. Cevallos MA, Guerrero G, Ríos S, Arroyo A, Villalobos MA & Porta H. 2020. The mitogenome of *Pseudocrossidium replicatum*, a desiccation-tolerant moss. *Mitochondrial DNA. Part B. Resources* **5**(3): 2339–2341. <https://doi.org/10.1080/23802359.2020.1774436>

105. Campbell C, Kelly DL, Smyth N, Lockhart N & Holyoak DT. 2016. Genetic variation in the red-listed moss *Ditrichum cornubicum* Paton (Ditrichaceae) and implications for its conservation. *Journal of Bryology* **39**(2): 141–151. <https://doi.org/10.1080/03736687.2016.1232041>
106. Tran TQ, Phan HN, Bui AL & Quach PND. 2020. Biological activities of *in vitro* liverwort *Marchantia polymorpha* L. extracts. *Notulae Botanicae Horti Agrobotanici Cluj-Napoca* **48**(2): 826–838. <https://doi.org/10.15835/nbha48211884>
107. Canivet L & Denayer FO. 2011. Staining of protonemal cells of *Ceratodon purpureus* (Hedw.) Brid. for better highlighting micronuclei in bryophytes. *Cryptogamie, Bryologie* **32**(3): 211–20.
108. Canivet L, Dubot P & Denayer FO. 2014. Uptake of iron nanoparticles by *Aphanorrhegma patens* (Hedw.) Lindb.. *Journal of Bryology* **36**(2): 104–109. <https://doi.org/10.1179/1743282014y.0000000010>
109. Basile A, Sorbo S, Conte B, Cardi M & Esposito S. 2013. Ultrastructural changes and Heat Shock Proteins 70 induced by atmospheric pollution are similar to the effects observed under *in vitro* heavy metals stress in *Conocephalum conicum* (Marchantiales – Bryophyta). *Environmental Pollution* **182**: 209–216. <https://doi.org/10.1016/j.envpol.2013.07.014>
110. Vives C, Charlot F, Mhiri C, Contreras B, Daniel J, Epert A, Voytas DF, Grandbastien M, Nogu   F & Casacuberta JM. 2016. Highly efficient gene tagging in the bryophyte *Physcomitrella patens* using the tobacco (*Nicotiana tabacum*) Tnt1 retrotransposon. *New Phytologist* **212**(3): 759–769. <https://doi.org/10.1111/nph.14152>
111. Smaw, S. G., & Petersen, R. L. (2005). Effects of simulated rain and cement amendments on protonematal growth of the urban moss, *Bryum capillare*, in culture. *The Bryologist*, *108*, 236–240.
112. Dietert, M. F. (1980) The effect of temperature and photoperiod on the development of geographically isolated populations of *Funaria hygrometrica* and *Weissia controversa*. *American Journal of Botany*, *67*(3), 369–380. <https://doi.org/10.1002/j.1537-2197.1980.tb07662.x>
113. Vashistha BD. 1987. Effect of Some Auxins and Cytokinins on Growth and Archegonial Formation in the Liverwort *Riccia frostii* Aust. *Biochemie Und Physiologie Der Pflanzen* **182**(4): 309–321. [https://doi.org/10.1016/s0015-3796\(87\)80062-8](https://doi.org/10.1016/s0015-3796(87)80062-8)
114. Ying Y & Shui-liang G. 2008. Influences of *in vitro* factors on spore germination of *Polytrichum commune* (Bryopsida: Musci). *Acta Scientiarum Naturalium Universitatis Sunyatseni* **47**: 0529–6579.
115. Ruiz-Molina N, Ortega-Bedoya I & Arias-Zabala M. 2019. Protonema suspension cultures of *Polytrichum juniperinum* as a potential production platform for bioactive compounds. *Journal of Herbs, Spices & Medicinal Plants* **25**(2): 114–127. <https://doi.org/10.1080/10496475.2019.1577321>
116. Bogdanović M., Sabovljević M, Sabovljević A & Grubišić D. 2009. The influence of gypsiferous substrata on bryophyte growth: are there obligatory gypsophilous bryophytes? *Botanica Serbica* **33**(1): 75-82.
117. Sabovljević A, Vujić M, Stanković J & Sabovljević M. 2018. Effects of zinc and copper on development and survival of the moss *Atrichum undulatum* in controlled conditions. *Botanica Serbica* **42**(2): 181-184 <https://doi.org/10.5281/zenodo.1468284>
118. Kowalczyk A, Przywara L & Kuta E. 1997. In vitro culture of liverworts. *Acta biologica Cracoviensia. Series Botanica* **39**: 27 – 33.
119. Ruiz-Molina N, Villalobos-L  pez MA & Arias-Zabala, M. (2016). Protonema suspension cultures of the medicinal moss *Polytrichum juniperinum*. *In Vitro Cellular & Developmental Biology – Plant* **52**(4) 419–426. <https://doi.org/10.1007/s11627-016-9783-4>
120. Tazaki H, Ito M, Miyoshi M, Kawabata J, Fukushima E, Fujita T, Motouri M, Furuki T & Nabeta K. 2002. Subulatin, an antioxidic caffeic acid derivative isolated from the *in vitro* cultured liverworts, *Jungermannia subulata*, *Lophocolea heterophylla*, and *Scapania parvixtexta*. *Bioscience, Biotechnology, and Biochemistry* **66**(2): 255–261. <https://doi.org/10.1271/bbb.66.255>

121. Hohe A, Schween G & Reski R. 2001. Establishment of a semicontinuous bioreactor culture of *Physcomitrella patens* for mass production of protoplasts. *Acta Horticulturae* **560**: 425–428. <https://doi.org/10.17660/actahortic.2001.560.82>
122. Cvetić T, Sabovljević A, Pristov JB & Sabovljević M. 2009 Effects of day length on photosynthetic pigments and antioxidative metabolism of *in vitro* cultured moss *Atrichum undulatum* (Hedw.) P. Beauv. (Bryophyta). *Botanica Serbica* **33**(1): 83–88.
123. Mishra R & Chandra R. 2020. Optimization of culture parameters for α -glucosidase production from suspension culture of moss *Hyophilla nymianiana* (Fleish.) Menzel. *Journal of Genetic Engineering and Biotechnology* **18**(1). <https://doi.org/10.1186/s43141-020-00098-8>
124. Sabovljević MS, Weidinger M, Sabovljević AD, Stanković J, Adlassnig W & Lang I. 2020. Metal accumulation in the acrocarp moss *Atrichum undulatum* under controlled conditions. *Environmental Pollution* **256**: 113397. <https://doi.org/10.1016/j.envpol.2019.113397>
125. Adam KP, Thiel R, Zapp J & Becker H. 1998. Involvement of the mevalonic acid pathway and the glyceraldehyde–pyruvate pathway in terpenoid biosynthesis of the liverworts *Ricciocarpos natans* and *Conocephalum conicum*. *Archives of Biochemistry and Biophysics* **354**(1): 181–187. <https://doi.org/10.1006/abbi.1998.0666>
126. Adam KP & Croteau R. 1998. Monoterpene biosynthesis in the liverwort *Conocephalum conicum*: demonstration of sabinene synthase and bornyl diphosphate synthase in honour of professor G. H. Neil Towers 75th Birthday. *Phytochemistry* **49**(2): 475–480. [https://doi.org/10.1016/s0031-9422\(97\)00741-3](https://doi.org/10.1016/s0031-9422(97)00741-3)
127. Chopra RN & Bhatla SC. 1981. Effect of physical factors on gametangial induction, fertilization and sporophyte development in the moss *Bryum argenteum* grown *in vitro*. *New Phytologist* **89**(3): 439–447. <https://doi.org/10.1111/j.1469-8137.1981.tb02325.x>
128. Wurzel G & Becker H. 1990. Growth and terpenoid production of an axenic culture from the liverwort *Ricciocarpos natans*. *Zeitschrift Für Naturforschung C* **45**(1-2): 13–18. <https://doi.org/10.1515/znc-1990-1-204>
129. Hoffman GR. 1966. Observations on the mineral nutrition of *Funaria hygrometrica* Hedw. *The Bryologist* **69**(2): 182–182. <https://doi.org/10.2307/3240510>
130. Srivastava A, Sahu V, Asthana AK. 2018. An observation on morphogenetic response of *Marchantia polymorpha* subsp. *ruderalis* Bischl. & Boissel.-Dub. in different culture media. *International Journal of Plant and Environment*, **4**(1), 64–69.
131. Pereira CG, Carvalho-Silva M, Rodrigues A & Silveira S. 2021. Indirect establishment increases the chances of *in vitro* propagation of mosses occurring in the Cerrado - a new method. *Rodriguésia* **72**. <https://doi.org/10.1590/2175-7860202172024>
132. Tazaki H, Iwasaki T, Nakasuga I, Kobayashi K, Koshino H, Tanaka M & Nabeta K. 1999. ent-Kaurane-type diterpenoids produced by cell culture of the liverwort *Jungermannia subulata*. *Phytochemistry* **52**(8): 1427–1430. [https://doi.org/10.1016/s0031-9422\(99\)00347-7](https://doi.org/10.1016/s0031-9422(99)00347-7)
133. Basile DV, Basile MR, Li QY & Corpe WA. 1985. Vitamin B₁₂-stimulated growth and development of *Jungermannia leiantha* Grolle and *Gymnocolea inflata* (Huds.) Dum. (Hepaticae). *The Bryologist* **88**(2): 77–77. <https://doi.org/10.2307/3242585>
134. Tazaki H, Adam KP & Becker H. 1995. Five lignan derivatives from *in vitro* cultures of the liverwort *Jamesoniella autumnalis*. *Phytochemistry* **40**(6): 1671–1675. [https://doi.org/10.1016/0031-9422\(95\)90024-p](https://doi.org/10.1016/0031-9422(95)90024-p)
135. Grimsley NH, Ashton NW & Cove DJ. 1977. The production of somatic hybrids by protoplast fusion in the moss, *Physcomitrella patens*. *Molecular Genetics and Genomics* **154**(1): 97–100. <https://doi.org/10.1007/bf00265582>

136. Sierocka I, Rojek A, Bielewicz D, Karlowski W, Jarmolowski A & Szweykowska-Kulinska Z. 2011. Novel genes specifically expressed during the development of the male thalli and antheridia in the dioecious liverwort *Pellia endiviifolia*. *Gene* **485**(1): 53–62. <https://doi.org/10.1016/j.gene.2011.06.012>
137. Ashton NW, Grimsle NH & Cove DJ. 1979. Analysis of gametophytic development in the moss, *Physcomitrella patens*, using auxin and cytokinin resistant mutants. *Planta* **144**(5): 427–435. <https://doi.org/10.1007/bf00380118>
138. Collier PA & Hughes KW. 1982. Ultraviolet mutagenesis of moss cells in vitro. *Journal of Tissue Culture Methods* **7**(2).
139. Day MJ & Currah RS. 2011. In vitro degradation of the moss *Hylocomium splendens* by three pleosporalean fungi. *Canadian Journal of Microbiology* **57**(5): 382–391. <https://doi.org/10.1139/w11-024>
140. Silvani VA, Rothen CP, Rodríguez MA, Godeas A & Fracchia S. 2012. The thalloid liverwort *Plagiochasma rupestre* supports arbuscular mycorrhiza-like symbiosis in vitro. *World Journal of Microbiology & Biotechnology* **28**(12): 3393–3397. <https://doi.org/10.1007/s11274-012-1146-7>
141. Mishra R & Chandra R. 2020. Optimization of process parameters by statistical experimental design for production of A-mannosidase from moss *Hyophilla nymaniana* (Fleish.) Menzel. *Research Square*. <https://doi.org/10.21203/rs.3.rs-107268/v1>
142. Chopra R N & Sood S. 1973. In vitro Studies on the Reproductive Biology of *Riccia crystallina*. *The Bryologist* **76**(2): 278–278. <https://doi.org/10.2307/3241330>
143. Kumra PK & Chopra RN. 1983. Effect of some physical factors on growth and gametangial induction in male clones of three mosses grown in vitro. *Botanical Gazette* **144**: 533–539.
144. von Schwartzenberg K, Schultze W & Kassner H. 2004. The moss *Physcomitrella patens* releases a tetracyclic diterpene. *Plant Cell Reports* **22**(10): 780–786. <https://doi.org/10.1007/s00299-004-0754-6>
145. Chopra RN & Gupta A. 1991. Effect of some cytokinins on growth and archegonial formation in the liverwort *Riccia discolor* L. grown in vitro. *The Journal of the Hattori Botanical Laboratory* **71**: 47–54.
146. Chopra RN & Kumra PK. 1983. Hormonal regulation of growth and antheridial production in three mosses grown in vitro. *Journal of Bryology* **12**(3): 491–502. <https://doi.org/10.1179/jbr.1983.12.3.491>
147. Sarla CRN & Chopra RN. 1987. Effect of some auxins and antiauxins on protonemal growth and bud formation in *Bryum pallescens* Schlecht. ex Schwaegr. grown in vitro. *Plant Science* **51**(2-3): 251–256. [https://doi.org/10.1016/0168-9452\(87\)90200-7](https://doi.org/10.1016/0168-9452(87)90200-7)
148. Barlow AJ, Becker H & Adam KP. 2001. Biosynthesis of the hemi- and monoterpene moieties of isoprenyl phenyl ethers from the liverwort *Trichocolea tomentella*. *Phytochemistry* **57**(1): 7–14. [https://doi.org/10.1016/s0031-9422\(01\)00002-4](https://doi.org/10.1016/s0031-9422(01)00002-4)
149. Rowntree JK, Cowan RS, Leggett M, Ramsay MM & Fay MF. 2009. Which moss is which? Identification of the threatened moss *Orthodontium gracile* using molecular and morphological techniques. *Conservation Genetics* **11**(3): 1033–1042. <https://doi.org/10.1007/s10592-009-9948-3>
150. Silva ASMD, Pôrto KC & Simabukuro EA. 2010. Effects of light and nutrients on different germination phases of the cosmopolitan moss *Bryum argenteum* Hedw. (Bryaceae). *Brazilian Archives of Biology and Technology* **53**(4): 763–769. <https://doi.org/10.1590/s1516-89132010000400003>
151. Silva ASMD, Pôrto KC & Simabukuro EA. 2009a. Effect of light and water availability on spore germination and protonemal growth of the Neotropical moss *Thamniopsis incurva* (Pilotrichaceae). *Cryptogamie, Bryology* **30**: 243–257.
152. Bopp M. 1984. The hormonal regulation of protonema development in mosses. *Zeitschrift Für Pflanzenphysiologie* **113**(5): 435–444. [https://doi.org/10.1016/s0044-328x\(84\)80099-9](https://doi.org/10.1016/s0044-328x(84)80099-9)

153. Tazaki H, Soutome H, Nabeta K, Okuyama H & Becker H. 1996. Pinguiculate derivatives from an axenic culture of the liverwort *Aneura pinguis*. *Phytochemistry* **42**(2): 465–468. [https://doi.org/10.1016/0031-9422\(95\)00971-x](https://doi.org/10.1016/0031-9422(95)00971-x)
154. Victória M, Minozzo MM, Pereira AB & Victoria FC. 2017. Growth and development of halophyte *Funaria hygrometrica* Hedw. (Funariaceae) under salt stress. *Bioscience Journal (Impresso)* 1617–1621. <https://doi.org/10.14393/bj-v33n6a2017-37184>
155. Neves M, Morais R, Gafner S, Hostettmann K. 1998. Three triterpenoids and one flavonoid from the liverwort *Asterella blumeana* grown *in vitro*. *Phytotherapy Research* **12**: S21–S24.
156. Pasiche-Lisboa CJ & Jesús ISD. 2018. Moss protonemata are dispersed by water, wind, and snails. *American Journal of Botany* **105**(4): 788–795. <https://doi.org/10.1002/ajb2.1065>
157. Maresca V, Lettieri G, Sorbo S, Piscopo M & Basile A. 2020. Biological responses to cadmium stress in liverwort *Conocephalum conicum* (Marchantiales). *International Journal of Molecular Sciences* **21**(18): 6485. <https://doi.org/10.3390/ijms21186485>
158. Katayama K, Miyoshi M, Nabeta K & Tazaki H. 2012. The biosynthesis of the antioxidant caffeic acid derivative subulatin by the liverwort *Jungermannia subulata* cultured *in vitro*. *Phytochemistry Letters (Print)* **5**(4): 761–765. <https://doi.org/10.1016/j.phyto.2012.08.008>
159. Ono K, Toyota M & Asakawa Y. 1992. Constituents from cell suspension cultures of selected liverworts. *Phytochemistry* **31**(4): 1249–1250. [https://doi.org/10.1016/0031-9422\(92\)80270-o](https://doi.org/10.1016/0031-9422(92)80270-o)
160. Chopra R & Vashistha BD. 1990. The effect of auxins and antiauxins on shoot-bud induction and morphology in the moss, *Bryum atrovirens* Will ex Brid. *Australian Journal of Botany* **38**(2): 177–177. <https://doi.org/10.1071/bt9900177>
161. Pacak A & Szwejkowska-Kulińska Z. 2003. Organellar inheritance in liverworts: an example of *Pellia borealis*. *Journal of Molecular Evolution* **56**(1): 11–17. <https://doi.org/10.1007/s00239-002-2375-4>
162. Takeda R & Katoh K. 1981. Growth and sesquiterpenoid production by *Calypogeia granulata* inoue cells in suspension culture. *Planta* **151**(6): 525–530. <https://doi.org/10.1007/bf00387429>
163. Nozaki H, Hayashi K, Okuda K, Kuyama F, Ono K & Matsuo A. 2007. *ent*-Kaurane-type diterpenoids from a cell suspension culture of the liverwort *Jungermannia subulata*. *Planta Medica* **73**(7): 689–695. <https://doi.org/10.1055/s-2007-981529>
164. Barlow AJ, Lorimer SD, Morgan ER & Weavers RT. 2003. Biosynthesis of the sesquiterpene hodgeonox from the New Zealand liverwort *Lepidolaena hodgeonae*. *Phytochemistry* **63**(1): 25–29. [https://doi.org/10.1016/s0031-9422\(02\)00725-2](https://doi.org/10.1016/s0031-9422(02)00725-2)
165. Adam KP & Becker H. 1993. Bisbibenzyl formation in aseptically cultured *Marchantia polymorpha*. *Zeitschrift Für Naturforschung* **48c**: 839–842.
166. Stanković J, Janković S, Lang I, Vujičić M, Sabovljević M & Sabovljević A. 2021. The toxic metal stress in two mosses of different growth forms under axenic and controlled conditions. *Botanica Serbica* **45**(1): 31–47. <https://doi.org/10.2298/botserb2101031s>
167. Hu Y, Li Q, Chen Z, Xu Z, Li H, Wen C, Duan L, Yang H & Liu L. 2023. Axenic *in vitro* cultivation and genome diploidization of the moss *Vesicularia montagnei* for horticulture utilization. *Frontiers in Plant Science* **14**. <https://doi.org/10.3389/fpls.2023.1137214>
168. Mathew M & Mathew ANS. (2021). Axenic culture of *Philonotis falcata* (Hook.) Mitt., an alternative to reduce the impact of large-scale collection from native habitat. *Plant Archives* **21**(1). <https://doi.org/10.51470/plantarchives.2021.v21.no1.038>
169. Chen KH, Liao HL, Arnold EA, Korotkin HB, Wu SH, Matheny BP & Lutzoni F. 2022. Comparative transcriptomics of fungal endophytes in co-culture with their moss host *Dicranum scoparium* reveals fungal trophic lability and moss unchanged to slightly increased growth rates. *New Phytologist (Print)* **234**(5): 1832–1847. <https://doi.org/10.1111/nph.18078>

170. Byun MY, Seo S, Lee J, Yoo YH & Lee H. 2021. Transfection of Arctic *Bryum* sp. KMR5045 as a model for genetic engineering of cold-tolerant mosses. *Frontiers in Plant Science* **11**.
<https://doi.org/10.3389/fpls.2020.609847>
171. Mathew M, Mathew A & Sindu N. 2022. Aposporic development of gametophyte in *Sematophyllum subpinnatum* (Brid.) E. Britton (Sematophyllaceae) from capsule wall. *Plant Science Today* **9**(1): 48–51.
<https://doi.org/10.14719/pst.1433>
172. Jadranin BZ, Ćosić MV, Božović DP, Vujičić MM, Ignatov MS, Ignatova EA, Sabovljević AD & Sabovljević MS. 2023. An insight into the biology of the rare and peculiar moss *Pterygoneurum sibiricum* (Pottiaceae): a conservation physiology approach. *Plants* **12**(6): 1359–1359.
<https://doi.org/10.3390/plants12061359>
173. Mathew A, Ravi A, Babu T & Mathew M. 2023. Axenic culture of *Calymperes erosum* C. Muell., collected from Idukki district, Kerala. *Proceedings of International Conference on Recent Advances in Biological Science. iCEIB, University of Kerala Kariavattom, Thiruvananthapuram*.
174. Ćosić M, Sabovljević M, Papp B, Giba Z, Šinžar-Sekulić J, Sabovljević A & Vujičić M. 2022. Micropropagation of rare bryo-halophyte *Hennediella heimii*. *Botanica Serbica* **46**(2): 187–195.
<https://doi.org/10.2298/botserb2202187c>
175. Sitthichoptham C, Wongkantrakorn N, Kraichak E & Sanevas N. 2023. Effects of the culture medium, pH level, and type of sugar on the growth of *Sphagnum cuspidatum* Müll. Hal. *Weon'ye Gwahag Gi'sulji* **41**(3): 329–338. <https://doi.org/10.7235/hort.20230030>
176. Athira S, Mathew M & Mathew A. 2021. Axenic culture of *Riccia* from gametophyte. *Plant Genetic Resource Utilization: An Appraisal. Department of Botany, University of Kerala*. ISBN:978-81-951912-4-6.
177. Ćosić MV, Janošević DA, Oaldje MM, Vujičić MM, Lang I, Sabovljević MS & Sabovljević AD. 2021. Terpenoid evidences within three selected bryophyte species under salt stress as inferred by histochemical analyses. *Flora* **285**: 151956. <https://doi.org/10.1016/j.flora.2021.151956>
178. Widyastuti A, Putrika A, Dwiranti A, Salamah A, Hemelda NM & Handayani W. 2021. The development of *in vitro* culture sterilization method of gametophyte explant *Lopholejeunea* sp. *HAYATI Journal of Biosciences* **28**(2): 110. <https://doi.org/10.4308/hjb.28.2.110>
179. Ćosić MV, Mišić DM, Jakovljević KM, Giba ZS, Sabovljević AD, Sabovljević MS & Vujičić MM. 2023. Analysis of the qualitative and quantitative content of the phenolic compounds of selected moss species under NaCl Stress. *Molecules* **28**(4): 1794–1794. <https://doi.org/10.3390/molecules28041794>
180. Putri MD, Handayani W, Dwiranti A, Salamah A, Hemelda NM & Putrika A. 2021. The development of gametophyte sterilization method for liverworts *Acrolejeunea fertilis* (Reinw., Blume and Nees) Schiffn. *in vitro* culture. *HAYATI Journal of Biosciences* **28**(1): 39. <https://doi.org/10.4308/hjb.28.1.39>
181. Wann FB. 1925. Some of the factors involved in the sexual reproduction of *Marchantia polymorpha*. *American Journal of Botany* **12**(6): 307. <https://doi.org/10.2307/2435337>
182. Boquete MT, Lang I, Weidinger M, Richards C & Alonso C. 2020. Patterns and mechanisms of heavy metal accumulation and tolerance in two terrestrial moss species with contrasting habitat specialization. *Authorea*. <https://doi.org/10.22541/au.160315210.03739090/v1>
183. Kollar LM, Kiel S, James AJ, Carnley CT, Scola DN, Clark TN, Khanal T, Rosenstiel TN, Gall ET, Grieshop K & McDaniel SF. 2021. The genetic architecture of sexual dimorphism in the moss *Ceratodon purpureus*. *Proceedings of the Royal Society B: Biological Sciences* **288**(1946): 20202908.
<https://doi.org/10.1098/rspb.2020.2908>
184. Giardini S, Bellini E, Bandoni E, Saba A & Sanità L. 2022. Tools for *in vitro* propagation/synchronization of the liverwort *Marchantia polymorpha* and application of a validated HPLC-ESI-MS-MS method for glutathione and phytochelatin analysis. *Stresses* **2**(1): 136–145. <https://doi.org/10.3390/stresses2010010>

185. Ramadhani NT, Handayani W, Yasman Y & Putrika A. 2023. Induction of in vitro shoots in liverwort gametophyte explant *Acrolejeunea fertilis* (Reinw., Blume & Nees) Schiffn. and its comparative metabolite and bioactivity analysis. *Research Square (Research Square)*. <https://doi.org/10.21203/rs.3.rs-3418259/v1>
186. Mezaka A, Plaksenkova I, Vanaga A, Petrova A & Svilāne I. 2021. Preliminary study of moss *Homalia trichomonadoides* (Hedw.) Brid. gametophyte development from spores *in vitro*. *Acta Biologica Universitatis Daugavpiliensis* **21**(1): 1407 – 8953.
187. Zhang Y, Yang H & Zhuo L. 2022. Comparison of dessication tolerance of desert moss *Syntrichia caninervis* in tissue culture and sand culture. *Pakistan Journal of Botany* **54**(4): 1295-1303. [https://doi.org/10.30848/PJB2022-4\(26\)](https://doi.org/10.30848/PJB2022-4(26))
188. Gunadi A, Li F & Van Eck J. 2022. Accelerating gametophytic growth in the model hornwort *Anthoceros agrestis*. *Applications in Plant Sciences* **10**(2). <https://doi.org/10.1002/aps3.11460>
189. Ríos-Meléndez S, Valadez-Hernández E, Delgadillo C, Luna-Guevara ML, Martínez-Núñez MA, Sánchez-Pérez M, Martínez-y-Pérez JL, Arroyo-Becerra A, Cárdenas L, Bibbins-Martínez M, Maldonado-Mendoza IE & Villalobos-López MA. 2021. *Pseudocrossidium replicatum* (Taylor) R.H. Zander is a fully desiccation-tolerant moss that expresses an inducible molecular mechanism in response to severe abiotic stress. *Plant Molecular Biology* **107**(4-5): 387–404. <https://doi.org/10.1007/s11103-021-01167-3>
190. Campbell C, Kelly DL, Smyth N, Lockhart N, Holyoak DT & Long D. 2023. Investigation of the copper requirements of the metallophyte liverworts *Cephaloziella nicholsonii* Douin and *C. massalongoi* (Spruce) Müll.Frib. *Plants* **12**(12): 2265–2265. <https://doi.org/10.3390/plants12122265>
191. Brambilla M, Chiari G, Commisso M, Nerva L, Musetti R, Petraglia A & Degola F. 2023. Glutamate dehydrogenase in “Liverworld”—A study in selected species to explore a key enzyme of plant primary metabolism in Marchantiophyta. *Physiologia Plantarum (København. 1948)* **175**(6). <https://doi.org/10.1111/ppl.14071>
192. Valeeva LR, Sannikova A, Shafigullina NR, Abdulkina LR, Sharipova MR & Shakirov EV. 2023. Telomere length variation in model Bryophytes. <https://doi.org/10.20944/preprints202312.0257.v1>
193. Bellini E, Bandoni E, Giardini S, Sorce C, Spanò C, Bottega S, Fontanini D, Kola A, Valensin D, Bertolini A, Saba A, Paoli L, Andreucci A, Li M, Varotto C & Sanità L. 2023. Glutathione and phytochelatins jointly allow intracellular and extracellular detoxification of cadmium in the liverwort *Marchantia polymorpha*. *Environmental and Experimental Botany* **209**: 105303–105303. <https://doi.org/10.1016/j.envexpbot.2023.105303>
194. Knosp S, Kriegshauser L, Tatsumi K, Malherbe L, Wiedemann G, Bakan B, Kohchi T, Reski R & Renault H. 2023. An ancient role for the *CYP73* gene family in *int*-cinnamic acid 4-hydroxylation, phenylpropanoid biosynthesis and embryophyte development. *BioRxiv (Cold Spring Harbor Laboratory)*. <https://doi.org/10.1101/2023.08.20.551634>
195. Cheng J, Loncarevic I & Cronberg N. 2023. Interspecific competition affects spore germination and gametophore development of mosses. *Open Research Europe* **3**: 91–91. <https://doi.org/10.12688/openreseurope.16004.1>
196. Eisenreich W, Rieder C, Grammes C, Heßler G, Adam KP, Becker H, Arigoni D & Bacher A. 1999. Biosynthesis of a neo-epi-verrucosane diterpene in the liverwort *Fossombronina alaskana*. *Journal of Biological Chemistry* **274**(51): 36312–36320. <https://doi.org/10.1074/jbc.274.51.36312>
197. Egunyomi A. 1978. Comparative culture studies on the spores and gemmae of *Octoblepharum albidum* Hedw. *Journal of Hattori Botanical Laboratory* **44**: 25–30.
198. Morais RMSC & Becker H. 1990. Growth and secondary product formation of *in vitro* cultures from the liverwort *Reboulia hemispherica*. *Zeitschrift Für Naturforschung* **46c**: 28- 32.
199. Bogdanović M, Ilić M, Živković S, Sabovljević A, Grubišić D & Sabovljević M. 2012. Comparative study on the effects of NaCl on selected moss and fern representatives. *Australian Journal of Botany* **59**(8): 734–740. <https://doi.org/10.1071/BT11059>

200. Mishra R, Pandey VK & Chandra R. 2014. In vitro culture of the moss *Hyophrilla nymaniana* (Fleish.) Menzel and its phytochemical screening. *International Journal of Phytomedicine* **6**: 377–383.
201. Sahu V, Rawat KK, Srivastava A & Asthana AK. 2017. In vitro propagation of saprophytic moss *Splachnum sphaericum* Hedw. *International Journal of Plant and Environment*, 3(02). <https://doi.org/10.18811/ijpen.v3i02.10436>
202. Pasiche-Lisboa CJ & Jesús ISD. 2013. The effect of pH on *in vitro* growth of protonemata, asexual propagules, or gametophytes fragments of four Neotropical moss species. *Bryophyte Diversity and Evolution* **35**(1): 64. <https://doi.org/10.11646/bde.35.1.8>
203. Sabovljević A, Ostojić J, Vujičić M, Pantović J, Ćosić M & Sabovljević M. 2018. Towards *ex situ* conservation of rare and endangered moss *Tayloria splachnoides*: biotechnical approach. *3rd International Conference on Plant Biology (22nd SPPS Meeting)*.
204. Sabovljević M, Vujičić M & Sabovljević A. 2016. Biotechnological approach to bryophyte protection: case studies on two *Sphagnum* species. *12th Symposium on the Flora of Southeastern Serbia and Neighboring Regions, Kopaonik Mt.*
205. Sabovljević A, Vujičić M & Sabovljević M. 2016. In vitro establishment, propagation and conservation of *Calliergon giganteum* (Schimp.) Kindb. (Amblystegiaceae) *9th Conference of European Committee for Conservation of Bryophytes*.
206. Sabovljević A, Vujičić M, Pantović J & Sabovljević M. 2015. Axenically culturing the Bryophytes: *in vitro* establishment and propagation of rheophile moss *Cinclidotus aquaticus* (Hedw.) Bruch & Schimp. (Cinclidoteaceae). *II Symposium of biologists and ecologists of the Republic of Srpska At: Banja Luka, Republika Srpska, Bosnia-Herzegovina*.
207. Sabovljević A, Troitsky A, Ignatov M & Sabovljević M. 2015. Axenically culturing and micro-propagation of the rare *Podperaea krylovii*. *Conference: International Bryological Conference. At: Sankt Petersburg, Russia. Volume: Proceeding of the International Bryological Conference devoted to the 100th Anniversary of Anastasiya Lavretievna Abramova*.
208. Vujičić M, Sabovljević A, Rajčić M, Janković J & Sabovljević M. 2015. In vitro development of the rare and endangered moss *Funaria muehlenbergii* Turn. (Funariaceae). *Conference: 6th Balkan Botanical Congress. Volume: Book of Abstracts: 122*.
209. Sabovljević M, Segarra-Moragues JG, Puche F, Cogoni A & Sabovljević A. 2015. Conservation biology of rare and endangered liverwort from Mediterranean temporary ponds: *Riella helicophylla*. *Conference: International Symposium on Mediterranean Temporary Ponds. At: Sassari, Italy*.
210. Jadranin B, Papp B, Božović DP, Ćosić M, Sabovljević A, Vujičić M & Sabovljević M. 2023. Influence of plant growth regulators on multiplication of rare and threaten moss *Drepanocladus lycopodioides* (Amblystegiaceae) in *in vitro* conditions. *Acta Biologica Plantarum Agriensis ISSN 2061-6716 (Print)*, 2063-6725.
211. Božović DP, Ćosić M, Tenji A, Vujičić M, Sabovljević A & Sabovljević M. 2023. Copper and zinc effects on spore germination of rare and threatened moss *Physcomitrium eurystomum*. *Acta Biologica Plantarum Agriensis ISSN 2061-6716 (Print)*, 2063-6725.
212. Tanaka D, Ishizaki K, Kohchi T & Yamato KT. 2015. Cryopreservation of gemmae from the liverwort *Marchantia polymorpha* L. *Plant and Cell Physiology* **57**(2): 300–306. <https://doi.org/10.1093/pcp/pcv173>
213. Sanobar N, Lin PC, Pan ZJ, Fang RY, Tjita V, Chen FF, Wang HC, Tsai HL, Wu SH, Shen TL, Chen YH & Lin SS. 2021. Investigating the viral suppressor HC-pro inhibiting small RNA methylation through functional comparison of HEN1 in angiosperm and Bryophyte. *Viruses* **13**(9): 1837–1837. <https://doi.org/10.3390/v13091837>
214. Hiwatashi T, Goh H, Yasui Y, Koh LQ, Takami H, Kajikawa M, Kirita H, Kanazawa T, Minamino N, Togawa T, Sato M, Wakazaki M, Yamaguchi K, Shigenobu S, Fukaki H, Mimura T, Toyooka K, Sawa S, Yamato KT & Ueda T. 2019. The RopGEF KARAPPO is essential for the initiation of vegetative

reproduction in *Marchantia polymorpha*. *Current Biology* **29**(20): 3525-3531.e7.
<https://doi.org/10.1016/j.cub.2019.08.071>

215. Quoc Tan T, Ngo Hoang P, Ngoc Vy L, Lan Anh B, Tan Nhut D & Ngo Diem PQ. 2020. Improving in vitro biomass and evaluating α -glucosidase inhibition activity of liverwort *Marchantia polymorpha* L. *Asian Journal of Plant Sciences* **19**(2): 133–145. <https://doi.org/10.3923/ajps.2020.133.145>
216. Petraglia A, De Benedictis M, Degola F, Pastore G, Calcagno M, Ruotolo R, Mengoni A & Sanità di Toppi L. 2014. The capability to synthesize phytochelatin and the presence of constitutive and functional phytochelatin synthases are ancestral (plesiomorphic) characters for basal land plants. *Journal of Experimental Botany* **65**(4): 1153–1163. <https://doi.org/10.1093/jxb/ert472>
217. Spinedi N, Rojas N, Storb R, Cabrera J, Aranda E, Salierno M, Svriz M & Scervino JM. 2019. Exploring the response of *Marchantia polymorpha*: Growth, morphology and chlorophyll content in the presence of anthracene. *Plant Physiology and Biochemistry* **135**: 570–574. <https://doi.org/10.1016/j.plaphy.2018.11.001>
218. Duckett JG. 1994. Studies of protonemal morphogenesis in mosses V. *Diphyscium foliosum* (Hedw.) Mohr (Buxbaumiales). *Journal of Bryology* **18**(2): 223–238. <https://doi.org/10.1179/jbr.1994.18.2.223>
219. Bellini E, Varotto C, Borsò M, Rugnini L, Bruno L & Sanità L. 2020. Eukaryotic and prokaryotic phytochelatin synthases differ less in functional terms than previously thought: a comparative analysis of *Marchantia polymorpha* and *Geitlerinema* sp. PCC 7407. *Plants* **9**(7): 914–914. <https://doi.org/10.3390/plants9070914>
220. Löbel S & Rydin H. 2010. Trade-offs and habitat constraints in the establishment of epiphytic bryophytes. *Functional Ecology* **24**(4): 887–897. <https://doi.org/10.1111/j.1365-2435.2010.01705.x>
221. Ručová D, Goga M, Sabovljević M, Vilková M, Petruřová V & Bačkor M. 2019. Insights into physiological responses of mosses *Physcomitrella patens* and *Pohlia drummondii* to lichen secondary metabolites. *Protoplasma* **256**(6): 1585–1595. <https://doi.org/10.1007/s00709-019-01403-0>
222. Rowntree JK, Duckett JG, Mortimer CL, Ramsay MM & Pressel S. 2007. Formation of specialized propagules resistant to desiccation and cryopreservation in the threatened moss *Ditrichum plumbicola* (Ditrichales, Bryopsida). *Annals of Botany* **100**(3): 483–496. <https://doi.org/10.1093/aob/mcm141>
223. Mallón R, Rodríguez-Oubiña J & González ML. 2010. Vitrification of mosses: a useful method for the cryopreservation of *Splachnum ampullaceum* Hedw. *CryoLetters* **31**(1): 24 – 28.
224. Giordano S, Basile A, Lanzetta R, Corsaro MM, Spagnuolo V & Castaldo RC. 1997. Potential allelochemicals from the lichen *Cladonia foliacea* and their in vitro effects on the development of mosses. *Allelopathy Journal* **4**: 89–100.
225. Pence VC, Dunford SS & Redella S. 2005. Differential effects of abscisic acid on desiccation tolerance and carbohydrates in three species of liverworts. *Journal of Plant Physiology* **162**(12): 1331–1337. <https://doi.org/10.1016/j.jplph.2005.02.002>
226. Bijelović A, Sabovljević M, Grubisić D & Konjević R. 2004. Phytohormone influence on the morphogenesis of two mosses (*Bryum argenteum* Hedw. and *Atrichum undulatum* (Hedw.) P. Beauv.). *Israel Journal of Plant Sciences* **52**(1): 31–36. <https://doi.org/10.1560/rx30-u7qh-demq-gl7p>
227. Rankin AH, Pressel S, Duckett JG, Rimington WR, Hawes I, Sumner DY, Mackey TJ, Castendyke D, Schneider H & Jungblut AD. 2017. Characterisation of a deep-water moss from the perennially ice-covered Lake Vanda, Antarctica. *Polar Biology* **40**(10): 2063–2076. <https://doi.org/10.1007/s00300-017-2127-y>
228. Heck MA, Lüth VM, Van Gessel N, Krebs M, Kohl M, Prager A, Joosten H, Decker EL & Reski R. 2020. Axenic in vitro cultivation of 19 peat moss (*Sphagnum* L.) species as a resource for basic biology, biotechnology, and paludiculture. *New Phytologist* **229**(2): 861–876. <https://doi.org/10.1111/nph.16922>
229. Tan TQ, Nguyen-Thi MD, Dat TQ & Quach-Ngo DP. 2023. Study on gametophyte cultivation and bioactive evaluation on biomass of silver moss *Bryum argenteum* Hedw. *Research Journal of Biotechnology* **18**(8): 22–31. <https://doi.org/10.25303/1808rjbt022031>

230. Lang I & Wernitznig S. 2011. Sequestration at the cell wall and plasma membrane facilitates zinc tolerance in the moss *Pohlia drummondii*. *Environmental and Experimental Botany* **74**: 186–193. <https://doi.org/10.1016/j.envexpbot.2011.05.018>
231. Awasthi V, Nath V & Asthana AK. 2012. In vitro study and micropropagation of ethnomedicinally important bryophyte: *Plagiochasma appendiculatum* Lehm. & Lindenb. *Proceedings of the National Academy of Sciences, India Section B: Biological Sciences* **82**(3): 405–412. <https://doi.org/10.1007/s40011-012-0051-z>
232. Tiloca G, Brundu G & Ballesteros D. 2022. Bryophyte spores tolerate high desiccation levels and exposure to cryogenic temperatures but contain storage lipids and chlorophyll: understanding the essential traits needed for the creation of bryophyte spore Banks. *Plants* **11**(9): 1262–1262. <https://doi.org/10.3390/plants11091262>
233. Kaul KN, Mitra GC & Tripathi BK. 1962. Responses of *Marchantia* in aseptic culture to well-known auxins and antiauxins. *Annals of Botany* **26**(3): 447–466. <https://doi.org/10.1093/oxfordjournals.aob.a083806>
234. Insuk C, Kuncharoen N, Cheeptham N, Tanasupawat S & Pathom-aree W. 2020. Bryophytes Harbor cultivable actinobacteria with plant growth promoting potential. *Frontiers in Microbiology* **11**. <https://doi.org/10.3389/fmicb.2020.563047>
235. Sierocka I, Kozłowski LP, Bujnicki JM, Jarmolowski A & Szweykowska-Kulinska Z. 2014. Female-specific gene expression in dioecious liverwort *Pellia endiviifolia* is developmentally regulated and connected to archegonia production. *BMC Plant Biology* **14**(1): 168. <https://doi.org/10.1186/1471-2229-14-168>
236. Batra A, Binding H, Rasmussen S, Rudolph H & Waetzig GH. 2003. Efficient regeneration of *Sphagnum fallax* from isolated protoplasts. *In Vitro Cellular & Developmental Biology - Plant* **39**(2): 147–150. <https://doi.org/10.1079/ivp2002382>
237. Hohe A, Rensing SA, Mildner M, Lang D & Reski R. 2002. Day length and temperature strongly influence sexual reproduction and expression of a novel MADS-Box gene in the Moss *Physcomitrella patens*. *Plant Biology* **4**(5): 595–602. <https://doi.org/10.1055/s-2002-35440>
238. Fan H, Wei G, Chen X, Guo H, Crandall-Stotler B, Köllner TG & Chen F. 2021. Sesquiterpene biosynthesis in a leafy liverwort *Radula lindenbergiana* Gottsche ex C. Hartm. *Phytochemistry* **190**: 112847. <https://doi.org/10.1016/j.phytochem.2021.112847>
239. Park JM & Kim WS. 2020. Cytokinin promotes fast maturation and mass propagation of the moss *Brachythecium plumosum*. *Acta Horticulturae* **1291**: 197–204. <https://doi.org/10.17660/actahortic.2020.1291.25>
240. Kumra PK. 1982. Effect of some chelating agents on growth and antheridial production in male clones of three mosses grown *in vitro*. *Annals of Botany (Print)* **50**(6): 771–777. <https://doi.org/10.1093/oxfordjournals.aob.a086421>
241. Duckett JG. 1994. Studies of protonemal morphogenesis in mosses VI. The foliar rhizoids of *Calliergon stramineum* (Brid.) Kindb. function as organs of attachment. *Journal of Bryology* **18**(2): 239–252. <https://doi.org/10.1179/jbr.1994.18.2.239>
242. Duckett JG & Ligrone R. 1992. A survey of diaspore liberation mechanisms and germination patterns in mosses. *Journal of Bryology* **17**(2): 335–354. <https://doi.org/10.1179/jbr.1992.17.2.335>
243. Kugita M. 2003. The complete nucleotide sequence of the hornwort (*Anthoceros formosae*) chloroplast genome: insight into the earliest land plants. *Nucleic Acids Research* **31**(2): 716–721. <https://doi.org/10.1093/nar/gkg155>
244. Duckett JG, Goode JA & Stead AD. 1993. Studies of protonemal morphogenesis in mosses I *Ephemerum*. *Journal of Bryology* **17**(3): 397–408. <https://doi.org/10.1179/jbr.1993.17.3.397>

245. Pressel S, Matcham HW & Duckett JG. 2005. Studies of protonemal morphogenesis in mosses. X. Ephemeraceae revisited; new dimensions underground. *Journal of Bryology* **27**(4): 311–318. <https://doi.org/10.1179/174328205x71451>
246. Goode JA, Stead AD & Duckett JG. 1993. Studies of protonemal morphogenesis in mosses II *Orthotrichum obtusifolium* Brid.. *Journal of Bryology* **17**(3): 409–419. <https://doi.org/10.1179/jbr.1993.17.3.409>
247. Goode JA, Stead AD, Ligrone R Duckett JG. 1994. Studies of protonemal morphogenesis in mosses IV. *Aloina* (Pottiales). *Journal of Bryology* **18**(1): 27–41. <https://doi.org/10.1179/jbr.1994.18.1.27>
248. Jensen W. 1981. Division, growth, and branch formation in protonema of the moss *Physcomitrium turbinatum*: Studies of sequential cytological changes in living cells. *Protoplasma* **107**(3-4): 301–317. <https://doi.org/10.1007/bf01276832>
249. Jensen LCW & Jensen CG. 1984. Fine structure of protonemal apical cells of the moss *Physcomitrium turbinatum*. *Protoplasma* **122**(1-2): 1–10. <https://doi.org/10.1007/bf01279432>
250. Duckett JG, Goode JA & Matcham HW. 2001. Studies of protonemal morphogenesis in mosses. VIII. The gemmiferous protonemata of *Orthodontium* and *Dicranoweisia*. *Journal of Bryology* **23**(3): 181–193. <https://doi.org/10.1179/jbr.2001.23.3.181>
251. Duckett JG & Ligrone R. 1995. The formation of catenate foliar gemmae and the origin of oil bodies in the liverwort *Odontoschisma denudatum* (Mart.) Dum. (Jungermanniales): a light and electron microscope study. *Annals of Botany* **76**(4): 405–419. <https://doi.org/10.1006/anbo.1995.1114>
252. Duckett JG & Matcham HW. 1995. Studies of protonemal morphogenesis in mosses VII. The perennial rhizoids and gemmiferous protonema of *Dicranella heteromalla* (Hedw.) Schimp. *Journal of Bryology* **18**(3): 407–424. <https://doi.org/10.1179/jbr.1995.18.3.407>
253. Goode JA, Alfano F, Stead AD & Duckett JG. 1993. The formation of aplastidic abscission (tmema) cells and protonemal disruption in the moss *Bryum tenuisetum* Limpr. is associated with transverse arrays of microtubules and microfilaments. *Protoplasma* **174**(3-4): 158–172. <https://doi.org/10.1007/bf01379048>
254. Klein B & Bopp M. 1971. Effect of activated charcoal in agar on the culture of lower plants. *Nature (London)* **230**(5294): 474–474. <https://doi.org/10.1038/230474a0>
255. Andel van. 1952. Germination of the spores and development of primary and secondary protonema of *Funaria hygrometrica*. *Transactions of the British Bryological Society* **2**(1): 74–81. <https://doi.org/10.1179/006813852804878273>
256. Duckett JG & Pressel S. 2003. Studies of protonemal morphogenesis in mosses. IX. *Discelium nudum*: exquisite pioneer of unstable clay banks. *Journal of Bryology* **25**(4): 241–245. <https://doi.org/10.1179/037366803225013092>
257. Glime JM & Knoop BC. 1986. Spore germination and protonemal development of *Fontinalis squamosa*. *The Journal of the Hattori Botanical Laboratory* **61**: 487–497.
258. Goode JA, Duckett JG & Stead AD. 1992. Protonemal Morphogenesis of the Moss *Tetraphis pellucida* Hedw. in Culture and in the Wild. *Annals of Botany* **70**(6): 519–530. <https://doi.org/10.1093/oxfordjournals.aob.a088512>
259. Ligrone R, Duckett JG & Gambardella R. 1996. Development and liberation of cauline gemmae in the moss *Aulacomnium androgynum* (Hedw.) Schwaegr. (Bryales): an ultrastructural study. *Annals of Botany* **78**(5): 559–568. <https://doi.org/10.1006/anbo.1996.0161>
260. Reski R & Abel WO. 1985. Induction of budding on chloronemata and caulonemata of the moss, *Physcomitrella patens*, using isopentenyladenine. *Planta* **165**(3): 354–358. <https://doi.org/10.1007/bf00392232>

261. Jules ES & Shaw AJ. 1994. Adaptation to metal-contaminated soils in populations of the moss, *Ceratodon purpureus*: vegetative growth and reproductive expression. *American Journal of Botany* **81**(6): 791–791. <https://doi.org/10.2307/2445660>
262. Shaw J, Beer SC & Lutz J. 1989. Potential for the evolution of heavy metal tolerance in *Bryum argenteum*, a moss. I. Variation within and among populations. *The Bryologist* **92**(1): 73. <https://doi.org/10.2307/3244019>
263. Rowntree JK, Sheffield E & Burch J. 2005. Growth and development of mosses are inhibited by the common herbicide asulam. *The Bryologist* **108**(2): 287–294. [https://doi.org/10.1639/0007-2745\(2005\)108\[0287:gadoma\]2.0.co;2](https://doi.org/10.1639/0007-2745(2005)108[0287:gadoma]2.0.co;2)
264. Takenaka M, Yamaoka S, Hanajiri T, Shimizu-Ueda Y, Yamato KT, Fukuzawa H & Ohyama K. 2000. Direct transformation and plant regeneration of the haploid liverwort *Marchantia polymorpha* L. *Transgenic Research* **9**(3): 179–185. <https://doi.org/10.1023/a:1008963410465>
265. Cove DJ. 1992. Regulation of development in the moss, *Physcomitrella patens*. *Development* 179–193. https://doi.org/10.1007/978-3-642-77043-2_13
266. Szövényi P, Frangedakis E, Ricca M, Quandt D, Wicke S & Langdale JA. 2015. Establishment of *Anthoceros agrestis* as a model species for studying the biology of hornworts. *BMC Plant Biology* **15**(1). <https://doi.org/10.1186/s12870-015-0481-x>
267. Nagao M, Minami A, Arakawa K, Fujikawa S & Takezawa D. 2005. Rapid degradation of starch in chloroplasts and concomitant accumulation of soluble sugars associated with ABA-induced freezing tolerance in the moss *Physcomitrella patens*. *Journal of Plant Physiology* **162**(2): 169–180. <https://doi.org/10.1016/j.jplph.2004.06.012>
268. Christianson ML & Hornbuckle JS. 1999. Phenylurea cytokinins assayed for induction of shoot buds in the moss *Funaria hygrometrica*. *American Journal of Botany* **86**: 1645–1648.
269. Ward M. 1960. Callus tissues from the mosses *Polytrichum* and *Atrichum*. *Science (New York, N.Y.)* **132**(3437): 1401–1402. <https://doi.org/10.1126/science.132.3437.1401>
270. Bisang I. 1987. The sporeling development in *Frullania tamarisci* (L.) Dum. *Journal of Bryology* **14**(4): 761–763. <https://doi.org/10.1179/jbr.1987.14.4.761>
271. Menon C & Lal M. 1972. Influence of sucrose on the differentiation of cells with zygote-like potentialities in a moss. *The Science of Nature* **59**(11): 514–514. <https://doi.org/10.1007/bf00609824>
272. Kajita M, Takio S, Takami S & Hino S. 1987. Establishment and growth characterization of suspension culture of cells from the moss, *Sphagnum imbrication*. *Physiologia Plantarum* **70**(1): 21–26. <https://doi.org/10.1111/j.1399-3054.1987.tb08691.x>
273. Schween G, Hohe A, Koprivova A & Reski R. 2003. Effects of nutrients, cell density and culture techniques on protoplast regeneration and early protonema development in a moss, *Physcomitrella patens*. *Journal of Plant Physiology* **160**(2): 209–212. <https://doi.org/10.1078/0176-1617-00855>
274. Sobotka D. 2015. Regeneration and vegetative propagation of *Sphagnum palustre* as factor of population stability. *Acta Societatis Botanicorum Poloniae* **45**(4): 357–368. <https://doi.org/10.5586/asbp.1976.031>
275. Morais RMSC, Harrison LJ & Becker H. 1991. A gymnomitrane-type sesquiterpenoid from *in vitro* cultures of *Reboulia hemisphaerica*. *Phytochemistry* **30**(3): 1013–1014. [https://doi.org/10.1016/0031-9422\(91\)85298-e](https://doi.org/10.1016/0031-9422(91)85298-e)
276. Sauerwein M & Becker H. 1990. Growth, terpenoid production and antibacterial activity of an *in vitro* culture of the liverwort *Fossombronina pusilla*. *Planta Medica* **56**(04): 364–367. <https://doi.org/10.1055/s-2006-960983>
277. Sood S & Chopra RN. 1973. A record preponement of bud-induction in the moss *Entodon myurus*. *Zeitschrift Für Pflanzenphysiologie* **69**(5): 390–393. [https://doi.org/10.1016/s0044-328x\(73\)80126-6](https://doi.org/10.1016/s0044-328x(73)80126-6)

278. Bopp M & Jacob HJ. 1986. Cytokinin effect on branching and bud formation in *Funaria*. *Planta* **169**(3): 462–464. <https://doi.org/10.1007/bf00392145>
279. Chaban CI, Kern VD, Ripetskyj RT, Demkiv OT & Sack FD. 1998. Gravitropism in caulonemata of the moss *Pottia intermedia*. *Journal of Bryology* **20**: 287–299.
280. Lamparter T, Esch H, Cove DJ, Hughes J & Hartmann E. 1996. Aphototropic mutants of the moss *Ceratodon purpureus* with spectrally normal and with spectrally dysfunctional phytochrome. *Plant, Cell & Environment* **19**(5): 560–568. <https://doi.org/10.1111/j.1365-3040.1996.tb00389.x>
281. Chopra RN & Dhingra-Babbar S. 1984. Studies on bud induction in the moss *Trematodon brevicalyx* Dixon. *New Phytologist* **97**: 613–620.
282. Valadon LRG & Mummery RS. 1971. Quantitative relationship between various growth substances and bud production in *Funaria hygrometrica*. A bioassay for abscisic acid. *Physiologia Plantarum* **24**(2): 232–234. <https://doi.org/10.1111/j.1399-3054.1971.tb03484.x>
283. Zeidler M, Hartmann E & Hughes J. 1999. Transgene expression in the moss *Ceratodon purpureus*. *Journal of Plant Physiology* **154**(5–6): 641–650. [https://doi.org/10.1016/s0176-1617\(99\)80239-9](https://doi.org/10.1016/s0176-1617(99)80239-9)
284. Gerdol R, Bonora A, Marchesini R, Gualandri R & Pancaldi S. 1998. Growth response of *Sphagnum capillifolium* to nighttime temperature and nutrient level: mechanisms and implications for global change. *Arctic and Alpine Research* **30**(4): 388. <https://doi.org/10.2307/1552011>
285. Newton ME. 1972. Sex-ratio differences in *Mnium hornum* Hedw. and *M. undulatum* Sw. in relation to spore germination and vegetative regeneration. *Annals of Botany* **36**(1): 163–178. <https://doi.org/10.1093/oxfordjournals.aob.a084569>
286. Sundberg S & Rydin H. 2002. Habitat requirements for establishment of *Sphagnum* from spores. *Journal of Ecology* **90**(2): 268–278. <https://doi.org/10.1046/j.1365-2745.2001.00653.x>
287. Wiklund K. 2003. Phosphorus concentration and pH in decaying wood affect establishment of the red-listed moss *Buxbaumia viridis*. *Canadian Journal of Botany* **81**(6): 541–549. <https://doi.org/10.1139/b03-048>
288. Bapna KR, Singh RP & Chaudhary BL. 1984. Induction of sex organs in *Targionia hypophylla* L. *The Bryologist* **87**(4): 340–340. <https://doi.org/10.2307/3242957>
289. Bostic SR. 1981. Laboratory Induction of Sexuality in *Asterella tenella* (L.) Beauv. (Aytoniaceae). *The Bryologist* **84**(1): 89. <https://doi.org/10.2307/3242984>
290. Chin CM, Maclellan AJ & Renzaglia KS. 1987. Vegetative growth and reproduction of *Fossombronia brasiliensis* Steph.: the influence of photoperiod, temperature and inorganic nitrogen source. *Journal of Bryology* **14**(3): 581–591. <https://doi.org/10.1179/jbr.1987.14.3.581>
291. Kumra S. 1984. Callus induction in the liverwort *Asterella wallichiana* (L. et L.) Grolle. *Journal of Plant Physiology* **115**(3): 263–269. [https://doi.org/10.1016/s0176-1617\(84\)80129-7](https://doi.org/10.1016/s0176-1617(84)80129-7)
292. Lockwood LG. 1975. The influence of photoperiod and exogenous nitrogen containing compounds on the reproductive cycles of the liverwort *Cephalozia media*. *American journal of botany* **62**: 893–900.
293. Tazaki H, Nabeta K, Okuyama H & Becker H. 1995. Biosynthesis of pinguisone in an axenic culture of the liverwort *Aneura pinguis*. *Bioscience, Biotechnology, and Biochemistry* **59**(1): 158–160. <https://doi.org/10.1271/bbb.59.158>
294. Allsopp A. 1957. Controlled differentiation in cultures of two liverworts. *Nature* **179**(4561): 681–682. <https://doi.org/10.1038/179681a0>
295. Nabeta K, Oohata T, Ohkubo S, Sato T & Katoh K. 1996. Spiro- γ -lactone diterpenes from in vitro cultures of the liverwort, *Heteroscyphus planus*. *Phytochemistry* **41**(2): 581–587. [https://doi.org/10.1016/0031-9422\(95\)00420-3](https://doi.org/10.1016/0031-9422(95)00420-3)

296. Chopra RN & Rawat MS. 1973. In vitro production of secondary gemmae on the protonema of *Bryum klingraeffii* Schimp. *The Bryologist* **76**(1): 183–183. <https://doi.org/10.2307/3241240>
297. Rahbar K & Chopra RN. 1983. Effect of chelating agents on bud induction and accumulation of iron and copper by the moss *Bartramidula bartramoides*. *Physiologia Plantarum* **59**(1): 148–152. <https://doi.org/10.1111/j.1399-3054.1983.tb06586.x>
298. Hansen CE & Rossi P. 1991. Effects of culture conditions on accumulation of arachidonic and eicosapentaenoic acids in cultured cells of *Rhytidiadelphus squarrosus* and *Eurhynchium striatum*. *Phytochemistry* **30**(6): 1837–1841. [https://doi.org/10.1016/0031-9422\(91\)85024-t](https://doi.org/10.1016/0031-9422(91)85024-t)
299. Mehta P. 1988. In vitro studies on spore germination, protonemal differentiation and bud formation in three mosses grown in vitro. *The Journal of the Hattori Botanical Laboratory* **64**: 401–410.
300. Redfearn PL & Meyer SL. 1949. Physiological studies on mosses. VIII. Observations on the regeneration of setae of *Physcomitrium turbinatum*. *The Bryologist* **52**(4): 197–197. <https://doi.org/10.2307/3239476>
301. Berthier J, Larpent JP & Larpent-Gourgand M. 1976. Light action on vegetative propagation in bryophytes. *The Journal of the Hattori Botanical Laboratory* **41**: 193–203.
302. Furness SB & Grime JP. 1982. Growth rate and temperature responses in bryophytes: I. an investigation of *Brachythecium rutabulum*. *The Journal of Ecology* **70**(2): 513. <https://doi.org/10.2307/2259919>
303. Glime JM. 1980. Effects of temperature and flow on rhizoid production in *Fontinalis*. *The Bryologist* **83**(4): 477. <https://doi.org/10.2307/3242300>
304. Vashistha BD & Chopra RN. 1984. Production of protonemal gemmae in culture by the moss *Didymodon recurvus* (Griff.) Broth. *New Phytologist* **97**(1): 83–86. <https://doi.org/10.1111/j.1469-8137.1984.tb04112.x>
305. Harashima S & Ono K. 1991. Physiological characteristics and morphogenetic potential of longterm cultured cell lines in bryophytes. *The Journal of the Hattori Botanical Laboratory* **69**: 171–184.
306. Ohta Y, Ishikawa M, Abe S, Katoh K & Hirose Y. 1981. Growth behavior of a liverwort, *Jungermannia subulata* Evans, in a cell suspension culture. The role of organic acids required for cell growth. *Plant and Cell Physiology* **22**(8): 1533–1540. <https://doi.org/10.1093/oxfordjournals.pcp.a076306>
307. Takami S, Yasunaga M, Takio S, Kimura J & Hino S. 1990. Establishment of suspension cultures of cells from the hornwort, *Anthoceros punctatus* L. *The Journal of the Hattori Botanical Laboratory* **64**: 429–435.
308. Takio S, Akita C, Ngumi VW & Takami S. 1990. Photosynthetic ability in dark-grown *Reboulia hemisphaerica* and *Barbula unguiculata* cells in suspension culture. *Plant Cell Reports* **8**(10): 575–578. <https://doi.org/10.1007/bf00270056>
309. Takio S, Kajita M, Takami S & Hino S. 1986. Establishment and growth characterization of suspension cultures of cells from *Barbula unguiculata*. *The Journal of the Hattori Botanical Laboratory* **60**: 407–417.
310. Schüßler A. 2000. Glomus claroideum forms an arbuscular mycorrhiza-like symbiosis with the hornwort *Anthoceros punctatus*. *Mycorrhiza* **10**(1): 15–21. <https://doi.org/10.1007/s005720050282>
311. Sarla & Chopra RN. 1989. In vitro regulation of gemma/bud formation by cytokinins in the moss *Bryum capillare* Hedw. *Plant Science* **64**(2): 237–242. [https://doi.org/10.1016/0168-9452\(89\)90029-0](https://doi.org/10.1016/0168-9452(89)90029-0)
312. Allsopp A & Mitra GC. 1956. The heterotrichous habit in the protonema of the Bryales. *Nature* **178**(4541): 1063–1064. <https://doi.org/10.1038/1781063b0>
313. Allsopp A & Mitra GC. 1958. The morphology of protonema and bud formation in the Bryales. *Annals of Botany (Print)* **22**(1): 95–115. <https://doi.org/10.1093/oxfordjournals.aob.a083599>
314. Chaban ChI, Ripetskyj RT, Kordyum EL & Kit NA. 1999. High temperature alters the growth reaction of *Pottia* protonemata. *Advances in Space Research* **23**(12): 2011–2016. [https://doi.org/10.1016/s0273-1177\(99\)00351-8](https://doi.org/10.1016/s0273-1177(99)00351-8)

315. Nishihama R, Ishizaki K, Hosaka M, Matsuda Y, Kubota A & Kohchi T. 2015. Phytochrome-mediated regulation of cell division and growth during regeneration and sporeling development in the liverwort *Marchantia polymorpha*. *Journal of Plant Research* **128**(3): 407–421. <https://doi.org/10.1007/s10265-015-0724-9>
316. Zhao JC, Huang SL, Li M, Sulayman M, He J, Zhang YM & Xiao L. 2004. A study on the characteristics of spore germination and protonemal development in *Lindbergia brachyptera*. *Arctoa* **13**: 223–228.
317. Bartholomew-Began SE & Crandall-Stotler BJ. 1994. The sporeling ontogeny of *Monoclea gottschei* subsp. *elongata*. *The Bryologist* **97**(3): 244. <https://doi.org/10.2307/3243455>
318. Luna ED. 1990. Protonemal development in the Hedwigiaceae (Musci), and its systematic significance. *Systematic Botany* **15**(2): 192. <https://doi.org/10.2307/2419173>
319. Renzaglia KS & Bartholomew SE. 1985. Sporeling development in *Fossombronia cristula* Aust. with special reference to the apical organization and growth. *The Bryologist* **88**(4): 337–337. <https://doi.org/10.2307/3242669>
320. Spiess LD, Lippincott BB & Lippincott JA. 1971. Development and gametophore initiation in the moss *Pylaisiella selwynii* as influenced by *Agrobacterium tumefaciens*. *American Journal of Botany* **58**(8): 726–726. <https://doi.org/10.2307/2441470>
321. Ohta Y, Katoh K & Miyake K. 1977. Establishment and growth characteristics of a cell suspension culture of *Marchantia polymorpha* L. with high chlorophyll content. *Planta* **136**(3): 229–232. <https://doi.org/10.1007/bf00385989>
322. Alcalde M, Abella L & Estebanez B. 1996. Protonemal development under different culture conditions in *Bartramia* Hedw. (Musci). *Journal of the Hattori Botanical Laboratory* **79**: 107–114.
323. Crandall-Stotler B & Bozzola JJ. 1988. Fine structure of the meristematic cells of *Takakia lepidozoides* Hatt. et H. Inoue (Takakiophyta). *Journal of the Hattori Botanical Laboratory* **64**: 197–218. https://doi.org/10.18968/jhbl.64.0_197
324. Yang BY. 1967. Spore germination and leafy gametophyte of *Haplomitrium rotundifolium* developed in culture. *Taiwania* **13**: 153–167. <https://doi.org/10.6165/tai.1967.13.153>
325. Takio S. 1989. Effect of cytokinin on morphological changes of suspension cultured cells of the moss, *Barbula unguiculata*. *Plant Cell Reports* **7**(8): 603–606. <https://doi.org/10.1007/bf00272039>
326. Simola LK. 1969. The effect of various mono- and disaccharides on the growth of *Sphagnum nemoreum* thalli in sterile cultures. *Physiologia Plantarum*, **22**(5), 1079–1084. <https://doi.org/10.1111/j.1399-3054.1969.tb07469.x>
327. Chopra RN & Vashistha BD. 1987. In vitro induction of buds in the moss *Bryum atrovirens*. *Journal of the Hattori Botanical Laboratory* **63**: 231–235. https://doi.org/10.18968/jhbl.63.0_231
328. Chopra RN & Dhingra-Babbar S. 1986. Studies on callus induction its growth and differentiation in *Marchantia palmata* Nees ii. effect of some amino acids, complex organic substances and activated charcoal. *Journal of the Hattori Botanical Laboratory* **60**: 193–202. https://doi.org/10.18968/jhbl.60.0_193
329. Anderson LE, Basile MR & Basile DV. 1992. Common garden experiments with *Sphagnum* in axenic culture. *Journal of Bryology* **17**(1): 15–25. <https://doi.org/10.1179/jbr.1992.17.1.15>
330. Basile A. 1995. Effect of lead and colchicine on morphogenesis in protonemata of the moss *Funaria hygrometrica*. *Annals of Botany* **76**(6): 597–606. <https://doi.org/10.1006/anbo.1995.1137>
331. Shaw J. 1987. Effect of environmental pretreatment on tolerance to copper and Zn in the moss *Funaria hygrometrica*. *American Journal of Botany* **74**(10): 1466–1475. <https://doi.org/10.1002/j.1537-2197.1987.tb12138.x>
332. Kelley CB & Doyle WT. 1975. Differentiation of intracapsular cells in the sporophyte of *Sphaerocarpos donnellii*. *American Journal of Botany* **62**(6): 547–547. <https://doi.org/10.2307/2441932>

333. Kunz S & Becker H. 1995. Cell wall pigment formation of *in vitro* cultures of the liverwort *Ricciocarpos natans*. *Zeitschrift Für Naturforschung C* **50**(3-4): 235–240. <https://doi.org/10.1515/znc-1995-3-412>
334. Maeda M. 1979. Isolation and culture of protoplasts from moss protonemata. *The Botanical Magazine Tokyo* **92**(2): 105–110. <https://doi.org/10.1007/bf02493383>
335. Goode JA, Stead AD & Duckett JG. 1993. Redifferentiation of moss protonemata: an experimental and immunofluorescence study of brood cell formation. *Canadian Journal of Botany* **71**(11): 1510–1519. <https://doi.org/10.1139/b93-183>
336. Jenkins GI & Cove DJ. 1983. Light requirements for regeneration of protoplasts of the moss *Physcomitrella patens*. *Planta* **157**(1): 39–45. <https://doi.org/10.1007/bf00394538>
337. Sahu V, Nath V, Asthana AK & Yunus M. 2010. Effect of heavy metals on the growth of gemmae of *Marchantia paleacea*. *Environmental Science: an Indian Journal* **5**(5): 291–294.
338. Stumm I, Meyer Y & Abel WO. 1975. Regeneration of the moss *Physcomitrella patens* (hedw.) from isolated protoplasts. *Plant Science Letters* **5**(2): 113–118. [https://doi.org/10.1016/0304-4211\(75\)90051-6](https://doi.org/10.1016/0304-4211(75)90051-6)
339. Gorton BS & Eakin RE. 1957. Development of the gametophyte in the moss *Tortella caespitosa*. *Botanical Gazette* **119**(1): 31–38. <https://doi.org/10.1086/335957>
340. Iwasa K. 1965. Chemical control of morphogenesis in moss protonema. *Plant and Cell Physiology* **6**: 421–429.
341. Nakosteen PC & Hughes KW. 1978. Sexual life cycle of three species of Funariaceae in Culture. *The Bryologist* **81**(2): 307. <https://doi.org/10.2307/3242191>
342. Mitra GC, Misra LP & Prabha C. 1965. Interaction of red and blue light on the development of the protonema and bud formation in *Pohlia nutans*. *Planta* **65**(1): 42–48. <https://doi.org/10.1007/bf00385178>
343. Lehnert B & Bopp M. 1983. The hormonal regulation of protonema development in mosses I. Auxin-cytokinin interaction. *Zeitschrift Für Pflanzenphysiologie* **110**(5): 379–391. [https://doi.org/10.1016/s0044-328x\(83\)80189-5](https://doi.org/10.1016/s0044-328x(83)80189-5)
344. Reiss HD & Schnepf E. 1983. Papaverine effects on development of *Funaria* caulonema filaments. *Zeitschrift Für Pflanzenphysiologie* **110**(4): 339–354. [https://doi.org/10.1016/s0044-328x\(83\)80184-6](https://doi.org/10.1016/s0044-328x(83)80184-6)
345. Saunders MJ & Hepler PK. 1981. Localization of membrane-associated calcium following cytokinin treatment in *Funaria* using chlorotetracycline. *Planta* **152**(3): 272–281. <https://doi.org/10.1007/bf00385156>
346. Saunders MJ & Hepler PK. 1982. Calcium Ionophore A23187 stimulates cytokinin-like mitosis in *Funaria*. *Science* **217**(4563): 943–945. <https://doi.org/10.1126/science.217.4563.943>
347. Saunders MJ & Hepler PK. 1983. Calcium antagonists and calmodulin inhibitors block cytokinin-induced bud formation in *Funaria*. *Developmental Biology* **99**(1): 41–49. [https://doi.org/10.1016/0012-1606\(83\)90252-x](https://doi.org/10.1016/0012-1606(83)90252-x)
348. Schmiedel G & Schnepf E. 1980. Polarity and growth of caulonema tip cells of the moss *Funaria hygrometrica*. *Planta* **147**(5): 405–413. <https://doi.org/10.1007/bf00380180>
349. Brandes H & Kende H. 1968. Studies on cytokinin-controlled bud formation in moss protonemata. *Plant Physiology* **43**(5): 827–837. <https://doi.org/10.1104/pp.43.5.827>
350. Reiss HD & Herth W. 1979. Calcium gradients in tip growing plant cells visualized by chlorotetracycline fluorescence. *Planta* **146**(5): 615–621. <https://doi.org/10.1007/bf00388841>
351. Chopra RN & Sarla. 1986. Bud formation in the moss *Garckea phascoides* (Hook.) C. Muell. I. Effects of auxins, cytokinins and their interaction. *Journal Hattori Botanical Laboratory* **61**: 75–92.

352. Mitra GC & Allsopp A. 1959. Effects of kinetin, gibberellic acid and certain auxins on the development of shoot buds on the protonema of *Pohlia nutans*. *Nature* **183**(4666): 974–975. <https://doi.org/10.1038/183974b0>
353. Rahbar K & Chopra RN. 1982. Factors affecting bud induction in the moss *Hyophila involuta*. *New Phytologist* **91**(3): 501–505. <https://doi.org/10.1111/j.1469-8137.1982.tb03328.x>
354. Ono K. 1973. Callus formation in liverwort, *Marchantia polymorpha*. *The Japanese Journal of Genetics* **48**(1): 69–70. <https://doi.org/10.1266/jjg.48.69>
355. Hoffman GR. 1964. The effects of certain sugars on spore germination in *Funaria hygrometrica* Hedw. *The Bryologist* **67**(3): 321. <https://doi.org/10.2307/3240895>
356. Ares Á, Itouga M, Kato Y & Sakakibara H. 2017. Differential metal tolerance and accumulation patterns of Cd, Cu, Pb and Zn in the liverwort *Marchantia polymorpha* L. *Bulletin of Environmental Contamination and Toxicology* **100**(3): 444–450. <https://doi.org/10.1007/s00128-017-2241-0>
357. Sassmann S, Adlassnig W, Puschenreiter M, Julio E, Leyvas M, Lichtscheidl IK & Lang I. 2015. Free metal ion availability is a major factor for tolerance and growth in *Physcomitrella patens*. *Environmental and Experimental Botany* **110**: 1–10. <https://doi.org/10.1016/j.envexpbot.2014.08.010>
358. Sassmann S, Weidinger M, Adlassnig W, Hofhansl F, Bock B & Lang I. 2015. Zinc and copper uptake in *Physcomitrella patens*: Limitations and effects on growth and morphology. *Environmental and Experimental Botany* **118**: 12–20. <https://doi.org/10.1016/j.envexpbot.2015.05.003>
359. Pandey VK, Mishra R, Chandra R. 2014. *In vitro* culture of moss *Bryum coronatum* Schwaegr. (Bryaceae) and its phytochemical analysis. *International Journal of Pharmacy and Pharmaceutical Sciences* **6**: 307–311.
360. Zhao W, Li Z, Hu Y, Wang M, Zheng S, Li Q, Wang Y, Xu L, Li X, Zhu R, Reski R & Sun Y. 2018. Development of a method for protonema proliferation of peat moss (*Sphagnum squarrosum*) through regeneration analysis. *New Phytologist* **221**(2): 1160–1171. <https://doi.org/10.1111/nph.15394>
361. Mathew M, Mathew A & Sindu N. 2022. Rejuvenation of ecosystem using axenic culture of *Octoblepharum albidum* HEDW. *Ecology, Environment and Conservation* **28**(01s): 42–42. <https://doi.org/10.53550/eec.2022.v28i01s.042>
362. Matzke EB & Raudzens L. 1968. Aposporous diploid gametophytes from sporophytes of the liverwort *Blasia pusilla* L. *Proceedings of the National Academy of Sciences* **59**(3): 752–755. <https://doi.org/10.1073/pnas.59.3.752>
363. Awasthi V, Nath V, Asthana AK. 2010. *In vitro* propagation of the endemic and threatened Indian liverwort: *Cryptomitrium himalayense* Kash. *Current Science* **98**: 1440–1441.
364. Liang L, Tang H, Deng Z, Liu Y, Chen X & Wang H. 2018. Ag nanoparticles inhibit the growth of the bryophyte, *Physcomitrella patens*. *Ecotoxicology and Environmental Safety* **164**: 739–748. <https://doi.org/10.1016/j.ecoenv.2018.08.021>
365. Nomura T & Hasezawa S. 2010. Regulation of gemma formation in the copper moss *Scopelophila cataractae* by environmental copper concentrations. *Journal of Plant Research* **124**(5): 631–638. <https://doi.org/10.1007/s10265-010-0389-3>
366. Shaw J, Antonovics J & Anderson LE. 1987. Inter- and intraspecific variation of mosses in tolerance to copper and zinc. *Evolution* **41**(6): 1312–1325. <https://doi.org/10.1111/j.1558-5646.1987.tb02469.x>
367. Shaw J. 1988. Genetic variation for tolerance to copper and zinc within and among populations of the moss, *Funaria hygrometrica* Hedw. *New Phytologist* **109**(2): 211–222. <https://doi.org/10.1111/j.1469-8137.1988.tb03710.x>
368. Shaw J & Gaughan JF. 1993. Control of sex ratios in haploid populations of the moss, *Ceratodon purpureus*. *American Journal of Botany* **80**(5): 584–591. <https://doi.org/10.1002/j.1537-2197.1993.tb13844.x>

369. Alfayate C, Ron E, Estébanez B & Pérez-Batista MÁ. 2013. Mature spores of four pleurocarpous mosses in the Canary Islands: ultrastructure and early germination stages. *The Bryologist* **116**(2): 97. <https://doi.org/10.1639/0007-2745-116.2.097>
370. Frangedakis E, Waller M, Nishiyama T, Tsukaya H, Xu X, Yue Y, Tjahjadi M, Gunadi A, Van Eck J, Li F, Szövényi P & Sakakibara K. 2021. An *Agrobacterium* -mediated stable transformation technique for the hornwort model *Anthoceros agrestis*. *New Phytologist* **232**(3): 1488–1505. <https://doi.org/10.1111/nph.17524>
371. Kubota A, Ishizaki K, Hosaka M & Kohchi T. 2013. Efficient *Agrobacterium*-mediated transformation of the liverwort *Marchantia polymorpha* using regenerating thalli. *Bioscience, Biotechnology, and Biochemistry* **77**(1): 167–172. <https://doi.org/10.1271/bbb.120700>
372. Nebel BJ & Naylor AW. 1968. Light, temperature and carbohydrate requirements for shoot-bud initiation from protonemata in the Moss *Physcomitrium turbinatum*. *American Journal of Botany* **55**(1): 38–38. <https://doi.org/10.2307/2440490>
373. Rose S, Rubery PH & Bopp M. 1983. The mechanism of auxin uptake and accumulation in moss protonemata. *Physiologia Plantarum* **8**(1): 52–56. <https://doi.org/10.1111/j.1399-3054.1983.tb04142.x>
374. Nakazato T, Kadota A & Wada M. 1999. Photoinduction of spore germination in *Marchantia polymorpha* L. is mediated by photosynthesis. *Plant and Cell Physiology* **40**(10): 1014–1020. <https://doi.org/10.1093/oxfordjournals.pcp.a029482>
375. Friederich S, Maier U, Deus-Neumann B, Asakawa Y & Zenk MH. 1999. Biosynthesis of cyclic bis(benzyls) in *Marchantia polymorpha*. *Phytochemistry* **50**(4): 589–598. [https://doi.org/10.1016/s0031-9422\(98\)00557-3](https://doi.org/10.1016/s0031-9422(98)00557-3)
376. Ishizaki K, Nonomura M, Kato H, Yamato KT & Kohchi T. 2012. Visualization of auxin-mediated transcriptional activation using a common auxin-responsive reporter system in the liverwort *Marchantia polymorpha*. *Journal of Plant Research* **125**(5): 643–651. <https://doi.org/10.1007/s10265-012-0477-7>
377. Ishizaki K, Johzuka-Hisatomi Y, Ishida S, Iida S & Kohchi T. 2013. Homologous recombination-mediated gene targeting in the liverwort *Marchantia polymorpha* L. *Scientific Reports* **3**(1). <https://doi.org/10.1038/srep01532>
378. Ishizaki K, Mizutani M, Shimamura M, Masuda A, Nishihama R & Kohchi T. 2013. Essential role of the E3 ubiquitin ligase NOPPERABO1 in schizogenous intercellular space formation in the liverwort *Marchantia polymorpha*. *The Plant Cell* **25**(10): 4075–4084. <https://doi.org/10.1105/tpc.113.117051>
379. Ishizaki K, Nishihama R, Yamato KT & Kohchi T. 2015. Molecular genetic tools and techniques for *Marchantia polymorpha* research. *Plant and Cell Physiology* **57**(2): 262–270. <https://doi.org/10.1093/pcp/pcv097>
380. Kanazawa T, Ishizaki K, Kohchi T, Hanaoka M & Tanaka K. 2013. Characterization of four nuclear-encoded plastid RNA polymerase sigma factor genes in the liverwort *Marchantia polymorpha*: Blue-light- and multiple stress-responsive SIG5 was acquired early in the emergence of terrestrial plants. *Plant and Cell Physiology* **54**(10): 1736–1748. <https://doi.org/10.1093/pcp/pct119>
381. Kanazawa T, Era A, Minamino N, Shikano Y, Fujimoto M, Uemura T, Nishihama R, Yamato KT, Ishizaki K, Nishiyama T, Kohchi T, Nakano A & Ueda T. 2015. SNARE molecules in *Marchantia polymorpha*: unique and conserved features of the membrane fusion machinery. *Plant and Cell Physiology* **57**(2): 307–324. <https://doi.org/10.1093/pcp/pcv076>
382. Kato H, Ishizaki K, Kouno M, Shirakawa M, Bowman JL, Nishihama R & Kohchi T. 2015. Auxin-mediated transcriptional system with a minimal set of components is critical for morphogenesis through the life cycle in *Marchantia polymorpha*. *PLOS Genetics* **11**(5): e1005084. <https://doi.org/10.1371/journal.pgen.1005084>
383. Komatsu A, Terai M, Ishizaki K, Suetsugu N, Tsuboi H, Nishihama R, Yamato KT, Wada M & Kohchi T. 2014. Phototropin encoded by a single-copy gene mediates chloroplast photorelocation movements in the

- liverwort *Marchantia polymorpha*^{1[W]}. *Plant Physiology* **166**(1): 411–427. <https://doi.org/10.1104/pp.114.245100>
384. Kubota A, Kita S, Ishizaki K, Nishihama R, Yamato KT & Kohchi T. 2014. Co-option of a photoperiodic growth-phase transition system during land plant evolution. *Nature Communications* **5**(1). <https://doi.org/10.1038/ncomms4668>
 385. Nishihama R, Ishida S, Urawa H, Kamei Y & Kohchi T. 2015. Conditional gene expression/deletion systems for *Marchantia polymorpha* using its own heat-shock promoter and Cre/loxP-mediated site-specific recombination. *Plant and Cell Physiology* **57**(2): 271–280. <https://doi.org/10.1093/pcp/pcv102>
 386. Ishizaki K, Chiyoda S, Yamato KT & Kohchi T. 2008. Agrobacterium-mediated transformation of the haploid liverwort *Marchantia polymorpha* L., an emerging model for plant biology. *Plant and Cell Physiology* **49**(7): 1084–1091. <https://doi.org/10.1093/pcp/pcn085>
 387. Lin PC, Lu CH, Shen B, Lee GZ, Bowman JL, Arteaga-Vazquez M, Yu L, Hong SF, Lo CF, Su GM, Kohchi T, Ishizaki K, Zachgo S, Althoff F, Takenaka M, Yamato KT & Lin SS. 2016. Identification of miRNAs and their targets in the liverwort *Marchantia polymorpha* by Integrating RNA-seq and degradome analyses. *Plant and Cell Physiology* **57**(2): 339–358. <https://doi.org/10.1093/pcp/pcw020>
 388. Basile A, Sorbo S, Pisani T, Paoli L, Munzi S & Loppi S. 2012. Bioaccumulation and ultrastructural effects of Cd, Cu, Pb and Zn in the moss *Scorpiurum circinatum* (Brid.) Fleisch. & Loeske. *Environmental Pollution* **166**: 208–211. <https://doi.org/10.1016/j.envpol.2012.03.018>
 389. Tougane K, Komatsu K, Bhyan SB, Sakata Y, Ishizaki K, Yamato KT, Kohchi T & Takezawa D. 2010. Evolutionarily conserved regulatory mechanisms of abscisic acid signaling in land plants: characterization of ABSCISIC ACID INSENSITIVE1-Like Type 2C protein phosphatase in the liverwort *Marchantia polymorpha*. *Plant physiology* **152**(3): 1529–1543. <https://doi.org/10.1104/pp.110.153387>
 390. Saint-Marcoux D, Proust H, Dolan L & Langdale JA. 2015. Identification of reference genes for real-time quantitative PCR experiments in the liverwort *Marchantia polymorpha*. *Plos one* **10**(3): e0118678. <https://doi.org/10.1371/journal.pone.0118678>
 391. Takemura M, Maoka T & Misawa N. 2013. Carotenoid analysis of a liverwort *Marchantia polymorpha* and functional identification of its lycopene β - and ϵ -cyclase genes. *Plant and Cell Physiology* **55**(1): 194–200. <https://doi.org/10.1093/pcp/pct170>
 392. Tanaka M, Esaki T, Kenmoku H, Koeduka T, Kiyoyama Y, Masujima T, Asakawa Y & Matsui K. 2016. Direct evidence of specific localization of sesquiterpenes and marchantin A in oil body cells of *Marchantia polymorpha* L. *Phytochemistry* **130**: 77–84. <https://doi.org/10.1016/j.phytochem.2016.06.008>
 393. Bleuel C, Wesenberg D & Meyer AJ. 2011. Degradation of glutathione s-conjugates in *Physcomitrella patens* is initiated by cleavage of glycine. *Plant & Cell Physiology/Plant and Cell Physiology* **52**(7): 1153–1161. <https://doi.org/10.1093/pcp/pcr064>
 394. Carginale V, Sorbo S, Capasso C, Trinchella F, Cafiero G & Basile A. 2004. Accumulation, localisation, and toxic effects of cadmium in the liverwort *Lunularia cruciata*. *Protoplasma* **223**(1): 53–61. <https://doi.org/10.1007/s00709-003-0028-0>
 395. Coombes AJ & Lepp NW. 1974. The effect of Cu and Zn on the growth of *Marchantia polymorpha* and *Funaria hygrometrica*. *The Bryologist* **77**(3): 447–447. <https://doi.org/10.2307/3241616>
 396. Chopra RN & Dhingra-Babbar S. 1992. Studies on protonemal differentiation and bud formation in *Philonotis lancifolia* Mitt. and *Trematodon brevicalyx* Dixon : Effect of some purine derivatives. *Journal Hattori Botanical Laboratory* **71**: 37–45.
 397. Keil M. 1949. The origin of moss gametophytes in cultures without access of light. *Experientia* **5**(5): 206–206. <https://doi.org/10.1007/bf02172494>
 398. Nishida Y & Saito S. 1961. Studies of germination of the spore in some mosses II. *Diphyscium fulvifolium* Mitt. and *Sphagnum cuspidatum* Ehrh. *Botanical Magazine Tokyo* **74**: 91–97.

399. Walker LM & Sack FD. 1991. Recovery of gravitropism after basipetal centrifugation in protonemata of the moss *Ceratodon purpureus*. *Canadian Journal of Botany. Journal Canadien de Botanique* **69**(8): 1737–1744. <https://doi.org/10.1139/b91-221>
400. Bowman JL, Kohchi T, Yamato KT, Jenkins J, Shu S, Ishizaki K, Yamaoka S, Nishihama R, Nakamura Y, Berger F, Adam C, Aki SS, Althoff F, Araki T, Arteaga-Vazquez MA, Balasubramanian S, Barry K, Bauer D, Boehm CR & Briginshaw L. 2017. Insights into land plant evolution garnered from the *Marchantia polymorpha* genome. *Cell* **171**(2): 287–304.e15. <https://doi.org/10.1016/j.cell.2017.09.030>
401. Degola F, De Benedictis M, Petraglia A, Massimi A, Fattorini L, Sorbo S, Basile A & Sanità L. 2014. A Cd/Fe/Zn-responsive phytochelatin synthase is constitutively present in the ancient liverwort *Lunularia cruciata* (L.) Dumort. *Plant and Cell Physiology* **55**(11): 1884–1891. <https://doi.org/10.1093/pcp/pcu117>
402. Mishler BD & Newton AE. 1988. Influences of mature plants and desiccation on germination of spores and gametophytic fragments of *Tortula*. *Journal of Bryology* **15**(2): 327–342. <https://doi.org/10.1179/jbr.1988.15.2.327>
403. Goga M, Antreich SJ, Bačkor M, Weckwerth W & Lang I. 2017. Lichen secondary metabolites affect growth of *Physcomitrella patens* by allelopathy. *Protoplasma* **254**(3): 1307–1315. <https://doi.org/10.1007/s00709-016-1022-7>
404. Hellwege EM, Dietz KJ & Hartung W. 1996. Absciscic acid causes changes in gene expression involved in the induction of the leaf form of the liverwort *Riccia fluitans* L. *Planta* **198**(3): 423–432. <https://doi.org/10.1007/bf00620059>
405. Werner O, Ros Espin R, Bopp M & Atzorn R. 1991. Absciscic-acid-induced drought tolerance in *Funaria hygrometrica* Hedw. *Planta* **186**(1). <https://doi.org/10.1007/bf00201503>
406. Whitehouse K. 1973. The occurrence of tubers in *Pohlia pulchella* (Hedw.) Lindb. and *Pohlia lutescens* (Limpr.) Lindb. file. *Journal of Bryology* **7**(4): 533–540. <https://doi.org/10.1179/jbr.1973.7.4.533>
407. Schnepf E & Reinhard C. 1997. Brachycytes in funaria protonemate: Induction by absciscic acid and fine structure. *Journal of Plant Physiology* **151**(2): 166–175. [https://doi.org/10.1016/s0176-1617\(97\)80149-6](https://doi.org/10.1016/s0176-1617(97)80149-6)
408. Giordano S, Basile A & Cobianchi RC. 1993. Effects of acetic extract from the lichen *Cladonia foliacea* on sporeling of the moss *Funaria hygrometrica*. *Giornale Botanico Italiano* **127**(6): 1195–1198. <https://doi.org/10.1080/11263509309429508>
409. Giordano S, Alfano F, Esposito A, Spagnuolo V, Basile A & Castaldo Cobianchi R. (1996). Regeneration from detached leaves of *Pleurochaete squarrosa* (Brid.) Lindb. in culture and in the wild. *Journal of Bryology* **19**(2): 219–227. <https://doi.org/10.1179/jbr.1996.19.2.219>
410. Hellwege EM, Volk OH & Hartung W. 1992. A Physiological role of absciscic acid in the liverwort *Riccia fluitans* L. *Journal of Plant Physiology* **140**(5): 553–556. [https://doi.org/10.1016/s0176-1617\(11\)80788-1](https://doi.org/10.1016/s0176-1617(11)80788-1)
411. Bopp M, Zimmermann S & Knoop B. 1980. Regeneration of protonema with multiple dna content from isolated protoplasts of the moss *Funaria hygrometrica*. *Protoplasma* **104**(1-2): 119–127. <https://doi.org/10.1007/bf01279374>
412. Reski R, Wehe M, Haderl B, Marienfeld JR & Abel WO. 1991. Cytokinin and light quality interact at the molecular level in the chloroplast-mutant PC22 of the moss *Physcomitrella*. *Journal of Plant Physiology (Print)* **138**(2): 236–243. [https://doi.org/10.1016/s0176-1617\(11\)80277-4](https://doi.org/10.1016/s0176-1617(11)80277-4)
413. Reski R, Faust M, Wang XH, Wehe M & Abel WO. 1994. Genome analysis of the moss *Physcomitrella patens* (Hedw.) B.S.G. *Molecular and General Genetics* **244**(4): 352–359. <https://doi.org/10.1007/bf00286686>
414. Szweykowska A, Dornowska E, Cybulska A & Asiek GW. 1971. The cell division response to cytokinins in isolated cell cultures of the protonema of *Funaria hygrometrica* and its comparison with the bud induction response. *Biochemie Und Physiologie Der Pflanzen* **162**(6): 514–525. [https://doi.org/10.1016/s0015-3796\(17\)31185-x](https://doi.org/10.1016/s0015-3796(17)31185-x)

415. Simola LK. 1975. The effect of several protein amino acids and some inorganic nitrogen sources on the growth of *Sphagnum nemoreum*. *Physiologia Plantarum* **35**(3): 194–199. <https://doi.org/10.1111/j.1399-3054.1975.tb03892.x>
416. Konno H, Nakashima S & Katoh K. 2010. Metal-tolerant moss *Scopelophila cataractae* accumulates copper in the cell wall pectin of the protonema. *Journal of Plant Physiology* **167**(5): 358–364. <https://doi.org/10.1016/j.jplph.2009.09.011>
417. Lunde C, Drew DP, Jacobs AK & Tester M. 2007. Exclusion of Na⁺ via sodium ATPase (PpENA1) ensures normal growth of *Physcomitrella patens* under moderate salt stress. *Plant Physiology* **144**(4): 1786–1796. <https://doi.org/10.1104/pp.106.094946>
418. Nagae M, Nakata M & Takahashi Y. 2008. Identification of negative cis-acting elements in response to copper in the chloroplastic iron superoxide dismutase gene of the moss *Barbula unguiculata*. *Plant Physiology* **146**(4): 1687–1696. <https://doi.org/10.1104/pp.107.114868>
419. Richardt S, Timmerhaus G, Lang D, Qudeimat E, Corrêa LGG, Reski R, Rensing SA & Frank W. 2009. Microarray analysis of the moss *Physcomitrella patens* reveals evolutionarily conserved transcriptional regulation of salt stress and abscisic acid signalling. *Plant Molecular Biology* **72**(1-2): 27–45. <https://doi.org/10.1007/s11103-009-9550-6>
420. Wang X, Yang P, Gao Q, Liu X, Kuang T, Shen S & He Y. 2008. Proteomic analysis of the response to high-salinity stress in *Physcomitrella patens*. *Planta* **228**(1): 167–177. <https://doi.org/10.1007/s00425-008-0727-z>
421. Dickson H. 1932. Polarity and the production of adventitious growing points in *Marchantia polymorpha*. *Annals of Botany* **46**(3): 683–684. <https://doi.org/10.1093/oxfordjournals.aob.a090342>
422. Yoshida K & Yamamoto K. 1982. The position of bud differentiation on protonema of the moss, *Physcomitrium sphaericum*. *Plant and Cell Physiology* **23**: 737–743.
423. Chaudhary BL & Vijaivargya V. 2011. Effects of sugars on spore germination of *Notothylas khasiana* Udar & D.K. Singh. *Plant archives* **11**(1): 21–23.
424. Johri MM & Desai S. 1973. Auxin regulation of caulonema formation in moss protonema. *Nature New Biology* **245**(146): 223–224. <https://doi.org/10.1038/newbio245223a0>
425. Noguchi A. 1958. Germination of spores in two species of *Sphagnum*. *Journal Hattori Botanical Laboratory* **19**: 71–75.
426. Benson-Evans K. 1964. Physiology of the reproduction of Bryophytes. *The Bryologist* **67**(4): 431. <https://doi.org/10.2307/3240769>
427. Rasmussen S, Peters G & Rudolph H. 1995. Regulation of phenylpropanoid metabolism by exogenous precursors in axenic cultures of *Sphagnum fallax*. *Physiologia Plantarum* **95**(1): 83–90. <https://doi.org/10.1111/j.1399-3054.1995.tb00812.x>
428. Ashton NW & Raju S. 2000. The distribution of gametangia on gametophores of *Physcomitrella* (*Aphanoregma*) *patens* in culture. *Journal of Bryology* **22**(1): 9–12. <https://doi.org/10.1179/jbr.2000.22.1.9>
429. Spiess LD, Lippincott BB & Lippincott JA. 1972. Influence of certain plant growth regulators and crown-gall related substances on bud formation and gametophore development of the moss *Pylaisiella selwynii*. *American Journal of Botany* **59**(3): 233–233. <https://doi.org/10.2307/2441423>
430. Szweykowska A. 1963. Kinetin-induced formation of gametophores in dark cultures of *Ceratodon purpureus*. *Journal of Experimental Botany* **14**(1): 137–141. <https://doi.org/10.1093/jxb/14.1.137>
431. Schneider MJ & Sharp AJ. 1962. Observations on the reproduction and development of the gametophyte of *Tetraphis pellucida* in culture. *The Bryologist* **65**(2): 154–154. <https://doi.org/10.2307/3240504>

432. Abel WO, Knebel W, Koop HU, Marienfeld JR, Quader H, Reski R, Schnepf E & Sprlein B. 1989. A cytokinin-sensitive mutant of the moss, *Physcomitrella patens*, defective in chloroplast division. *Protoplasma* **152**(1): 1–13. <https://doi.org/10.1007/bf01354234>
433. Nebel BJ. 1968. Action spectra for photogrowth and phototropism in protonemata of the moss *Physcomitrium turbinatum*. *Planta* **81**(3): 287–302. <https://doi.org/10.1007/bf00391164>
434. Nebel BJ. 1969. Responses of moss protonemata to red and far-red polarized light: evidence for disc-shaped phytochrome photoreceptors. *Planta* **87**(1-2): 170–179. <https://doi.org/10.1007/bf00386974>
435. Nebel BJ & Naylor AW. 1968. Initiation and development of shoot-buds from protonemata in the moss *Physcomitrium turbinatum*. *American Journal of Botany* **55**(1): 33–33. <https://doi.org/10.2307/2440489>
436. DeMaggio AE & Stetler DA. 1977. Protonemal organization and growth in the moss *Dawsonia superba*: ultrastructural characteristics. *American Journal of Botany* **64**(4): 449–449. <https://doi.org/10.2307/2441774>
437. Goode JA, Alfano F, Stead AD & Duckett JG. 1993. The formation of aplastidic abscission (tmema) cells and protonemal disruption in the moss *Bryum tenuisetum* Limpr. is associated with transverse arrays of microtubules and microfilaments. *Protoplasma* **174**(3-4): 158–172. <https://doi.org/10.1007/bf01379048>
438. Whitehouse K. 1961. The occurrence of *Tortula stanfordensis*, steere in cornwall, new to Europe. *Transactions of the British Bryological Society* **4**(1): 84–94. <https://doi.org/10.1179/006813861804870578>
439. Dhingra S & Chopra RN. 1983. Protonemal gemmae in the moss *Trematodon brevicalyx* Dixon. *Journal of Bryology* **12**(4): 571–573. <https://doi.org/10.1179/jbr.1983.12.4.571>
440. Side AG & Whitehouse K. 1987. Colourless tubers in *Discolium nudum* Brid. *Journal of Bryology* **14**(4): 741–743. <https://doi.org/10.1179/jbr.1987.14.4.741>
441. Forman RTT. 1964. Growth under controlled conditions to explain the hierarchical distributions of a moss, *Tetraphis pellucida*. *Ecological Monographs* **34**(1): 1–25. <https://doi.org/10.2307/1948461>
442. Dale MJT & Rushing AE. 1985. Development of the gemmae of *Oedipodiella* (Musci). I. scanning electron microscopy and growth in culture. *The Bryologist* **88**(2): 69–69. <https://doi.org/10.2307/3242583>
443. Selkirk PM. 1981. Protonemal gemmae on *Amblystegium serpens* (Hedw.) B., S. & G. from Macquarie Island. *Journal of Bryology* **11**(4): 719–721. <https://doi.org/10.1179/jbr.1981.11.4.719>
444. Shaw AJ. 1990. Metal tolerances and cotolerances in the moss *Funaria hygrometrica*. *Canadian Journal of Botany* **68**(10): 2275–2282. <https://doi.org/10.1139/b90-290>
445. Girke T, Schmidt H, Zahringer U, Reski R & Heinz E. 1998. Identification of a novel D6-acyl-group desaturase by targeted gene disruption in *Physcomitrella patens*. *The Plant Journal* **15**(1): 39–48. <https://doi.org/10.1046/j.1365-313x.1998.00178.x>
446. Bold HC. 1948. The Prothallium of *Sphagnum palustre* L. *The Bryologist* **51**(2): 55–55. <https://doi.org/10.2307/3239029>
447. Batra A & Abel WO. 1981. Development of moss plants from isolated and regenerated protoplasts. *Plant Science Letters* **20**(3): 183–189. [https://doi.org/10.1016/0304-4211\(81\)90260-1](https://doi.org/10.1016/0304-4211(81)90260-1)
448. Christianson ML. 1998. A Simple Protocol for Cryopreservation of Mosses. *The Bryologist* **101**(1): 32. <https://doi.org/10.2307/3244072>
449. Christianson ML. 1998. The quantitative response to cytokinin in the moss *Funaria hygrometrica* does not reflect differential sensitivity of initial target cells. *American Journal of Botany* **85**(1): 144–148. <https://doi.org/10.2307/2446563>
450. Nehlsen W. 1979. A new method for examining induction of moss bud by cytokinin. *American Journal of Botany* **66**(5): 601–603. <https://doi.org/10.1002/j.1537-2197.1979.tb06263.x>

451. Kern VD, Smith JD, Schwuchow JM & Sack FD. 2001. Amyloplasts that sediment in protonemata of the moss *Ceratodon purpureus* are nonrandomly distributed in microgravity. *Plant Physiology* **125**(4): 2085–2094. <https://doi.org/10.1104/pp.125.4.2085>
452. Saxena PK & Rashid A. 1980. Differentiation of bud-cells on the protonema of the moss *Anoetangium thomsonii*. Effect of aspirin and salicylic acid. *Zeitschrift Für Pflanzenphysiologie* **99**(2): 187–189. [https://doi.org/10.1016/s0044-328x\(80\)80129-2](https://doi.org/10.1016/s0044-328x(80)80129-2)
453. Saxena PK & Rashid A. 1980. Differentiation of caulonema and bud-cells on the protonema of the moss *Anoetangium thomsonii* Mitt. — Effect of activated charcoal. *Zeitschrift Für Pflanzenphysiologie* **99**(4): 373–377. [https://doi.org/10.1016/s0044-328x\(80\)80152-8](https://doi.org/10.1016/s0044-328x(80)80152-8)
454. Anderson LE & Crosby MR. 1965. The protonema of *Sphagnum meridense* (Hampe) C. Muell. *The Bryologist* **68**(1): 47–47. <https://doi.org/10.2307/3240983>
455. Armentano TV & Caponetti JD. 1972. The effect of pH on the growth of protonemata of *Tetraplodon mnioides* and *Funaria hygrometrica*. *The Bryologist* **75**(2): 147. <https://doi.org/10.2307/3241442>
456. Boatman DJ & Lark PM. 1971. Inorganic nutrition of the protonemata of *Sphagnum papillosum* Lindb., *S. magellanicum* Brid., and *S. cuspidatum* Ehrh. *New Phytologist* **70**(6): 1053–1059. <https://doi.org/10.1111/j.1469-8137.1971.tb04587.x>
457. Dietert MF. 1979. Studies on the gametophyte nutrition of the cosmopolitan Species *Funaria hygrometrica* and *Weissia controversa*. *The Bryologist* **82**(3): 417–417. <https://doi.org/10.2307/3242217>
458. Woollon FBM. 1975. Mineral relationships and ecological distribution of *Fissidens cristatus* Wils.. *Journal of Bryology* **8**(4): 455–464. <https://doi.org/10.1179/jbr.1975.8.4.455>
459. Basile DV. 1965. Growth, development and gemma formation in the liverwort *Scapania nemorosa*, as influenced by L-arginine, L-histidine and L-glutamic acid. *American Journal of Botany* **52**(5): 443–454. <https://doi.org/10.1002/j.1537-2197.1965.tb06807.x>
460. Schuler JF, Diller VM, Fulford M & Kersten HJ. 1955. Culture studies on *Sphaerocarpos*. III. The utilization of nitrogen by *Sphaerocarpos texanus*. *Plant Physiology* **30**(5): 478–482. <https://doi.org/10.1104/pp.30.5.478>
461. Maltzahn V. 1959. Interaction between kinetin and indoleacetic acid in the control of bud reactivation in *Splachnum ampullaceum* (L.) Hedw. *Nature* **183**(4653): 60–61. <https://doi.org/10.1038/183060a0>
462. Schneider MJ, Voth PD & Troxler RF. 1967. Methods of propagating bryophyte plants, tissues, and propagules. *Botanical Gazette (Chicago, Ill.)* **128**(3/4): 169–174. <https://doi.org/10.1086/336394>
463. Glime JM & Acton DW. 1979. Temperature effects on assimilation and respiration in the *Fontinalis duriae* - periphyton association. *The Bryologist* **82**(3): 382. <https://doi.org/10.2307/3242214>
464. Ono K, Murasaki Y & Kawauchi K. 1987. Establishment and characteristics of a cell suspension culture from a moss, *Atrichum undulatum*. *The Botanical Magazine Tokyo* **100**(2): 217–221. <https://doi.org/10.1007/bf02488325>
465. Takami S & Takio S. 1987. Establishment of cell suspension cultures of *Hedwigia ciliata* and *Heteroscyphus bescheraei*. *Journal of Plant Physiology* **130**(2-3): 267–272. [https://doi.org/10.1016/s0176-1617\(87\)80230-4](https://doi.org/10.1016/s0176-1617(87)80230-4)
466. Bartholomew S. 1986. Sporeling development in selected representatives of the Pallaviciniaceae: *Pallavicinia subciliata*, *Symphyogyna aspera*, and *Podomitrium phyllanthus*. *Lindbergia* **12**: 111–118.
467. Vashistha BD & Chopra RN. 1986. In vitro studies on spore germination, protonemal differentiation and bud formation in three Himalayan mosses. *Journal Hattori Botanical Laboratory* **62**: 121 - 136. https://doi.org/10.18968/jhbl.62.0_121
468. Binns AN & Maravolo NC. 1972. Apical dominance, polarity, and adventitious growth in *Marchantia Polymorpha*. *American Journal of Botany* **59**(7): 691–691. <https://doi.org/10.2307/2441140>

469. Imaizumi T, Kadota A, Hasebe M & Wada M. 2002. Cryptochrome light signals control development to suppress auxin sensitivity in the moss *Physcomitrella patens*. *The Plant Cell* **14**(2): 373–386. <https://doi.org/10.1105/tpc.010388>
470. Saxena PK & Rashid A. 1980. Development of gametophores from isolated protoplasts of the moss *Anoetangium thomsvnii* Mitt. *Protoplasma* **103**(4): 401–406. <https://doi.org/10.1007/bf01276966>
471. Handa AK & Johri MM. 1979. Involvement of cyclic adenosine-3', 5'-monophosphate in chloronema differentiation in protonema cultures of *Funaria hygrometrica*. *Planta* **144**(4): 317–324. <https://doi.org/10.1007/bf00391574>
472. Menon C & Lal M. 1974. Morphogenetic role of kinetin and abscisic acid in the moss *Physcomitrium*. *Planta* **115**(4): 319–328. <https://doi.org/10.1007/bf00388614>
473. Sood S & Hackenberg D. 1979. Interaction of auxin, antiauxin and cytokinin in relation to the formation of buds in moss protonema. *Zeitschrift Für Pflanzenphysiologie* **91**(5): 385–397. [https://doi.org/10.1016/s0044-328x\(79\)80253-6](https://doi.org/10.1016/s0044-328x(79)80253-6)
474. Szweykowska A. 2015. The effects of kinetin and IAA on shoot development in *Funaria hygrometrica* and *Ceratodon purpureus*. *Acta Societatis Botanicorum Poloniae* **31**(3): 553–557. <https://doi.org/10.5586/asbp.1962.039>
475. Whitehouse K. 1980. The production of protonemal gemmae by mosses growing in deep shade. *Journal of Bryology* **11**(1): 133–138. <https://doi.org/10.1179/jbr.1980.11.1.133>
476. Chopra RN & Gupta U. 1967. Dark-induction of buds in *Funaria hygrometrica* Hedw. *The Bryologist* **70**(1): 102. <https://doi.org/10.2307/3241144>
477. Kumra S. 1985. Effect of some auxins and cytokinins on bud formation in the moss *Anisothecium molliculum* (Mitt.) Broth. *Journal Hattori Botanical Laboratory* **59**: 279–301.
478. Chopra RN & Sarla. 1985. Induction of buds in the moss *Bryum pallescens* Schleich. ex Schwaegr. by a metal chelate, Fe-EDTA. *Journal of Bryology* **13**(3): 423–428. <https://doi.org/10.1179/jbr.1985.13.3.423>
479. Chopra RN & Sharma P. 1985. Effect of cyclic 3',5'-adenosine monophosphate and kinetin on growth and fertility in the male clones of the moss *Microdus brasiliensis* (Dub.) Ther. *Journal of Plant Physiology* **117**(4): 293–296. [https://doi.org/10.1016/s0176-1617\(85\)80065-1](https://doi.org/10.1016/s0176-1617(85)80065-1)
480. Sarla & Chopra RN. 1985. Effect of three cytokinins on bud induction in *Bryum pallescens* Schleich. ex Schwaegr.. *Journal of Bryology* **13**(3): 429–434. <https://doi.org/10.1179/jbr.1985.13.3.429>
481. Antreich S, Sassmann S & Lang I. 2016. Limited accumulation of copper in heavy metal adapted mosses. *Plant Physiology and Biochemistry* **101**: 141–148. <https://doi.org/10.1016/j.plaphy.2016.02.005>
482. Kapur A & Chopra RH. 1989. Effects of some metal ions on protonemal growth and bud formation in the moss *Timmiella anomala* grown in aseptic cultures. *Journal Hattori Botanical Laboratory* **66**: 283–298.
483. Bleuel C, Wesenberg D, Sutter K, Miersch J, Braha B, Bärlocher F & Krauss GJ. 2005. The use of the aquatic moss *Fontinalis antipyretica* L. ex Hedw. as a bioindicator for heavy metals: 3. Cd²⁺ accumulation capacities and biochemical stress response of two *Fontinalis* species. *The Science of the Total Environment* **345**(1-3): 13–21. <https://doi.org/10.1016/j.scitotenv.2004.11.015>
484. Luna ED. 1990. Multicellular spores and false anisospory in *Bryowijkia ambigua* (Musci: Trachypodaceae). *Lindbergia* **16**: 73–79.
485. Estébanez B, Alfayate C & Ron E. 1997. Observations on spore ultrastructure in six species of *Grimmia* (Bryopsida). *Grana* **36**(6): 347–357. <https://doi.org/10.1080/00173139709362628>
486. Rose S, Eberhardt I & Bopp M. 1983. Temperature dependent auxin efflux from moss protonema. *Zeitschrift Für Pflanzenphysiologie* **109**(3): 243–249. [https://doi.org/10.1016/s0044-328x\(83\)80226-8](https://doi.org/10.1016/s0044-328x(83)80226-8)

487. Wada K, Hirabayashi Y & Saito W. 1984. Light germination of *Anthoceros miyabeanus* spores. *Botanical Magazine Tokyo* **97**(3): 369–379. <https://doi.org/10.1007/bf02488669>
488. Siegelaf U, Mues R, Dönig R, Eicher Th, Blechschmidt M & Becker H. 1992. Ten asulenes from *Plagiochila longispina* and *Calypogeia azurea*. *Phytochemistry* **31**(5): 1671–1678. [https://doi.org/10.1016/0031-9422\(92\)83126-j](https://doi.org/10.1016/0031-9422(92)83126-j)
489. Noguchi A & Furuta H. 1956. Germination of spores and regeneration of leaves of *Merceya ligulata* and *M. gedana*. *Journal of the Hattori Botanical Laboratory* **17**: 32–44.
490. Mishler BD. 1985b. Biosystematic studies of the *Tortula ruralis* complex. I. Variation of taxonomic characters in culture. *Journal of the Hattori Botanical Laboratory* **58**: 225–253.
491. Lersten NR. 1961. A comparative study of generation from isolated gametophytic tissues in *Mnium*. *The Bryologist* **64**(1): 37–37. <https://doi.org/10.2307/3240920>
492. Longton RE & Greene SW. 1979. Experimental studies of growth and reproduction in the moss *Pleurozium schreberi* (Brid.) Mitt.. *Journal of Bryology* **10**(3): 321–338. <https://doi.org/10.1179/jbr.1979.10.3.321>
493. Ye FJ, Gierlich R, Reski R, Marienfeld JR & Abel WO. 1989. Isoenzyme analysis of cytokinin sensitive mutants of the moss *Physcomitrella patens*. *Plant Science (Limerick)* **64**(2): 203–212. [https://doi.org/10.1016/0168-9452\(89\)90025-3](https://doi.org/10.1016/0168-9452(89)90025-3)
494. Młodzianowski F & Szweykowska A. 2015. Fine structure of kinetin-treated protonema and kinetin-induced gametophore buds in *Funaria hygrometrica*. *Acta Societatis Botanicorum Poloniae* **40**(4): 549–555. <https://doi.org/10.5586/asbp.1971.042>
495. Szweykowska A, Guzowska I & Gallas J. 2015. Studies on the activity of kinetin in cultures of *Funaria hygrometrica*. II. Effect of kinetin on isolated protonema cells. *Acta Societatis Botanicorum Poloniae* **37**(2): 201–206. <https://doi.org/10.5586/asbp.1968.019>
496. Szweykowska A, Guzowska I & Gallas J. 2015. Studies on the activity of kinetin in cultures of *Funaria hygrometrica*. II. Effect of kinetin on isolated protonema cells. *Acta Societatis Botanicorum Poloniae* **37**(2): 201–206. <https://doi.org/10.5586/asbp.1968.019>
497. Szweykowska A, Schneider J & Prusińska U. 2015. Studies on the specificity and sensitivity of the bud-induction response to cytokinins in the protonema of *Funaria hygrometrica*. *Acta Societatis Botanicorum Poloniae* **38**(1): 139–142. <https://doi.org/10.5586/asbp.1969.014>
498. Bhatla SC & Chopra RN. 1984. Subcellular localization of adenylate cyclase in the shoot apices of *Bryum argenteum* Hedw. *Annals of Botany* **54**(2): 195–200. <https://doi.org/10.1093/oxfordjournals.aob.a086783>
499. Chopra RN & Bhatla SC. 1981. Involvement of cyclic 3',5' adenosine monophosphate and other purine derivatives in sex induction in the moss *Bryum argenteum*. *Zeitschrift Für Pflanzenphysiologie* **103**(5): 393–402. [https://doi.org/10.1016/s0044-328x\(81\)80162-6](https://doi.org/10.1016/s0044-328x(81)80162-6)
500. Belkengren RO. 1962. Growth and sexual reproduction of the moss *Amblystegium riparium* under sterile conditions. *American Journal of Botany* **49**(6): 567. <https://doi.org/10.2307/2439712>
501. Burkholder PR. 1959. Organic nutrition of some mosses growing in pure culture. *The Bryologist* **62**(1): 6. <https://doi.org/10.2307/3240402>
502. Nishida Y. 1978. Studies on the sporeling types in mosses. *Journal of the Hattori Botanical Laboratory* **44**: 371–454.
503. Hatcher RE. 1965. Towards the establishment of a pure culture collection of Hepaticae. *The Bryologist* **68**(2): 227. <https://doi.org/10.2307/3241021>
504. Iverson GB. 1957. Pure culture of *Frullania*. *The Bryologist* **60**(4): 348–348. <https://doi.org/10.2307/3239882>

505. Diller VM, Fulford M & Kersten HJ. 1955.) Culture studies on *Sphaerocarpos*. II. The effect of various sugars on the growth and form of *S. texanus*. *American Journal of Botany* **42**(9): 819–829. <https://doi.org/10.1002/j.1537-2197.1955.tb10429.x>
506. Kurz EH. 1976. The Effect of cycloheximide on spore germination of the liverwort, *Sphaerocarpos donnellii*. *Zeitschrift Für Pflanzenphysiologie* **78**(4): 339–343. [https://doi.org/10.1016/s0044-328x\(76\)80104-3](https://doi.org/10.1016/s0044-328x(76)80104-3)
507. Odu EA. 1979. Spore germination in two tropical mosses: *Fissidens* sp. and *Racopilum* sp. *Annals of Botany* **44**(2): 147–152. <https://doi.org/10.1093/oxfordjournals.aob.a085714>
508. Sugano SS, Shirakawa M, Takagi J, Matsuda Y, Shimada T, Hara-Nishimura I & Kohchi T. 2014. CRISPR/Cas9-mediated targeted mutagenesis in the liverwort *Marchantia polymorpha* L. *Plant and Cell Physiology* **55**(3): 475–481. <https://doi.org/10.1093/pcp/pcu014>
509. Ashton NW & Cove DJ. 1977. The isolation and preliminary characterisation of auxotrophic and analogue resistant mutants of the moss, *Physcomitrella patens*. *Molecular Genetics and Genomics* **154**(1): 87–95. <https://doi.org/10.1007/bf00265581>
510. Cevallos MA, Guerrero G, Ríos S, Arroyo A, Villalobos MA & Porta H. 2019. The chloroplast genome of the desiccation-tolerant moss *Pseudocrossidium replicatum* (Taylor) R.H. Zander. *Genetics and Molecular Biology (Impresso)* **42**(2): 488–493. <https://doi.org/10.1590/1678-4685-gmb-2018-0184>
511. Gao B, Zhang D, Li X, Yang H, Zhang Y & Wood AJ. 2015. De novo transcriptome characterization and gene expression profiling of the desiccation tolerant moss *Bryum argenteum* following rehydration. *BMC Genomics* **16**(1). <https://doi.org/10.1186/s12864-015-1633-y>
512. Hiss M, Laule O, Meskauskienė RM, Arif MA, Decker EL, Erxleben A, Frank W, Hanke ST, Lang D, Martin A, Neu C, Reski R, Richardt S, Schallenberg-Rüdinger M, Szövényi P, Tiko T, Wiedemann G, Wolf L, Zimmermann P & Rensing SA. 2014. Large-scale gene expression profiling data for the model moss *Physcomitrella patens* aid understanding of developmental progression, culture and stress conditions. *The Plant Journal* **79**(3): 530–539. <https://doi.org/10.1111/tpj.12572>
513. Khraiwesh, B., Qudeimat, E., Thimma, M., Chaiboonchoe, A., Jijakli, K., Alzahmi, A., Arnoux, M., & Salehi-Ashtiani, K. (2015). Genome-wide expression analysis offers new insights into the origin and evolution of *Physcomitrella patens* stress response. *Scientific Reports*, 5(1), 17434. <https://doi.org/10.1038/srep17434>
514. Silva AT, Gao B, Fisher KM, Mishler BD, Ekwealor JB, Stark LR, Li X, Zhang D, Bowker MA, Brinda JC, Coe KK & Oliver MJ. 2020. To dry perchance to live: Insights from the genome of the desiccation-tolerant biocrust moss *Syntrichia caninervis*. *Plant Journal* **105**(5): 1339–1356. <https://doi.org/10.1111/tpj.15116>
515. Ashton NW, Schulze A, Hall P & Bandurski RS. 1985. Estimation of indole-3-acetic acid in gametophytes of the moss, *Physcomitrella patens*. *Planta* **164**(1): 142–144. <https://doi.org/10.1007/bf00391040>
516. Stieha CR, Middleton A, Stieha JK, Trott S & McLetchie DN. 2014. The dispersal process of asexual propagules and the contribution to population persistence in *Marchantia* (Marchantiaceae). *American Journal of Botany* **101**(2): 348–356. <https://doi.org/10.3732/ajb.1300339>
517. Arif MA, Hiss M, Tomek M, Busch H, Meyberg R, Tintelnot S, Reski R, Rensing SA & Frank W. 2019. ABA-Induced vegetative diaspore formation in *Physcomitrella patens*. *Frontiers in Plant Science* **10**. <https://doi.org/10.3389/fpls.2019.00315>
518. Chopra RN & Kapur A. 1989. Effect of abscisic acid and kinetin on protonemal differentiation in *Timmiella anomala*. *Plant Science* **61**(2): 203–206. [https://doi.org/10.1016/0168-9452\(89\)90225-2](https://doi.org/10.1016/0168-9452(89)90225-2)
519. Menand B, Calder G & Dolan L. 2007. Both chloronemal and caulonemal cells expand by tip growth in the moss *Physcomitrella patens*. *Journal of Experimental Botany* **58**(7): 1843–1849. <https://doi.org/10.1093/jxb/erm047>

520. Mathew M, Mathew A & Sindu N. 2021. Axenic culture of *Marchantia linearis* Lehm. & Lindenb and optimization of media for gametophyte proliferation. *Plant Genetic Resource Utilization: An Appraisal. Department of Botany, University of Kerala*. ISBN:978-81-951912-4-6
521. Mueller SJ, Lang D, Hoernstein SNW, Lang EGE, Schuessle C, Schmidt A, Fluck M, Leisibach D, Niegl C, Zimmer AD, Schlosser A & Reski R. 2014. Quantitative analysis of the mitochondrial and plastid proteomes of the moss *Physcomitrella patens* reveals protein macrocompartmentation and microcompartmentation. *Plant Physiology* **164**(4): 2081–2095. <https://doi.org/10.1104/pp.114.235754>
522. Roberts AW, Dimos CS, Budziszek MJ, Goss CA & Lai V. 2010. Knocking out the wall: protocols for gene targeting in *Physcomitrella patens*. *Methods in Molecular Biology* 273–290. https://doi.org/10.1007/978-1-61779-008-9_19
523. Nakata M, Watanabe Y, Sakurai Y, Hashimoto Y, Matsuzaki M, Takahashi Y & Satoh T. 2004. Germin-like protein gene family of a moss, *Physcomitrella patens*, phylogenetically falls into two characteristic new clades. *Plant Molecular Biology* **56**(3): 381–395. <https://doi.org/10.1007/s11103-004-3475-x>
524. Nelson JM, Hauser DA, Hinson R & Shaw AJ. 2018. A novel experimental system using the liverwort *Marchantia polymorpha* and its fungal endophytes reveals diverse and context-dependent effects. *New Phytologist* **218**(3): 1217–1232. <https://doi.org/10.1111/nph.15012>
525. Munasinghe NN, Liyanage SN & Saputhanthri P. 2015 *In vitro* propagation of the thalloid liverwort *Riccia sorocarpa* Bisch. Conference: 35th Annual sessions of the Institute of Biology Volume: Proceedings of the 35th Annual sessions of the Institute of Biology.
526. Ogbimi AZ, Owuoye YB, Ibiyemi VO & Bofede AV. 2014. Effects of pH, photoperiod, and nutrient on germination and growth of *Calymperes erosum* C. Muell. Gemmaling. *Journal of Botany* **2014**: 1–5. <https://doi.org/10.1155/2014/159457>
527. Ozcan E, Onlu S, Sezgin ME & Barpete S. 2021. The effect of improvised media and sugar concentration on in vitro shoot multiplication of *Riccia fluitans* L.: an amphibious liverwort. *Fresenius environmental bulletin* **30**(02A): 1696-1702.
528. Neuenschwander U, Fleming AJ & Kuhlemeier C. 1994. Cytokinin induces the developmentally restricted synthesis of an extracellular protein in *Physcomitrella patens*. *The Plant Journal* **5**(1): 21–31. <https://doi.org/10.1046/j.1365-313x.1994.5010021.x>
529. Schulz PR, Reski R, Maldiney M, Laloue & von Schwartzberg K. 2000. Kinetics of cytokinin production and bud formation in *Physcomitrella*: Analysis of wild type, a developmental mutant and two of its ipt transgenics. *Journal of Plant Physiology (Print)* **156**(5-6): 768–774. [https://doi.org/10.1016/s0176-1617\(00\)80246-1](https://doi.org/10.1016/s0176-1617(00)80246-1)
530. Schulz AP, Hofmann AH, Russo V, Hartmann E, Laloue M & von Schwartzberg K. 2001. Cytokinin overproducing mutants of *Physcomitrella patens* show increased riboside to base conversion. *Plant Physiology* **126**(3): 1224–1231. <https://doi.org/10.1104/pp.126.3.1224>
531. Engel PP. 1968. The induction of biochemical and morphological mutants in the moss *Physcomitrella patens*. *American Journal of Botany* **55**(4): 438–438. <https://doi.org/10.2307/2440573>
532. Collier PA & Hughes KW. 1982. Life cycle of the moss, *Physcomitrella patens*, in culture. *Journal of Tissue Culture Methods* **7**(1): 19–22. <https://doi.org/10.1007/bf01666875>
533. Spiess LD, Lippincott BB & Lippincott JA. 1973. Effect of hormones and vitamin B12 on gametophore development in the moss *Pylaisiella selwynii*. *American Journal of Botany* **60**(7): 708–716. <https://doi.org/10.1002/j.1537-2197.1973.tb05977.x>
534. Ikram NABK, Kashkooli AB, Peramuna AV, Van der Krol AR, Bouwmeester H & Simonsen HT. 2017. Stable production of the antimalarial drug artemisinin in the moss *Physcomitrella patens*. *Frontiers in Bioengineering and Biotechnology* **5**. <https://doi.org/10.3389/fbioe.2017.00047>

535. Hayashida A, Takechi K, Sugiyama M, Kubo M, Itoh RD, Takio S, Fujita T, Hiwatashi Y, Hasebe M & Takano H. 2005. Isolation of mutant lines with decreased numbers of chloroplasts per cell from a tagged mutant library of the moss *Physcomitrella patens*. *Plant Biology* 7(3): 300–306. <https://doi.org/10.1055/s-2005-837691>
536. Schween G, Egener T, Fritzowsky D, Granado J, Guitton MC, Hartmann N, Hohe A, Holtorf H, Lang D, Lucht JM, Reinhard C, Rensing SA, Schlink K, Schulte J & Reski R. 2005. Large-scale analysis of 73 329 *Physcomitrella* plants transformed with different gene disruption libraries: production parameters and mutant phenotypes. *Plant Biology* 7(3): 228–237. <https://doi.org/10.1055/s-2005-837692>
537. Trouiller B, Charlot F, Choinard S, Schaefer DG & Nogu   F. 2007. Comparison of gene targeting efficiencies in two mosses suggests that it is a conserved feature of Bryophyte transformation. *Biotechnology Letters* 29(10): 1591–1598. <https://doi.org/10.1007/s10529-007-9423-5>
538. Bassi P, Basile A, Stefanini A, Vosa CG, Maffei M, Giordano S & Castaldo-Cobianchi R. 1995. Effects of lead on the nuclear repetitive DNA of the moss *Funaria hygrometrica* (Bryophyta). *Protoplasma* 188(1-2): 104–108. <https://doi.org/10.1007/bf01276800>
539. Adam KP. 1996. *Marchantia polymorpha* (Liverwort): culture and production of metabolites. *Biotechnology in Agriculture and Forestry* 186–201. https://doi.org/10.1007/978-3-662-08618-6_12
540. Olarinmoye SO, Egunyomim A & Akandem AO. 1981. Spore germination and protonema development in *Stereophyllum radiculosum* (Hook.) Mitt. *Journal of the Hattori Botanical Laboratory* 50: 95–106. https://doi.org/10.18968/jhbl.50.0_95
541. Vaarama A & Taren N. 1963. On the separate and combined effects of calcium, kinetin and gibberellic acid on the development of moss protonemata. *Journal of the Linnean Society of London, Botany* 58(373): 297–304. <https://doi.org/10.1111/j.1095-8339.1990.tb00898.x>
542. Arif M, Alseekh S, Harb J, Fernie AR & Frank W. 2018. *Absciscic acid, cold and salt stimulate conserved metabolic regulation in the moss Physcomitrella patens*. *Plant Biology* 20(6): 1014–1022. <https://doi.org/10.1111/plb.12871>
543. Chodok P, Eiamsa-ard P, Cove DJ, Quatrano RS & Kaewsuwan S. 2013. Identification and functional characterization of two $\Delta 12$ -fatty acid desaturases associated with essential linoleic acid biosynthesis in *Physcomitrella patens*. *Journal of Industrial Microbiology and Biotechnology/Journal of Industrial Microbiology & Biotechnology* 40(8): 901–913. <https://doi.org/10.1007/s10295-013-1285-3>
544. Erxleben A, Gessler A, Vervliet-Scheebaum M & Reski R. 2011. Metabolite profiling of the moss *Physcomitrella patens* reveals evolutionary conservation of osmoprotective substances. *Plant Cell Reports* 31(2): 427–436. <https://doi.org/10.1007/s00299-011-1177-9>
545. Hartmann EP, Beutelmann O, Vandekerckhove Euler R & Kohn G. 1986. Moss cell cultures as sources of arachidonic and eicosapentaenoic acids. *FEBS Letters* 198(1): 51–55. [https://doi.org/10.1016/0014-5793\(86\)81183-8](https://doi.org/10.1016/0014-5793(86)81183-8)
546. Zank TK, Z  hringer U, Beckmann C, Pohnert G, Boland W, Holtorf H, Reski R, Lerchl J & Heinz E. 2002. Cloning and functional characterisation of an enzyme involved in the elongation of $\Delta 6$ -polyunsaturated fatty acids from the moss *Physcomitrella patens*. *The Plant Journal* 31(3): 255–268. <https://doi.org/10.1046/j.1365-313x.2002.01354.x>
547. Takio S. 1990. Nitrate reductase inactivator in a chlorate resistant mutant of the liverwort, *Marchantia paleacea* var. *diptera*. *Journal of Plant Physiology* 136(1): 30–34. [https://doi.org/10.1016/s0176-1617\(11\)81610-x](https://doi.org/10.1016/s0176-1617(11)81610-x)
548. Takio S, Ikuta K, Satoh Y & Satoh T. 1993. Photosynthetic properties of dark-bleached cells of the newly established line from the liverwort, *Marchantia paleacea* var. *diptera*. *Journal of Plant Physiology* 142(1): 6–11. [https://doi.org/10.1016/s0176-1617\(11\)80099-4](https://doi.org/10.1016/s0176-1617(11)80099-4)

549. Takio S, Takami S & Hino S. 1988. Photosynthetic ability of dark-grown *Marchantia paleacea* cells in suspension culture. *Journal of Plant Physiology* **132**(2): 195–198. [https://doi.org/10.1016/s0176-1617\(88\)80160-3](https://doi.org/10.1016/s0176-1617(88)80160-3)
550. Miller MW & Colaiace J. 1969. The induction of sexual reproductive structures of *Marchantia polymorpha* grown under aseptic culture conditions. *The Bryologist* **72**(1): 45. <https://doi.org/10.2307/3241355>
551. Park M, Park H, Lee H, Lee B & Lee J. 2018. The complete plastome sequence of an antarctic bryophyte *Sanionia uncinata* (Hedw.) Loeske. *International Journal of Molecular Science* **19**(3): 709. <https://doi.org/10.3390/ijms19030709>
552. Duckett JG & Renzaglia KS. 1993. The reproductive biology of the liverwort *Blasia pusilla* L.. *Journal of Bryology* **17**(4): 541–552. <https://doi.org/10.1179/jbr.1993.17.4.541>
553. Shinmen Y, Katoh K, Shimizu S, Jareonkitmongkol S & Yamada H. 1991. Production of arachidonic acid and eicosapentaenoic acids by *Marchantia polymorpha* in cell culture. *Phytochemistry* **30**(10): 3255–3260. [https://doi.org/10.1016/0031-9422\(91\)83188-q](https://doi.org/10.1016/0031-9422(91)83188-q)
554. Minami A, Nagao M, Arakawa K, Fujikawa S & Takezawa D. 2003. Absciscic acid-induced freezing tolerance in the moss *Physcomitrella patens* is accompanied by increased expression of stress-related genes. *Journal of Plant Physiology* **160**(5): 475–483. <https://doi.org/10.1078/0176-1617-00888>
555. Reutter K, Atzorn R, Hader B, Schmülling T & Reski R. 1998. Expression of the bacterial ipt gene in *Physcomitrella* rescues mutations in budding and in plastid division. *Planta* **206**(2): 196–203. <https://doi.org/10.1007/s004250050391>
556. Asthana AK & Sahu V. 2011. Growth responses a moss *Brachymerium capitatum* (Mitt.) Par. in different culture media. *National Academy Science Letters* **34**(1-2): 1-4.
557. Daku RM, Rabbi F, Buttigieg J, Coulson IM, Horne D, Martens G, Ashton NW & Suh DY. 2016. PpASCL, the *Physcomitrella patens* anther-specific chalcone synthase-like enzyme implicated in sporopollenin biosynthesis, is needed for integrity of the moss spore wall and spore viability. *Plos one* **11**(1): e0146817–e0146817. <https://doi.org/10.1371/journal.pone.0146817>
558. Nyman LP & Cutter EG. 1981. Auxin–cytokinin interaction in the inhibition, release, and morphology of gametophore buds of *Plagiommium cuspidatum* from apical dominance. *Canadian Journal of Botany* **59**(5): 750–762. <https://doi.org/10.1139/b81-106>
559. Spiess LD. 1975. Comparative activity of isomers of zeatin and ribosyl-zeatin on *Funaria hygrometrica*. *Plant Physiology* **55**(3): 583–585. <https://doi.org/10.1104/pp.55.3.583>
560. Le Bail A, Scholz S & Kost B. 2013. Evaluation of reference genes for RT qPCR analyses of structure-specific and hormone regulated gene expression in *Physcomitrella patens* Gametophytes. *Plos one* **8**(8): e70998. <https://doi.org/10.1371/journal.pone.0070998>
561. Pan X, Han L, Zhang Y, Dongfang C & Simonsen HT. 2015. Sclareol production in the moss *Physcomitrella patens* and observations on growth and terpenoid biosynthesis. *Plant Biotechnology Reports* **9**(3): 149–159. <https://doi.org/10.1007/s11816-015-0353-8>
562. Petersen M. 2003. Cinnamic acid 4-hydroxylase from cell cultures of the hornwort *Anthoceros agrestis*. *Planta* **217**(1): 96–101. <https://doi.org/10.1007/s00425-002-0960-9>
563. Cuming AC, Cho SH, Kamisugi Y, Graham H & Quatrano RS. 2007. Microarray analysis of transcriptional responses to abscisic acid and osmotic, salt, and drought stress in the moss, *Physcomitrella patens*. *New Phytologist* **176**(2): 275–287. <https://doi.org/10.1111/j.1469-8137.2007.02187.x>
564. Tanahashi T. 2005. Diversification of gene function: homologs of the floral regulator FLO/LFY control the first zygotic cell division in the moss *Physcomitrella patens*. *Development* **132**(7): 1727–1736. <https://doi.org/10.1242/dev.01709>

565. Wolf L, Rizzini L, Stracke R, Ulm R & Rensing SA. 2010. The molecular and physiological responses of *Physcomitrella patens* to ultraviolet-B radiation. *Plant Physiology* **153**(3): 1123–1134. <https://doi.org/10.1104/pp.110.154658>
566. Kunz S, Burkhardt G & Becker H. 1993. Riccionidins a and b, anthocyanidins from the cell walls of the liverwort *Ricciocarpos natans*. *Phytochemistry* **35**(1): 233–235. [https://doi.org/10.1016/s0031-9422\(00\)90540-5](https://doi.org/10.1016/s0031-9422(00)90540-5)
567. Amagai A, Honda Y, Ishikawa S, Hara Y, Kuwamura M, Shinozawa A, Sugiyama N, Ishihama Y, Takezawa D, Sakata Y, Shinozaki K & Umezawa T. 2018. Phosphoproteomic profiling reveals ABA-responsive phosphosignaling pathways in *Physcomitrella patens*. *The Plant Journal* **94**(4) 699–708. <https://doi.org/10.1111/tpj.13891>
568. Perroud PF & Quatrano RS. 2006. The role of ARPC4 in tip growth and alignment of the polar axis in filaments of *Physcomitrella patens*. *Cytoskeleton* **63**(3): 162–171. <https://doi.org/10.1002/cm.20114>
569. Wiedemann G, Hermesen C, Melzer M, Büttner-Mainik A, Heinz Rennenberg Reski R & Kopriva S. 2010. Targeted knock-out of a gene encoding sulfite reductase in the moss *Physcomitrella patens* affects gametophytic and sporophytic development. *FEBS Letters* **584**(11): 2271–2278. <https://doi.org/10.1016/j.febslet.2010.03.034>
570. Sakakibara K. 2003. Involvement of auxin and a homeodomain-leucine zipper I gene in rhizoid development of the moss *Physcomitrella patens*. *Development* **130**(20): 4835–4846. <https://doi.org/10.1242/dev.00644>
571. Khraiweh B, Ossowski S, Weigel D, Reski R & Frank W. 2008. Specific gene silencing by artificial microRNAs in *Physcomitrella patens*: an alternative to targeted gene knockouts. *Plant Physiology* **148**(2): 684–693. <https://doi.org/10.1104/pp.108.128025>
572. Egner T, Granado J, Guitton MC, Hohe A, Holtorf H, Lucht JM, Rensing SA, Schlink K, Schulte, J, Schween G, Zimmermann S, Duwenig E, Rak B & Reski R. 2002. High frequency of phenotypic deviations in *Physcomitrella patens* plants transformed with a gene-disruption library. *BMC Plant Biology* **2**(1): 6. <https://doi.org/10.1186/1471-2229-2-6>
573. Nagao M, Oku K, Minami A, Mizuno K, Sakurai M, Arakawa K, Fujikawa S & Takezawa D. 2006. Accumulation of theandrose in association with development of freezing tolerance in the moss *Physcomitrella patens*. *Phytochemistry* **67**(7): 702–709. <https://doi.org/10.1016/j.phytochem.2006.01.031>
574. Heintz D, Erxleben A, High AA, Wurtz V, Reski R, Van Dorsselaer A & Sarnighausen E. 2006. Rapid Alteration of the Phosphoproteome in the Moss *Physcomitrella patens* after Cytokinin Treatment. *Journal of Proteome Research*, **5**(9), 2283–2293. <https://doi.org/10.1021/pr060152e>
575. Dunham VL & Bryan JK. 1968. Effects of exogenous amino acids on the development of *Marchantia polymorpha* gemmalings. *American Journal of Botany* **55**(7): 745–745. <https://doi.org/10.2307/2440961>
576. Miller MW. 1964. A Technique for isolating and culturing gemmae of *Marchantia polymorpha* L. under Aseptic Conditions. *The Bryologist* **67**(3): 317. <https://doi.org/10.2307/3240894>
577. O'Donoghue MT, Chater C, Wallace S, Gray JE, Beerling DJ & Fleming AJ. 2013. Genome-wide transcriptomic analysis of the sporophyte of the moss *Physcomitrella patens*. *Journal of Experimental Botany* **64**(12): 3567–3581. <https://doi.org/10.1093/jxb/ert190>
578. Aoyama T, Hiwatashi Y, Shigyo M, Kofuji R, Kubo M, Ito M & Hasebe M. 2012. AP2-type transcription factors determine stem cell identity in the moss *Physcomitrella patens*. *Development* **139**(17): 3120–3129. <https://doi.org/10.1242/dev.076091>
579. Rother M, Krauss G, Grass G & Wesenberg D. 2006. Sulphate assimilation under Cd²⁺ stress in *Physcomitrella patens* – combined transcript, enzyme and metabolite profiling. *Plant, Cell & Environment* **29**(9): 1801–1811. <https://doi.org/10.1111/j.1365-3040.2006.01557.x>

580. Cho SH, Hoang QT, Phee JW, Kim YY, Shin HY & Shin JS. 2007. Modified suppression subtractive hybridization identifies an AP2-containing protein involved in metal responses in *Physcomitrella patens*. *Molecules and Cells* **23**(1): 100–107. [https://doi.org/10.1016/s1016-8478\(23\)07395-8](https://doi.org/10.1016/s1016-8478(23)07395-8)
581. Koduri H, Gordon GS, Barker EJ, Colpitts CC, Ashton N & Suh DY. 2010. Genome-wide analysis of the chalcone synthase superfamily genes of *Physcomitrella patens*. *Plant Molecular Biology* **72**(3): 247–263. <https://doi.org/10.1007/s11103-009-9565-z>
582. Basile A, Sorbo S, López-Sáez JA & Castaldo Cobianchi R. 2003. Effects of seven pure flavonoids from mosses on germination and growth of *Tortula muralis* HEDW. (Bryophyta) and *Raphanus sativus* L. (Magnoliophyta). *Phytochemistry* **62**(7): 1145–1151. [https://doi.org/10.1016/s0031-9422\(02\)00659-3](https://doi.org/10.1016/s0031-9422(02)00659-3)
583. Silber MV, Meimberg H & Ebel J. 2008. Identification of a 4-coumarate:CoA ligase gene family in the moss, *Physcomitrella patens*. *Phytochemistry* **69**(13): 2449–2456. <https://doi.org/10.1016/j.phytochem.2008.06.014>
584. Thelander M, Olsson T & Ronne H. 2005. Effect of the energy supply on filamentous growth and development in *Physcomitrella patens*. *Journal of Experimental Botany* **56**(412): 653–662. <https://doi.org/10.1093/jxb/eri040>
585. Hughes JG. 1979. Seasonal behaviour of gemmate shoots of *Tetraphis geniculata* Girgh. ex Milde in test-tube culture. *Journal of Bryology* **10**(4): 539–551. <https://doi.org/10.1179/jbr.1979.10.4.539>
586. Pressel S, Matcham HW & Duckett JG. 2007. Studies of protonemal morphogenesis in mosses. XI. *Bryum* and allied genera: a plethora of propagules. *Journal of Bryology* **29**(4): 241–258. <https://doi.org/10.1179/174328207x244042>
587. Nishida Y. 1973. On the formation of protonema of *Drummondia sinensis* of the Orthotrichaceae. *The Botanical Magazine Tokyo* **86**(1): 35–41. <https://doi.org/10.1007/bf02491255>
588. Nehira K. 1976. Protonema development in mosses. *Journal of the Hattori Botanical Laboratory* **41**: 157–165.
589. Asthana AK, Sahu V & Srivastava A. 2015. *In-vitro* propagation of three species of *Bryum* Hedw.: A comparative study. *Geophytology* **45**(2): 215–220.
590. Fiedorow P, Odrzykoski IJ, Szweykowski J & Szweykowska-Kulinska Z. 2001. Phylogeny of the European species of the genus *Pellia* (Hepaticae; Metzgeriales) based on the molecular data from nuclear tRNA Leu CAA intergenic sequences. *Gene* **262**(1-2): 309–315. [https://doi.org/10.1016/s0378-1119\(00\)00523-0](https://doi.org/10.1016/s0378-1119(00)00523-0)
591. Bopp M. 1982. How can external hormones regulate the morphogenesis of mosses. *Journal of the Hattori Botanical Laboratory* **53**: 159–169.
592. Gagnon ZE & Glime JM. 1992. The pH-lowering ability of *Sphagnum magellanicum* Brid.. *Journal of Bryology* **17**(1): 47–57. <https://doi.org/10.1179/jbr.1992.17.1.47>
593. Sastad SM, Bakken S & Pedersen B. 1998. Propagation of *Sphagnum* in axenic culture - a method for obtaining large numbers of cloned gametophores. *Lindbergia* **23**: 65–73.
594. Rose S & Bopp M. 1983. Uptake and polar transport of indoleacetic acid in moss rhizoids. *Physiologia Plantarum* **58**(1): 57–61. <https://doi.org/10.1111/j.1399-3054.1983.tb04143.x>
595. Wada K, Hirabayashi Y & Saito W. 1984. Light germination of *Anthoceros miyabeanus* spores. *Botanical Magazine Tokyo* **97**(3): 369–379. <https://doi.org/10.1007/bf02488669>
596. Min L, Shiliang H, Jiancheng Z, Yuanming Z & Zhenjie W. 2006. Characteristics of spore germination and protonemal development in *Hypnum pacleaseens*. *Frontiers of Biology in China* **1**(3): 225–229. <https://doi.org/10.1007/s11515-006-0015-x>
597. Dhingra-Babbar S. 1989. *In vitro* behavior of gemmae in *Trematodon brevicalyx* and *Semibarbula orientalis* II. Effect of activated charcoal, coconut milk, octopine and tryptophan. *Journal of the Hattori Botanical Laboratory* **66**: 299–306

598. Diller VM, Fulford M & Kersten HJ. 1955. Culture studies on *Sphaerocarpos*. I. Growth of *Sphaerocarpos texanus* in Organic Media. *The Bryologist* **58**(3): 173–173. <https://doi.org/10.2307/3239903>
599. Ridgway JE. 1966. Factors initiating antheridial formation in six Anthocerotales. *The Bryologist* **70**(2): 203–203. <https://doi.org/10.2307/3240945>
600. Arts T. 1994. Rhizoidal tubers and protonemal gemmae in European *Ditrichum* species. *Journal of Bryology* **18**(1): 43–61. <https://doi.org/10.1179/jbr.1994.18.1.43>
601. Kapoor A & Chopra RN. 1983. Effect of kinetin and cyclic 3'5'-adenosine monophosphate on bud induction in the moss *Timmia anomala*. *New Phytologist* **94**(3): 393–399. <https://doi.org/10.1111/j.1469-8137.1983.tb03453.x>
602. Saito S. 1958. Studies on the germination of the spores in some mosses. *Scientific Reports Shimane University* **9**: 55–63.
603. Bagdatli MN & Erdağ BB. 2017. Spore germination and protonemal features of some mosses under *in vitro* conditions. *European Journal of Biotechnology and Bioscience* **5**: 53–58.
604. Chopra RN & Vashistha BD. 1993. Effect of some chemical factors on growth and archegonial formation in female clone of *Riccia frostii* Aust. *Journal of the Hattori Botanical Laboratory* **73**: 231–247. https://doi.org/10.18968/jhbl.73.0_231
605. Nehlsen W. 1977. In vitro meiosis of *Sphaerocarpos texanus* Sporocytes. *The Bryologist* **80**(1): 184. <https://doi.org/10.2307/3242534>
606. Studlar SMJ, Caponetti D & Sharp A. 1984. Morphology of the urban moss *Tortula pagorum* in sterile culture. *Journal of the Hattori Botanical Laboratory* **56**: 351–368.
607. Ares A, Duckett JG & Pressel S. 2014. Asexual reproduction and protonemal development *in vitro* in *Fontinalis antipyretica* Hedw.. *Journal of Bryology* **36**(2): 122–133. <https://doi.org/10.1179/1743282014y.0000000099>
608. Udar R. 1958. Studies in Indian Sauteriaceae. I. sporeling patterns in *Athalamia pinguis* Falc. *Journal of Indian Botanical Society* **37**: 300–308.
609. Spiess LD. 1979. Antagonism of cytokinin induced callus in *Pylaisiella selwynii* by nucleosides and cyclic nucleotides. *The Bryologist* **82**(1): 47–47. <https://doi.org/10.2307/3241966>
610. Bagdatli MN & Erdağ BB. 2015. The moss *Dicranella varia* (Hedw.) Schimp, from spore to gametophore under *in vitro* conditions. *European Journal of Biotechnology and Bioscience* **3**(11): 47–50.
611. Stanojković JN, Ćosić MV, Božović DP, Sabovljević MS, Čučulović A & Vujičić MM. 2024. Effects of cesium on photosynthesis in moss *Atrichum undulatum* (Hedw.) P. Beauv grown *in vitro*. 5th International Conference on Plant Biology [and] (24th SPPS Meeting), 3–5 October 2024, Srebrno Jezero
612. Anglana C, Barozzi F, Capaci P, Migoni D, Rojas M, Fanizzi FP & Di Sansebastiano GP. 2024. Characterization of three species of aquatic mosses in axenic culture for biomonitoring and biotechnological applications. *Aquatic Botany* **193**: 103762. <https://doi.org/10.1016/j.aquabot.2024.103762>
613. Jadranin BZ, Ćosić MV, Božović DP, Vujičić MM, Papp B, Sabovljević AD & Sabovljević MS. 2024. Novel insights into the conservation physiology and ex situ conservation of the threatened and rare semi-aquatic moss *Drepanocladus lycopodioides* (Amblystegiaceae). *Phyton-International Journal of Experimental Botany* **93**(11): 3039–3054. <https://doi.org/10.32604/phyton.2024.058469>
614. Ramadhani NT, Handayani W, Yasman Y & Putrika A. 2024. Induction of *in vitro* shoots in liverwort *Acrolejeunea fertilis* (Reinw., Blume & Nees) Schiffn. Gametophyte explants and their comparative metabolite and bioactivity analysis. *Plant Cell Tissue and Organ Culture* **158**: 10 <https://doi.org/10.1007/s11240-024-02787-5>

615. Lunić T, Rakić M, Sabovljević A, Sabovljević M, Filipović T, Božić B & Božić Nedeljković B. 2024. Exploring In vitro immunomodulatory properties of moss *Atrichum undulatum* extracts. *Plants* **13**: 1349. <https://doi.org/10.3390/plants13101349>
616. Božović DP, Rimac A, Vujičić MM, Singh P, Goga M, Li M, Varotto C, Sabovljević AD & Sabovljević MS. 2024. The developmental and physiological traits of rare and threatened moss *Physcomitrium eurystomum* Sendtn. (Funariaceae) valuable for its conservation. *Phyton-International Journal of Experimental Botany* **93**(11): 2949-2961. <https://doi.org/10.32604/phyton.2024.057995>
617. Rajčić MV, Sircelj H, Matić NA, Pavkov SD, Poponessi S, Tosti TB, Sabovljević AD, Sabovljević MS & Vujičić MM. 2024. Effects of the salt stress duration and intensity on developmental and physiological features of the moss *Polytrichum formosum*. *Plants* **13**: 1438. <https://doi.org/10.3390/plants13111438>
618. Božović DP, Čosić MV, Vujičić MM, Sabovljević AD & Sabovljević MS. 2024. Effects of zinc- and copper-acetate on morphogenesis of rare and threatened moss *Physcomitrium eurystomum* (Funariaceae). 5th International Conference on Plant Biology [and] (24th SPPS Meeting), 3–5 October 2024, Srebrno Jezero
619. Andre CM, Sansom CE, Plunkett BJ, Hamiaux C, Massey L, Chan A, Caddie M, Espley RV & Perry NB. 2024. Unique bibenzyl cannabinoids in the liverwort *Radula marginata*: parallels with Cannabis chemistry. *New Phytologist* **246**: 2666–2682. <https://doi.org/10.1111/nph.20349>
620. Calcutt R, Aghli Y, Arinzeh T & Dixit R. 2024. A fibrous scaffold for in vitro culture and experimental studies of *Physcomitrium patens*. *Plant Direct* **8**(2): e570. <https://doi.org/10.1002/pld3.570>
621. Teyssier E, Grat S, Rich M, Delaux PM & Mbengue M. 2024. LysM-RLK plays an ancestral symbiotic function in plants. *bioRxiv*. <https://doi.org/10.1101/2024.01.16.575821>
622. Chaos Z, Fernández JA, Balseiro-Romero M, Celeiro M, García-Jares C, Méndez A, Pérez-Alonso P, Estébanez B, Kaal J, Nierop KGJ, Aboal JR & Monterroso C. 2024. What potential do mosses have as biomonitors of POPs? A comparative study of hexachlorocyclohexane sorption. *Science of The Total Environment* **934**: 173021. <https://doi.org/10.1016/j.scitotenv.2024.173021>.
623. Svriz M, Torres CD, Mongiat L, Aranda E, Spinedi N, Fracchia S & Scervino JM. 2024. Anthracene-induced alterations in liverwort architecture in nitro: Potential for indication of environmental pollution. *Plants* **13**(15): 2060. <https://doi.org/10.3390/plants13152060>
624. Keyl A, Herrfurth C, Pandey G, Kim RJ, Helwig L, Haslam TM, Vries Sd, Vries Jd, Gutsche N, Zachgo S, Suh MC, Kunst L & Feussner I. 2024. Divergent evolution of the alcohol-forming pathway of wax biosynthesis among bryophytes. *New Phytologist* **242**: 2251–2269. <https://doi.org/10.1111/nph.19687>
625. Vázquez-Arias A, Giráldez P, Martínez-Abaigar J, Núñez-Olivera E, Aboal JR & Fernández JA. 2024. Fine-tuning the use of moss transplants to map pollution by potentially toxic elements (PTEs) in urban areas. *Science of The Total Environment* **923**: 171601. <https://doi.org/10.1016/j.scitotenv.2024.171601>
626. Knosp S, Kriegshauser L, Tatsumi K, Malherbe L, Erhardt M, Wiedemann G, Bakan B, Kohchi T, Reski R & Renault H. 2024. An ancient role for CYP73 monooxygenases in phenylpropanoid biosynthesis and embryophyte development. *The EMBO Journal* **43**(18): 4092-4109. <https://doi.org/10.1038/s44318-024-00181-7>
627. Munoz C, Schröder K, Henes B, Hubert J, Leblond S, Poigny S, Reski R & Wandrey F. 2024. Phytochemical exploration of ceruchinol in moss: A multidisciplinary study on biotechnological cultivation of *Physcomitrium patens* (Hedw.) Mitt. *Applied Sciences* **14**: 1274. <https://doi.org/10.3390/app14031274>
628. Magdy M, Werner O, Patiño J & Ros RM. 2024. Landscape heterogeneity drives genetic diversity in the highly dispersive moss *Funaria hygrometrica* Hedw. *Plants* **13**: 2785. <https://doi.org/10.3390/plants13192785>
629. Rempfer C, Hoernstein SNW, van Gessel N, Graf AW, Spiegelhalder RP, Bertolini A, Bohlender LL., Parsons J, Decker EL & Reski R. 2024. Differential prolyl hydroxylation by six *Physcomitrella* prolyl-4

hydroxylases. *Computational and Structural Biotechnology Journal* **23**: 2580-2594.
<https://doi.org/10.1016/j.csbj.2024.06.014>

630. Lafferty DJ, Robison TA, Gunadi A, Gunn LH, Van Eck J & Li FW. 2024. Biolistics-mediated transformation of hornworts and its application to study pyrenoid protein localization. *Journal of Experimental Botany* **75**: 4760–4771. <https://doi.org/10.1093/jxb/erae243>
631. Antonishyn NA, Duckett JG & Ashton NW. 2024. Observations on the curvature of *Physcomitrium patens* (Hedw.) Mitt. and *Funaria hygrometrica* (Hedw.) caulonemal filaments. *Botany* **102**(10): 387-394. <https://doi.org/10.1139/cjb-2024-0028>
632. Tolopka JI, Svriz M, Ledesma TM, Lanari E, Scervino JM & Moreno JE. 2024. Environmental pollutant anthracene induces ABA-dependent transgenerational effects on gemmae dormancy in *Marchantia polymorpha*. *Plants* **13**: 2979. <https://doi.org/10.3390/plants13212979>
633. Shen T, Gadiant P, Goodrich J & Becher H. 2024. Selection efficacy differs between lifestyles in the haploid-diploid *Marchantia polymorpha* subsp. *Ruderalis*. *bioRxiv* <https://doi.org/10.1101/2024.09.06.611587>
634. Job TO, Litholdo CGJ, Stolze SC, Stephan L, Westermann J, Harzen A, Hülkamp M, Nakagami H & Boisson-Dernier A. 2024. An omics approach on *Marchantia polymorpha* single FERONIA and MARIS homologs confirms links between cell wall integrity and abscisic acid. *bioRxiv* <https://doi.org/10.1101/2024.11.26.625412>
635. Yue Y, Sablok G, Neubauer A, Hyvönen J & Szövényi P. 2024. Nitrogen starvation response in hornworts and liverworts provides little evidence for complex priming to the cyanobiont. *bioRxiv* <https://doi.org/10.1101/2024.05.22.595400>
636. Stanojković JN, Ćosić MV, Božović DP, Sabovljević AD, Sabovljević MS, Čučulović AA & Vujičić MM. 2024. Effects of cesium on physiological traits of the Catherine's moss *Atrichum undulatum* Hedw. *Plants* **13**: 54. <https://doi.org/10.3390/plants13010054>
637. Gómez-Molinero MA, Estébanez B & Medina NG. 2024. Interactions in bryophytes using a new in vitro culture method reveal negative and positive interspecific effects in the sporelings of two moss species. *Biologia* **79**: 3239–3247 <https://doi.org/10.1007/s11756-024-01769-4>
638. Li G, Liu X, Zhang Y, Muhammad A, Han W, Li D, Cheng X & Cai Y. 2020. Cloning and functional characterization of two cinnamate 4-hydroxylase genes from *Pyrus bretschneideri*. *Plant Physiology and Biochemistry* **156**: 135-145. <https://doi.org/10.1016/j.plaphy.2020.07.035>
639. Ćosić MV, Božović DP, Vujičić MM, Ignatova EA, Sabovljević AD, Ignatov MS & Sabovljević MS. 2024. Growth optimization, micropropagation and in vitro culture of the rare and threatened moss *Entosthodon pulchellus* (Funariaceae) 5th International Conference on Plant Biology [and] (24th SPPS Meeting), 3–5 October 2024, Srebrno Jezero
640. Jadranin BZ, Božović DP, Vujičić MM, Papp B, Sabovljević AD & Saboljević MS. 2024. The influence of growth regulators on the mass propagation of rare and threaten moss *Hamatocaulis vernicosus* 5th International Conference on Plant Biology [and] (24th SPPS Meeting), 3–5 October 2024, Srebrno Jezero
641. Duckett JG, Burch J, Fletcher PW, Matcham HW, Read DJ, Russell AJ & Pressel S. 2004. *In vitro* cultivation of bryophytes: a review of practicalities, problems, progress and promise. *Journal of bryology* **26**(1): 3-20. <https://doi.org/10.1179/037366803235001742>
642. Sabovljević MS, Ćosić MV, Jadranin BZ, Pantović JP, Giba ZS, Vujičić MM & Sabovljević AD. 2022. The conservation physiology of bryophytes. *Plants* **11**(10): 1282. <https://doi.org/10.3390/plants11101282>