

Supporting Information

Table S1. The effect of different carbohydrate, protein, and organic additives on the germination of 15, 18 and 20-day-old *G. elata* seeds for one month.

Medium Code	Va	Y(g/L)	Gc(g/L)	S (g/L)	Other Ingredient	Germination
Va	Va				-	-
VGc20	Va		20		-	-
VGc30	Va		30		-	-
VS20	Va			20	-	-
VS30	Va			30	-	+
VGcS10	Va		10	10	-	-
VCW100	Va		10	10	100 mL/L CW(25 DAP)	+
VCW150	Va		10	10	150 mL/L CW	-
VCW200	Va		10	10	200 mL/L CW(20DAP)	+
VHGc20	Va		20		100 mg/L humic acid	-
VHGc30	Va		30		100 mg/L humic acid	-
Y2		2	10	10	-	+
Y2A		2	10	10	20 g/L apple puree	+
Y2H		2	10	10	100 mg/L humic acid	+
Y2L		2	10	10	2 g/L bee larva	+
Y2MSG		2	10	10	2 g/L Na-glutamate	+
Y2Pp		2	10	10	2 g/L peptone	+
Y2Pt		2	10	10	20 g/L mashed potato	+
Y2CW150		2	10	10	150 mL/L CW	-
Y3		3	10	10	-	+
Y3A		3	10	10	20 g/L apple puree	+
Y3H		3	10	10	100 mg/L humic acid	+
Y3L		3	10	10	2 g/L bee larva	+
Y3MSG		3	10	10	2 g/L Na-glutamate	+
Y3Pp		3	10	10	2 g/L peptone	+
Y3Pt		3	10	10	20 g/L mashed potato	+
Y3CW150		3	10	10	150 mL/L CW	-

D nutrient: 100 mg/L inositol + 0.3 g/L B complex* + 2 g/L charcoal + 8 g/L agar, pH 5.2. Va: V (Vacin & Went, 1949)+D nutrient. Y: Hyponex 7-6-19 + D nutrient. Gc: glucose; S: sucrose; CW: coconut water. No growth regulators were added in these tests.

Table S2. Effect of IAA, GA₃ or 2iP and coconut water in medium on the germination of 20-day-old *G. elata* seeds for one month.

Medium Code	Medium	Agar (g/L)	Growth Regulator	Germination
YH	YH	8	-	-
YHG 0.5	YH	8	0.5 mg/L GA ₃	-
YHG 1	YH	8	1 mg/L GA ₃	-
YHG 2	YH	8	2 mg/L GA ₃	-
YHI 0.2	YH	8	0.2 mg/L IAA	-
YHI 0.5	YH	8	0.5 mg/L IAA	+
YHI 1	YH	8	1 mg/L IAA	+
YHI 2	YH	8	2 mg/L IAA	+
YP 0.1	YH	8	0.1 mg/L 2iP	-
YP 0.2	YH	8	0.2 mg/L 2iP	-
YIPa	YH	8	0.5 mg/L IAA + 0.1 mg/L 2iP	-
YIPb	YH	8	2.0 mg/L IAA + 0.2 mg/L 2iP	+
YCW	YH	8	150 mL/L CW	-
YCWa	YH	6	150 mL/L CW	-

Basal medium YH: 2 g/L Y + D nutrient + 10 mg/L humic acid + 10 g/L glucose + 10 g/L sucrose. IAA: indole-3-acetic acid; GA₃: gibberellic acid; 2iP: N⁶-Δ²-isopentyl-adenine CW: coconut water. +: germination; -: no germination.

Table S3. Effect of combination of IAA and 2iP in medium on the germination of 21 and 22-day-old *G. elata* seeds for one month.

Medium Code	Basal Medium	Growth Regulator	Germination
VH	VH	-	-
VI0.5	VH	0.5 mg/L IAA	+
VI1	VH	1 mg/L IAA	+
VI2	VH	2 mg/L IAA	+
VP0.2	VH	0.2 mg/L 2iP	-
VP0.4	VH	0.4 mg/L 2iP	-
VIPc	VH	0.5 mg/L IAA + 0.2 mg/L 2iP	-
VIPd	VH	1 mg/L IAA + 0.2 mg/L 2iP	-
VIPe	VH	2 mg/L IAA + 0.2 mg/L 2iP	-
VIPf	VH	0.5 mg/L IAA + 0.4 mg/L 2iP	-
VIPg	VH	1 mg/L IAA + 0.4 mg/L 2iP	-
VIPh	VH	2 mg/L IAA + 0.4 mg/L 2iP	-

VH: V + D nutrient + 10 mg/L humic acid + 10 g/L glucose + 10 g/L sucrose. IAA: indole-3-acetic acid; 2iP: N⁶-Δ²-isopentyl-adenine. +: germination; -: no germination.

Table S4. The effect of combination of IAA and GA₃ in medium on the germination of 22 -day-old *G. elata* seeds for one month.

Medium Code	Basal Medium	Growth Regulator	Germination
YH	YH	-	+
YIG1	YH	0.5 mg/L IAA + 0.5 mg/L GA ₃	+
YIG2	YH	1 mg/L IAA + 0.5 mg/L GA ₃	+
YIG3	YH	2 mg/L IAA + 0.5 mg/L GA ₃	+
YIG4	YH	0.5 mg/L IAA + 1 mg/L GA ₃	+
YIG5	YH	1 mg/L IAA + 1 mg/L GA ₃	+
YIG6	YH	2 mg/L IAA + 1 mg/L GA ₃	+

Basal medium YH: 2 g/L Y + D nutrient + 10 mg/L humic acid + 10 g/L glucose + 10 g/L sucrose. IAA: indole-3-acetic acid; GA₃: gibberellic acid. +: germination; -: no germination. Seeds collected at 22 DAP.

Table S5. The effect of combination of GA₃ and 2iP in medium on the germination of 23 or 24-day-old *G. elata* seeds for one month.

Medium Code	Basal Medium	Other Ingredient	Germination
VGP1	VHb	0.5 mg/L GA ₃ + 0.2 mg/L 2iP	-
VGP2	VHb	1 mg/L GA ₃ + 0.2 mg/L 2iP	-
VGP3	VHb	2 mg/L GA ₃ + 0.2 mg/L 2iP	-
VGP4	VHb	0.5 mg/L GA ₃ + 0.4 mg/L 2iP	-
VGP5	VHb	1 mg/L GA ₃ + 0.4 mg/L 2iP	-
VGP6	VHb	2 mg/L GA ₃ + 0.4 mg/L 2iP	-

Basal medium VHb: VH + 2 mg/L B6. GA₃: gibberellic acid; 2iP: N⁶-Δ²-isopentyl-adenine. +: germination; -: no germination.

Table S6. Effect of different cytokinin on growth and proliferation of *G. elata* juvenile rhizomes in culture medium.

Medium Code	Basal Medium	Other Ingredient
YH1	YH1	-
BA	YH1	1 mg/L BA
2iP	YH1	1 mg/L2iP
TDZ	YH1	1 mg/L TDZ
Kinetin	YH1	1 mg/L Kinetin
CPPU 1	YH1	1 mg/L CPPU
CPPU 2	YH1	2 mg/L CPPU
CPPU 4	YH1	4 mg/L CPPU

Basal medium YH1: 2 g/L Y + E nutrient. BA: benzyl adenine; 2iP:N⁶-Δ2isopentenyl-adenine; TDZ: thidiazuron; kinetin: (N⁶-furfuryladenine); CPPU: N-phenyl-N'-[2-chloro- 4-pyridyl]urea.

Table S7. Growth and proliferation of *G. elata* juvenile rhizomes on media with various nitrogen source, amino acid and vitamin.

Medium Code	Medium	Other Ingredient
CH	YH2	1 g/L casein hydrolysate
ME	YH2	1 g/L malt extract
Pep	YH2	1 g/L peptone
Try	YH2	1 g/L tryptone
YE	YH2	1 g/L yeast extract
Arg	YH2	1 g/L arginine
Glu	YH2	1 g/L glutamic acid
2Glu	YH2	2 g/L glutamic acid
Gly	YH2	1 g/L glycine
His	YH2	1 g/L histidine
Leu	YH2	1 g/L leucine
Phe	YH2	1 g/L phenylalanine
Tryp	YH2	1 g/L tryptophan
Tyr	YH2	1 g/L tyrosine
Val	YH2	1 g/L valine
4MSG	YH2	4 g/L MSG
B1	YH2	0.1 mg/L B1
B2	YH2	0.5 mg/L B2
B3	YH2	0.5 mg/L B3
B6	YH2	0.5 mg/L B6
B7	YH2	1.0 mg/L B7
B9	YH2	0.5 mg/L B9

Basal medim YH2: 2 g/L Hyponex 7-6-19 + 100 mg/L inositol + 3 g/L charcoal + 0.3 g/L B complex* + 30 g/L glucose + 100 mg/L humic acid + 3.5 g/L gelrite, pH 5.6. Medium B1~B9 did not include B complex. B complex*: A mixture of 34 mg B1(thiamine), 22 mg B2(riboflavin), 16 mg B3 (niacina-mide), 58 mg B5(pantothenic acid), 6 mg B6(pyridoxine), 35 mg B7 (biotin), 0.04 mg B9(folic acid), 37 mg inositol, 159 mg taurine, 39 mg choline bitartrate.

Table S8. Media with chitosan used for growth and proliferation of *G. elata* juvenile rhizomes.

Medium Code	Basal Medium	Other Ingredient
YH3	YH3	-
TM	YM3 without 370 mg/L MgSO ₄ ·7H ₂ O & 170 mg/L KH ₂ PO ₄	1 g/L chitosan
CHT1	YH3	1 g/L chitosan
CHT2	YH3	2 g/L chitosan

YH3: 2 g/L Y + F nutrient. BA: 6-benzyladenine; IAA: indole-3-acetic acid; B6: pyridoxine; B9: folic acid.

Table S9. Effect of various basal salts on growth and proliferation of *G. elata* juvenile rhizomes.

Medium Code	Basal Medium	Other Ingredient
Y1	YH5	1 g/L Hyponex 7-6-19
1/2 AB	YH5	Only 1/2 amount of NH ₄ NO ₃ +KNO ₃ in MS
Y1 + 1/2 AB	YH5	1 g/L Hyponex 7-6-19 + 1/2 amount of NH ₄ NO ₃ +KNO ₃ in MS

Basal medium YH5: F nutrient (tryptone 5 g) + 1 g/L chitosan + 1.5 g/L *A. mellea* powder + 100 mL/L coconut water + 2 mg/L BA + 2 mg/L NAA. 1/2 AB: MS salts with only 1/2 amount of NH₄NO₃ (825 mg/L) and KNO₃ (950 mg/L) in original MS medium. BA: 6-benzyladenine; IAA: indole-3-acetic acid; B6: pyridoxine; B9: folic acid. 30 g/L glucose + 100 mg/L inositol + 100 mg/L humic acid + 3 g/L charcoal + 0.5 mg/L B6 + 0.5 mg/L B9 + 2 g/L tryptone + 2 g/L glutamic acid + MSs* + 3.5 g/L gelrite, pH5.6).