

Figure S1. Mass isotopomer distribution (%) of isopulegone in each leaf pair at $30 \mu\text{mol m}^{-2} \text{s}^{-1}$ light intensity. (a) Shoot-tip culture was initiated with one developing leaf pair and after 15 days of culture, total four leaf pairs (older than 6 days) were observed. (b) Shoot-tip culture started without leaves and after 15 DALV, total three leaf pairs (older than 6 days) were observed (mean \pm standard error, $n=5$).

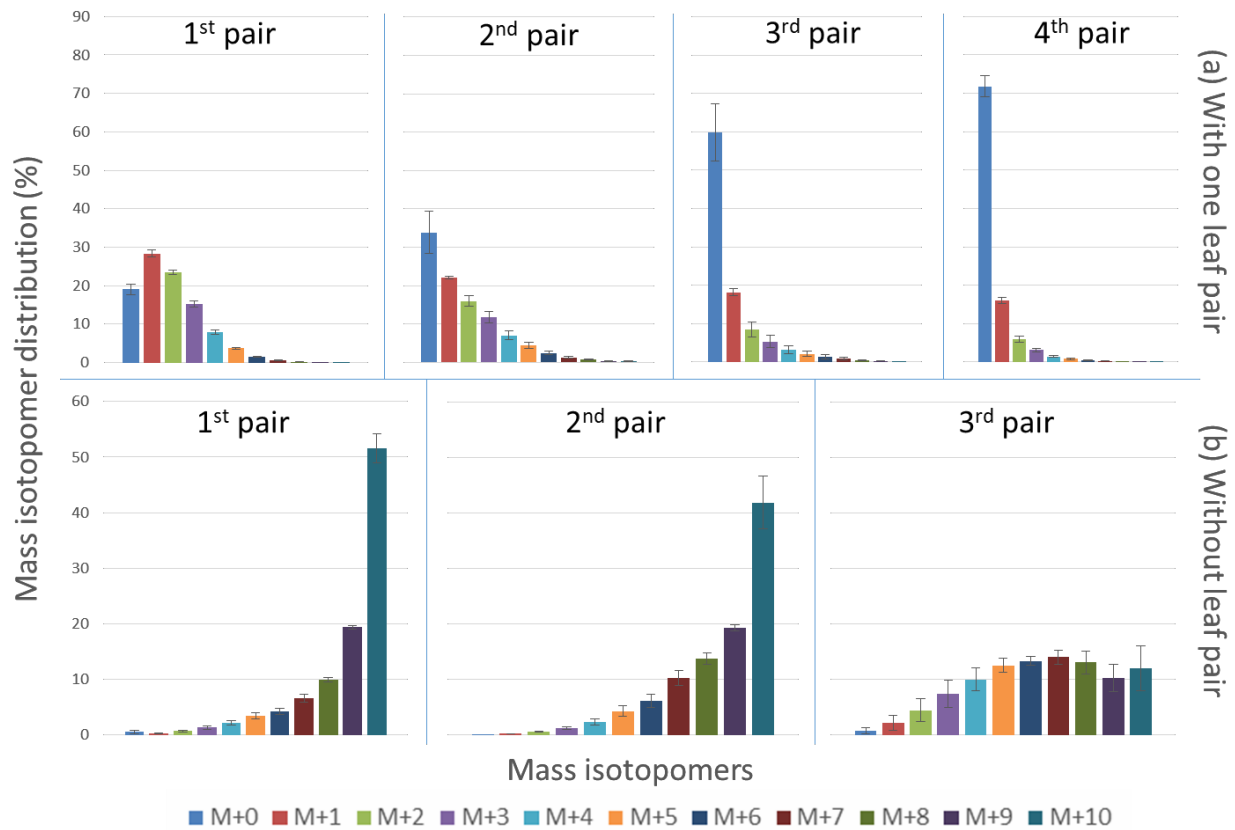


Figure S2. Mass isotopomer distribution (%) of menthofuran in each leaf pair at $30 \mu\text{mol m}^{-2} \text{s}^{-1}$ light intensity. (a) Shoot-tip culture initiated with one developing leaf pair and after 15 days of culture, total four leaf pairs (older than 6 days) were observed. (b) Shoot-tip culture started without leaves and after 15 DALV, total three leaf pairs (older than 6 days) were observed (mean \pm standard error, $n=5$).

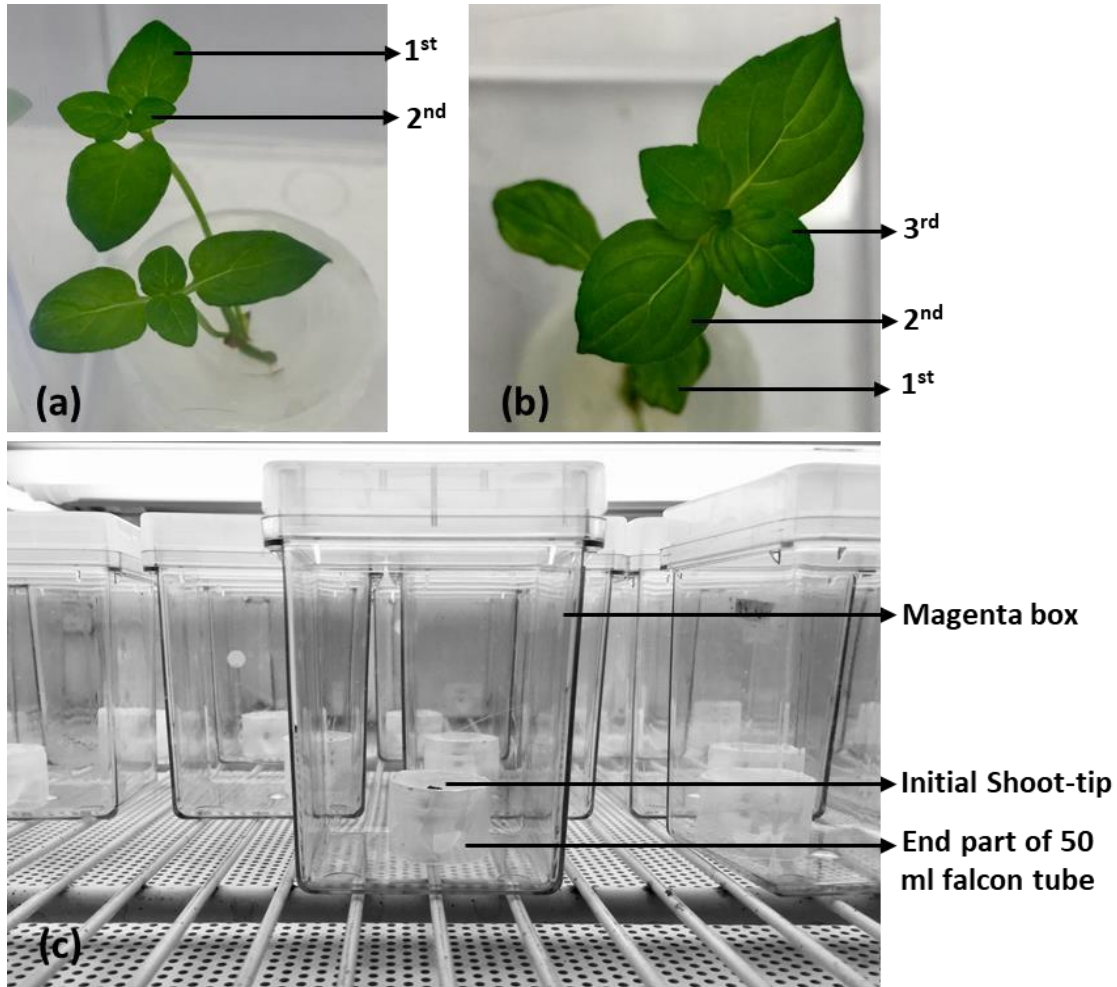


Figure S3. Photographs of shoot-tip culture (a) Shoot-tip culture at 15 DALV under 5 $\mu\text{mol m}^{-2} \text{s}^{-1}$ light intensity (b) Shoot-tip culture at 20 DALV under 5 $\mu\text{mol m}^{-2} \text{s}^{-1}$ light intensity (c) Overview of shoot- tip culture system inside growth chamber. Two and three leaf pairs (older than 6 days) were observed at 15 and 20 DALV, respectively.

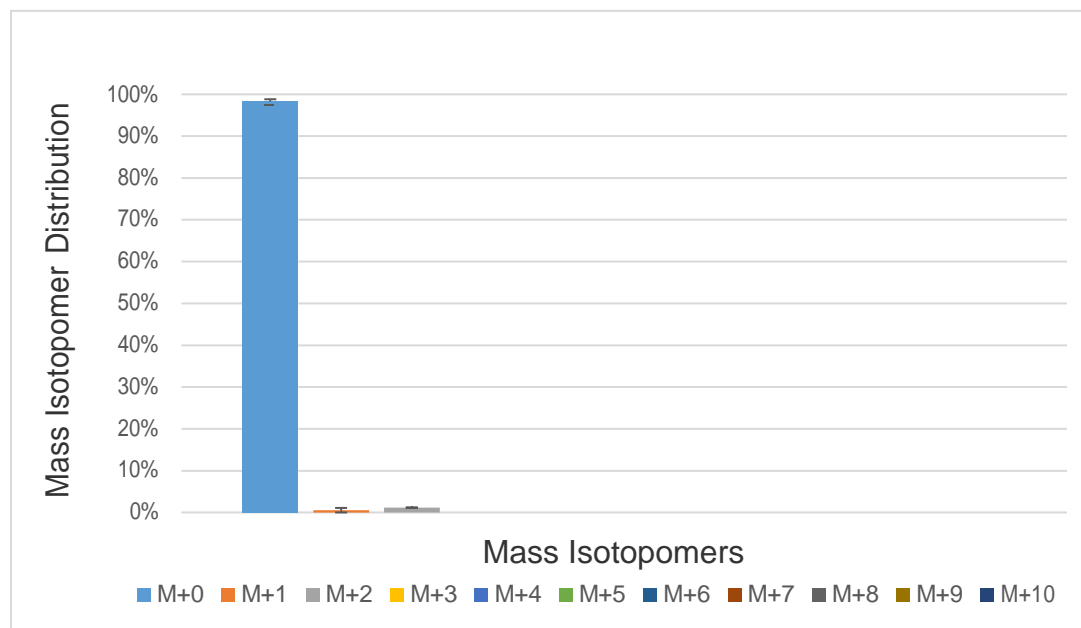


Figure S4. Mass isotopomer distribution (%) of pulegone in control shoot-tips, nurtured with unlabelled glucose as sole carbon source. Calculated label dilution in this control shoot-tips was 99.74% (after natural abundance correction) with negligible amounts of ^{13}C (0.26%) was considered as an experimental or measurement error (mean \pm standard error, n=5). This result remained virtually similar in control treatments within leaves of different age grown under different light intensities.

Table S1. Consumption of glucose (mg) by shoot-tip culture. Glucose consumption was measured after 15 DALV growth of the shoot-tip culture under different light intensities (mean \pm standard error, n=5).

Light intensity ($\mu\text{mol m}^{-2} \text{s}^{-1}$)	Total glucose needed (mg/shoot culture)
5	41.4 \pm 1.8
10	47.1 \pm 1.2
20	54.8 \pm 2.6
30	46.3 \pm 2.4

Table S2. Production of photosynthetic pigments and volatile terpenes in 15 days old leaves from *in vivo* plants. Leaves were collected from the peppermint plant grown under natural condition (mean \pm standard error, n=5).

Metabolites	Quantity
Chlorophyll (mg g ⁻¹ leaf fresh weight)	
Chl a	1.53 \pm 0.03
Chl b	1.00 \pm 0.07
Total (a+b)	2.54 \pm 0.09
Chl (a/b)	1.54
Carotenoids (mg g ⁻¹ leaf fresh weight)	0.31 \pm 0.02
Volatile terpenes (ng mg ⁻¹ leaf fresh weight)	
Pinene α	163.38 \pm 27.92
Sabinene	78.90 \pm 13.28
Pinene β	315.86 \pm 49.07
Myrcene	90.27 \pm 16.37
Limonene	33.70 \pm 6.83
1,8-Cineole	1110.72 \pm 161.46
Sabinene Hydrate	271.72 \pm 59.57
Menthone	9599.41 \pm 2651.2
Menthofuran	2226.18 \pm 346.1
Isopulegone	684.64 \pm 65.57
Pulegone	2846.56 \pm 262.95
Germacrene D	91.89 \pm 15.84
Total volatile terpene	17513.25 \pm 3333.95

Table S3. Photosynthetic assimilation rates of 15 days old leaves from shoot-tip cultures and normal plants. The measurements were taken using the LI-6400XT portable gas exchange system (Li-Cor Inc., Lincoln, NE, USA) (mean \pm standard error, n=5).

Light intensity ($\mu\text{mol m}^{-2} \text{s}^{-1}$)	Assimilation rate ($\mu\text{mol (CO}_2\text{) m}^{-2}$ (leaf area) s^{-1})	
	Shoot-tip cultures	Normal plants
5	-0.402 ± 0.094	-0.482 ± 0.114
10	-0.129 ± 0.089	-0.101 ± 0.056
20	0.433 ± 0.082	0.461 ± 0.123
30	0.518 ± 0.077	0.661 ± 0.112

Table S4. Details of measured amino acids and their fragments

Measured amino acids	Source intermediate(s)	Compartments (Dersch et al., 2016)	Analysed fragments
Tyrosine (Tyr)	Phosphoenol pyruvate and Erythrose 4-phosphate	Plastid	364 (M-57)
Serine (Ser)	3-phosphoglyceric acid	Cytosol	362 (M-85)
Alanine (Ala)	Pyruvate	Cytosol	232 (M-85)
Lysine (Lys)	Oxaloacetic acid	Cytosol	431 (M-57)
Proline (Pro)	α -ketoglutarate	Mitochondria	258 (M-85)

Table S5. Label dilution (%) into monoterpene in two leaf pairs of oregano shoot-tip culture after 15 DALV under $10 \mu\text{mol m}^{-2} \text{s}^{-1}$ light intensity. Labelled U- ^{13}C glucose (2%) was supplemented in the basal media (mean \pm standard error, n=5).

Leaf pair	Label dilution (%)
First	1.83 ± 0.19
Second	1.36 ± 0.05