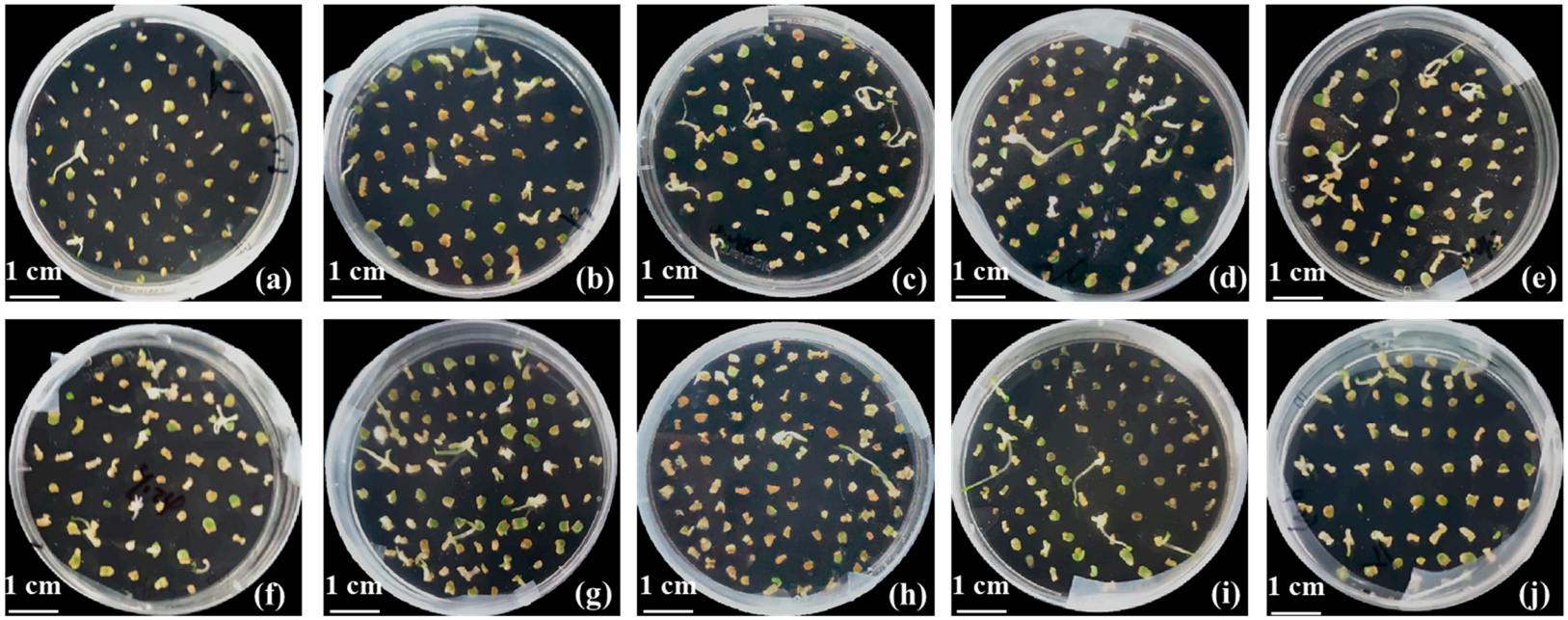
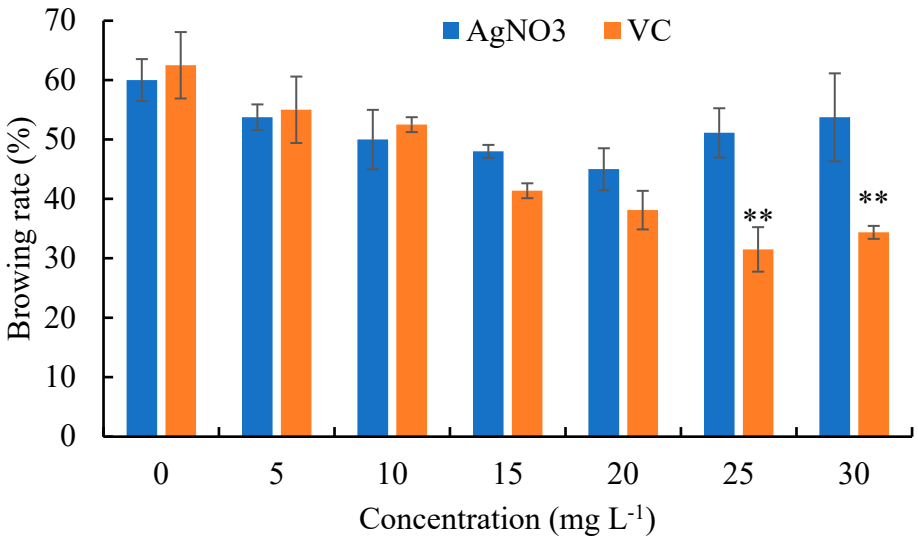



**Supplement Figure S1. C**alluses of different varieties of white clover at 20-days-old emerged from the cotyledon wounds. **(A)** Barbzan callus. **(B)** Koala callus. **(C)** HaHnony callus. **(D)** Ladino callus. **(E)** Sulky callus. **(F)** Haifa callus. **(G)** Miracle callus. **(H)** Pixie callus. **(I)** Zapican callus. **(J)** Mag callus.




**Supplement Figure S2.** Comparison of $AgNO_3$ and VC for reducing browning rate at the same concentration gradient. "**" was significant at the 0.01 level.

**Supplement Table S1.** Names and origins of the tested white clover varieties**.**

| Varieties | Amount | Seed source | Origin |
|---|---|---|---|
| Barbzan | 1 kg | Evergeen International Co., Ltd. | Netherlands |
| Koala | 1 kg | Evergeen International Co., Ltd. | Australia |
| HaHnony | 1 kg | Evergeen International Co., Ltd. | America |
| Ladino | 1 kg | Evergeen International Co., Ltd. | America |
| Sulky | 1 kg | Evergeen International Co., Ltd. | Argentina |
| Haifa | 1 kg | Beijing Hope Turf Techenogy Co., LTD | Australia |
| Miracle | 1 kg | Evergeen International Co., Ltd. | America |
| Pixie | 1 kg | Evergeen International Co., Ltd. | New Zealand |
| Zapican | 1 kg | Beijing Hope Turf Techenogy Co., LTD | Argentina |
| MAG | 1 kg | Beijing Hope Turf Techenogy Co., LTD | Argentina |

**Supplement Table S2.** Transformation efficiency statistics using the leaf explant protocol.

| Method | Explants | Kan-resistant callus | Positive lines | Transformation Efficiency |
|---|---|---|---|---|
| Article section 4.5 | 210 | 56 | 5(8.9%) | 2.38% |

**Supplement Table S3.** Culture medium composition for callus induction and differentiation

| Chemica | CCM 1000ml | CDM1 1000ml | CDM2 1000ml |
|---|---|---|---|
| MS basal medium | 4.74 g | 4.74 g | 4.74 g |
| Sucrose | 3 g | 3 g | 3 g |
| Calcium gluconate | 0.6 g | 0.6 g | 0.6 g |
| pH | 5.8 | 5.8 | 5.8 |
| Plant Aga | 7 g | 7 g | 7 g |
| 2,4-D stock solution (2 mg/ml) | 1 ml | 0 | 0 |
| 6-BA stock solution (0.5 mg/ml) | 1 ml | 2 ml | 0 |
| NAA stock solution (0.1 mg/ml) | 0 | - | 1 ml |

**Supplement Table S4.** Medium composition for white clover callus induction and proliferation

| Chemica | CIM 1000ml | CM 1000ml | CCM-S 1000ml | CDM-S 1000ml | CRM-S 1000ml |
|---|---|---|---|---|---|
| MS basal medium | 4.74 g | 4.74 g | 4.74 g | 4.74 g | 4.74 g |
| Sucrose | 3 g | 3 g | 3 g | 3 g | 3 g |
| Calcium gluconate | 0.6 g | 0.6 g | 0.6 g | 0.6 g | 0.6 g |
| pH | 5.8 | 5.8 | 5.8 | 5.8 | 5.8 |
| Acetosyringone stock solution (20 mg/ml) | 1 ml | 1 ml | 0 | 0 | 0 |
| Plant Agar | 0 | 7 g | 7 g | 7 g | 7 g |
| Cefotaxime stock solution (300 mg/ml) | 0 | 0 | 1 ml | 1 ml | 1 ml |
| Blp stock solution (25 mg/ml) | 0 | 0 | 1 ml | 1 ml | 1 ml |
| 2,4-D stock solution (2 mg/ml) | 1 ml | 1 ml | 1 ml | 0 | 0 |
| 6-BA stock solution (0.5 mg/ml) | 1 ml | 1 ml | 1 ml | 2 ml | 0 |
| NAA stock solution (0.1 mg/ml) | 0 | 0 | 0 | 5 ml | 1 ml |
| KT stock solution (1 mg/ml) | 0 | 0 | 0 | 1 ml | 0 |