Figure S1. Monthly precipitation and monthly mean temperature in the past 10 years (2008–2017) in Bayan-Unjuul, Mongolia.

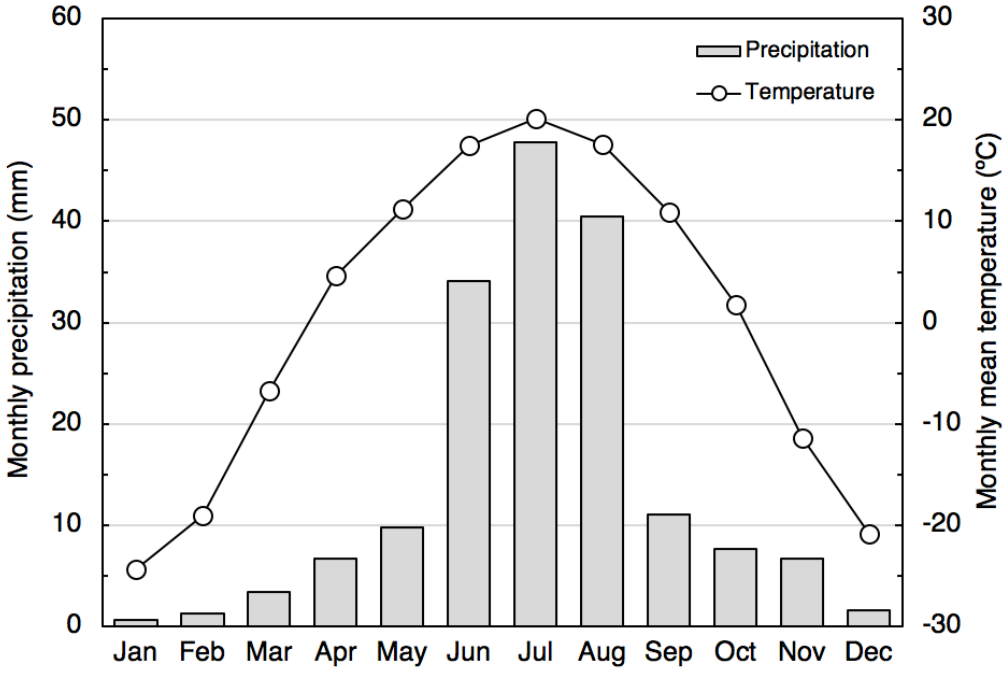

Figure S2. (A) Petri dishes filled with agar medium not containing *A. adamsii* residue and containing residue. The pictures were taken immediately after seeding on the media that were prepared the day before seeding. (B) Schematic diagram of testing autotoxic inhibition of germination in *A. adamsii* by volatile compounds (Fig. 3). After testing autotoxic inhibition by volatile compounds, planted dishes were moved into new large dishes without residue and the germination test was continued. As further germination was not observed after moving, seeds were transplanted to new agar medium and testing was continued.

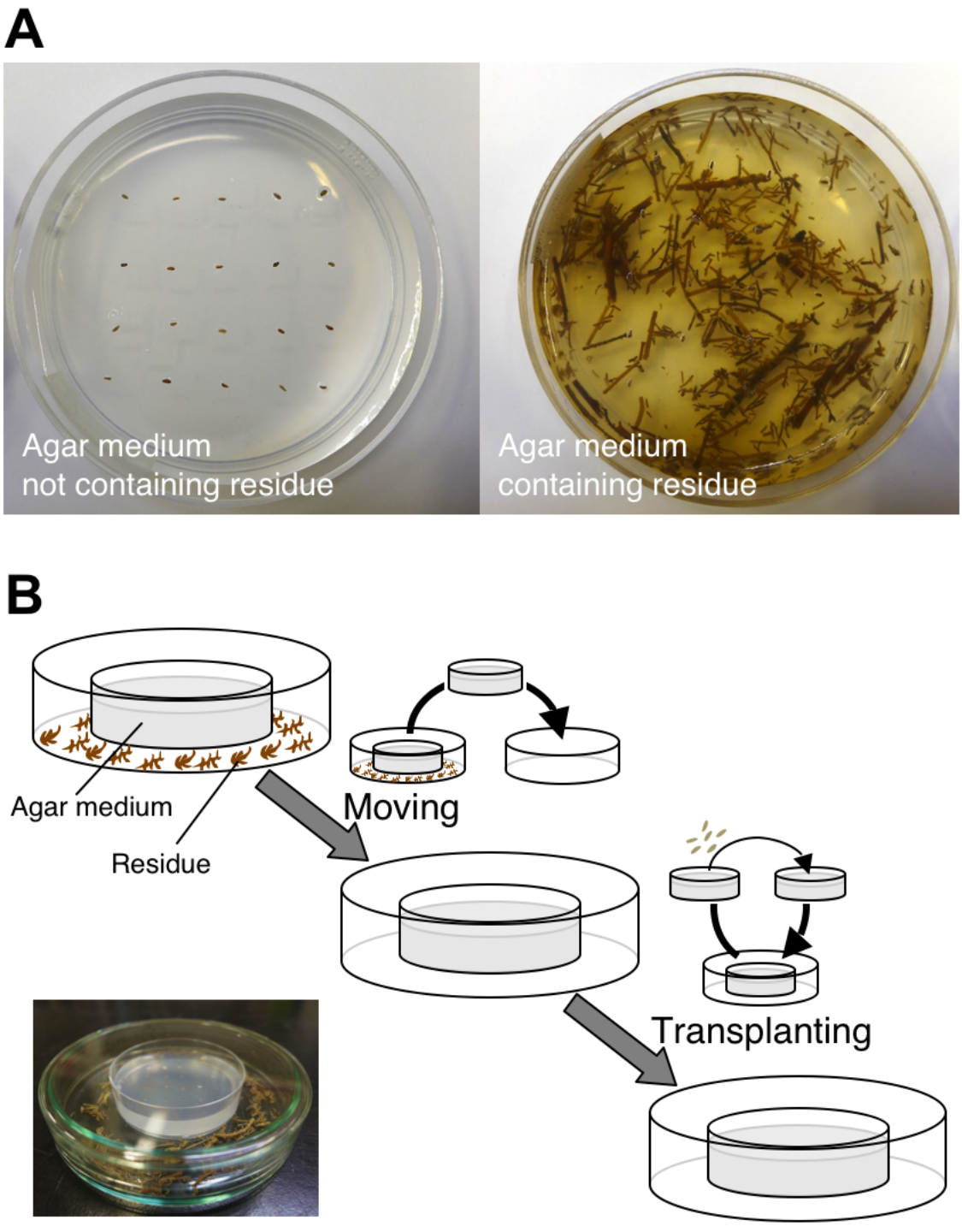

Figure S3. Relationship between vegetation cover and aboveground biomass of *A. adamsii* in grassland near Bayan-Unjuul in central Mongolia. The data plotted were measured for 50 × 50-cm quadrates in September 2006, June 2007, September 2007, June 2008, September 2008, September 2009 and September 2010.

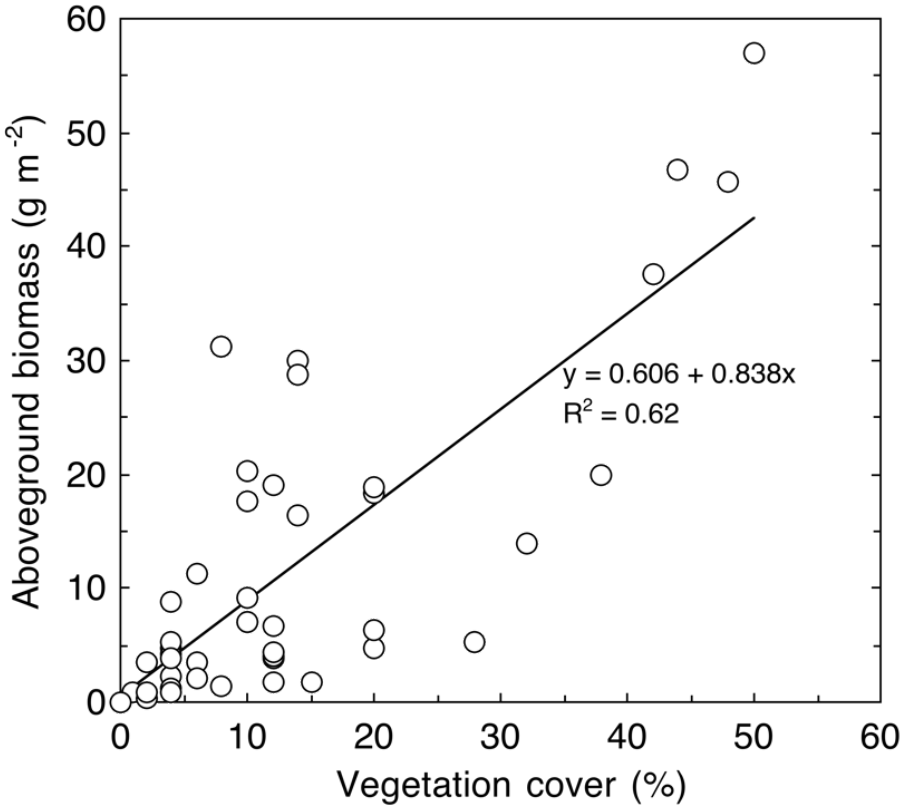

Figure S4. Germination time course of *A. adamsii*, lettuce and radish in agar medium not containing *A. adamsii* residue (Control) and medium containing residue (Residue). In *A. adamsii*, ungerminated seeds in medium containing residue were transplanted to new agar medium not containing residue and testing of germination was continued to confirm seed viability. Error bars represent ± SE (n = 5).

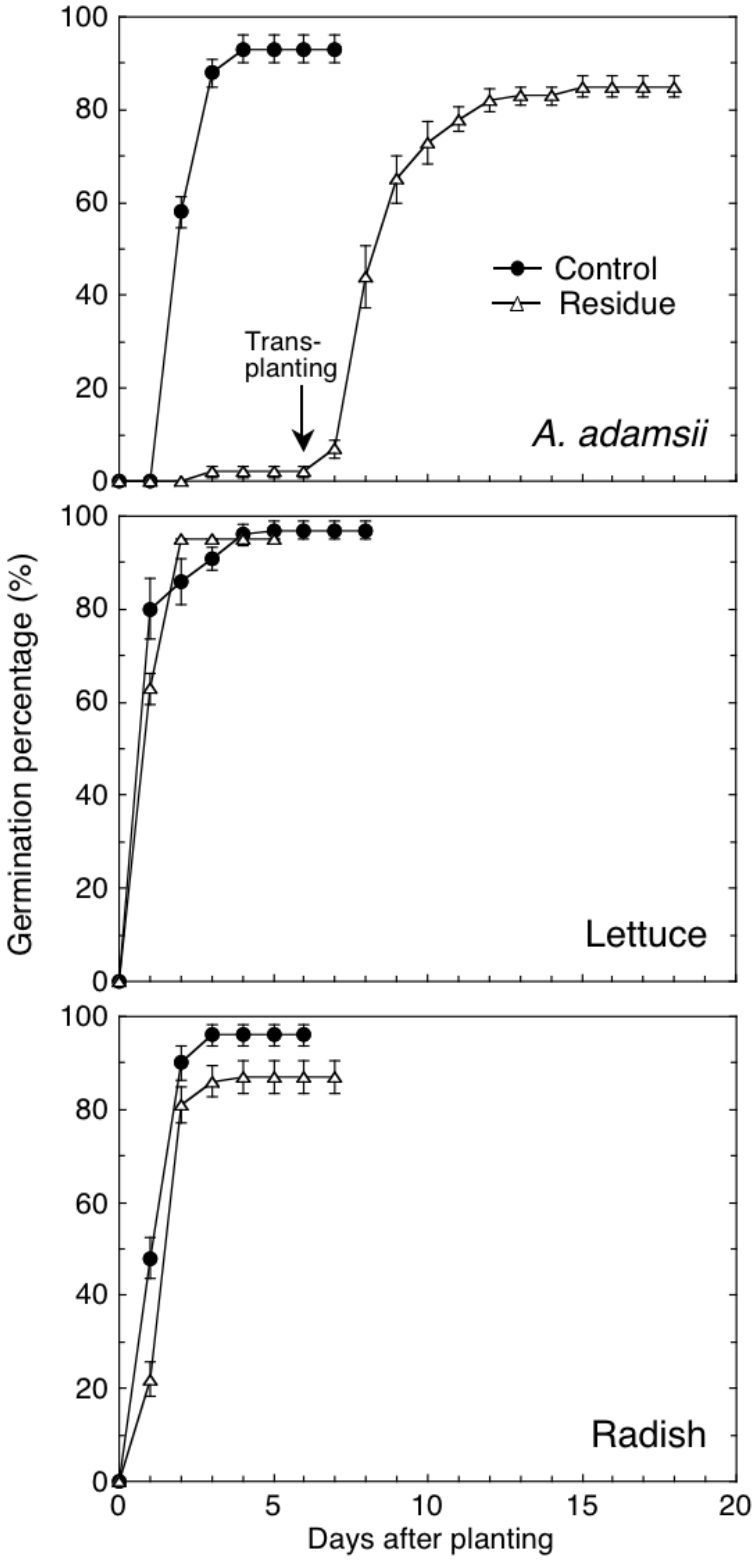

Figure S5. Germination time course of native species of the Mongolian steppe in agar medium not containing *A. adamsii* residue (Control) and in medium containing residue (Residue). Error bars represent ± SE (n = 5).

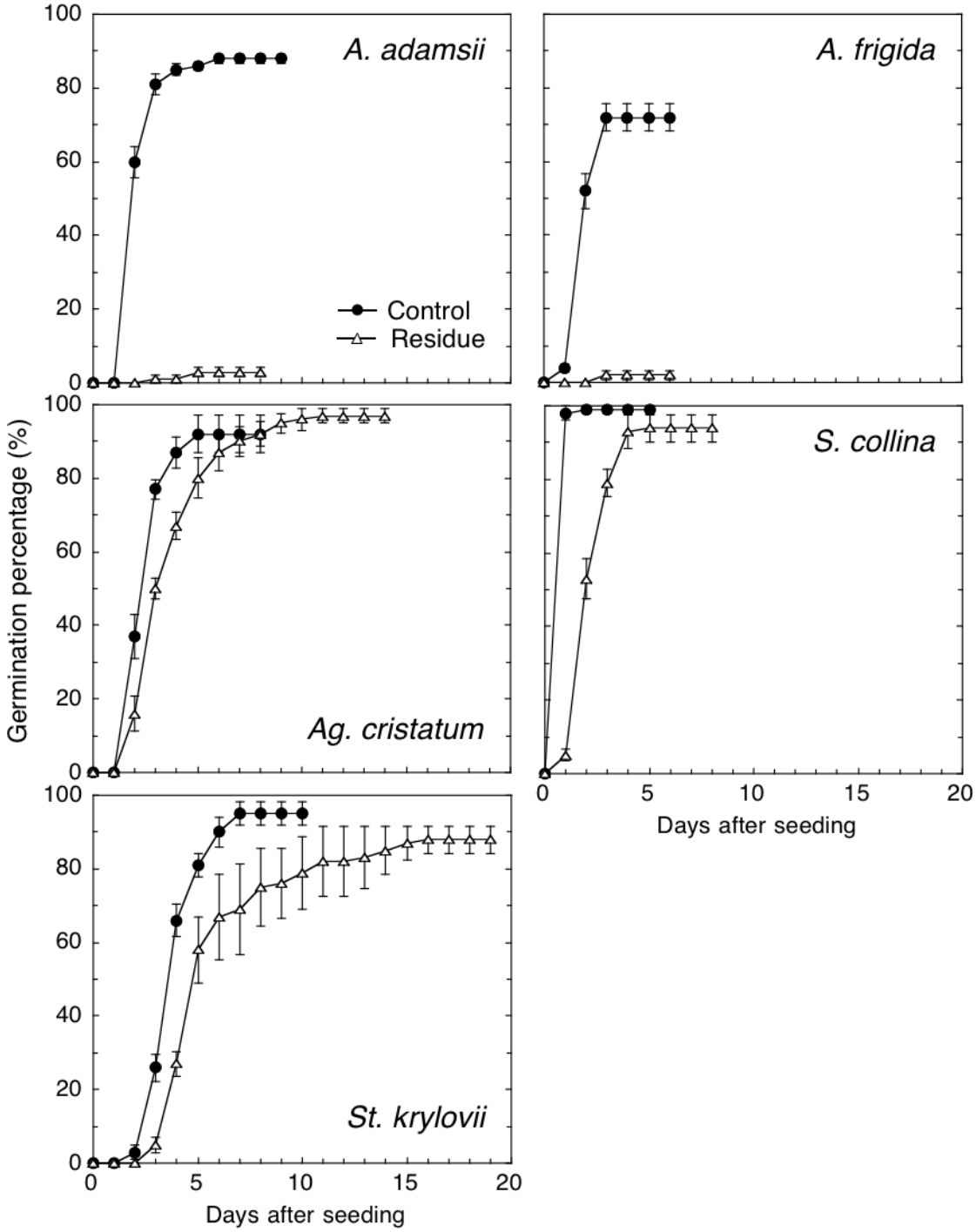

Figure S6. Germination of (A) *Agropyron cristatum* and (B) *Stipa krylovii* at different light conditions at 20 °C. Germination was tested for each light condition with 40 seeds in a 5-cm Petri dish. Germination tests were continued until new germination was not observed for three consecutive days or all tested seeds had germinated. No statistically significant difference in germination percentage was found among light conditions (Pearson's χ^2 test followed by sequential Bonferroni adjustment, $P = 0.05$).