1 billion years of abstinence: Chloroplasts can finally hope for sex

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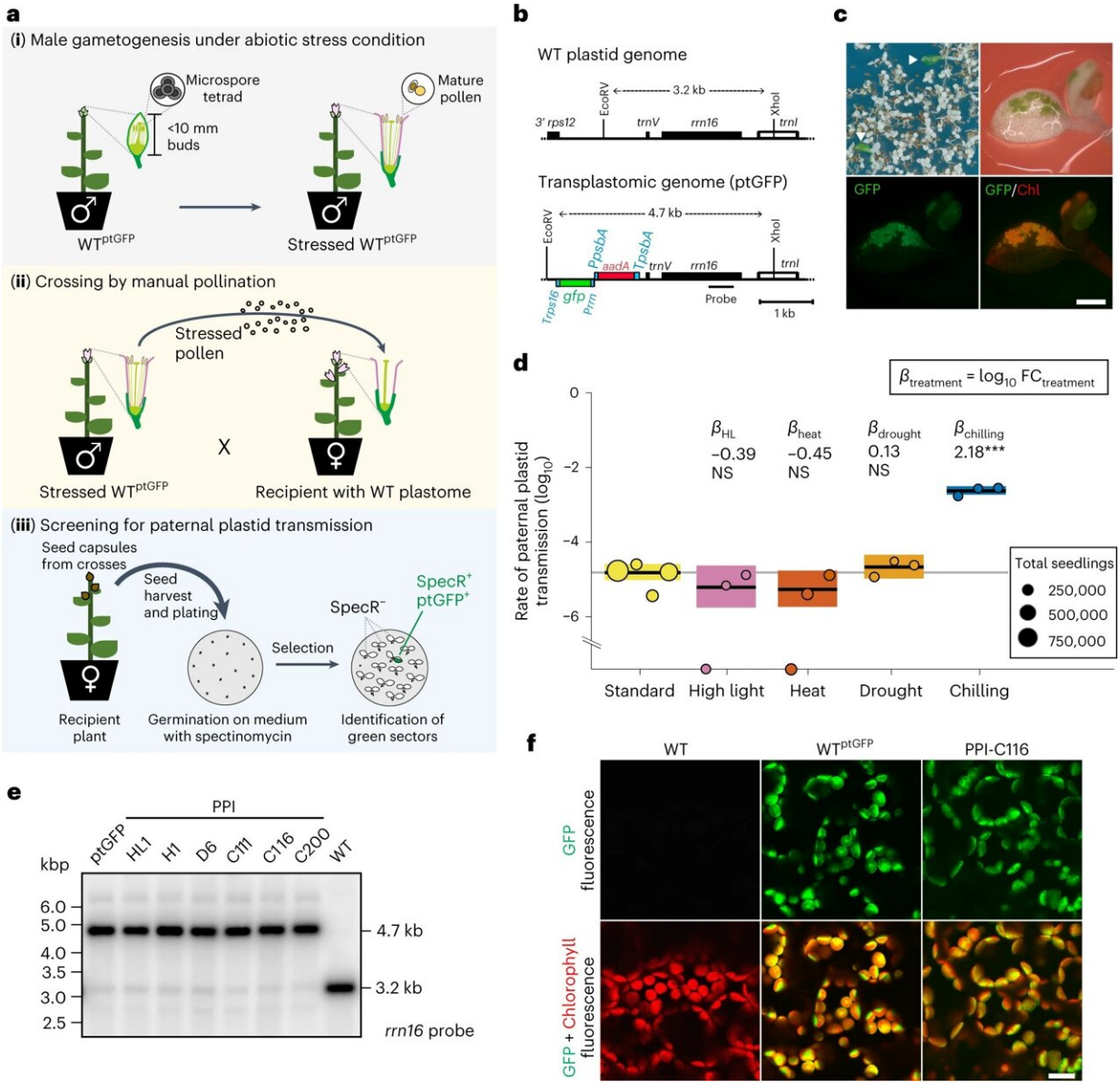

Identification of abiotic factors controlling plastid inheritance. **a**, Genetic screen for paternal plastid transmission. (**i**) At the onset of flowering, transplastomic plants (WT^{ptGFP}) are exposed to abiotic stress so that the male gametophyte develops under stress. (**ii**) Greenhouse-grown plants with wild-type plastids are fertilized with pollen from stressed WT^{ptGFP} plants. (**iii**) Seeds are sown on spectinomycin-containing medium. Seedlings that inherited paternal plastids display green (spectinomycin-resistant) sectors. **b**, Physical maps of the maternal (wild-type, WT) and paternal (transplastomic, ptGFP) plastid genomes. The paternal plastid genome harbors two transgenes: *aadA* (resistance marker) and *gfp* (reporter). Promoters, terminators (both blue) and relevant restriction sites are indicated. The black bar depicts a hybridization probe for RFLP. **c**, Paternal plastid transmission detected by spectinomycin selection. Top left: arrowheads indicate seedlings with green sectors. Top right: enlarged image of a green sector. Bottom: seedlings with green sectors displaying both GFP (left) and chlorophyll (Chl, right) fluorescence. Scale bar, 1 mm. **d**, Rates of paternal plastid transmission under stress. Circles represent proportions of seedlings carrying green, GFP-positive sectors per harvest (unit of replication, see Methods); circles in the *x* axis mean paternal transmission was not found. Transmission rates of stressed and untreated plants were compared, representing 'Experiment 1'. Treatment effects (β) were estimated using Model 1 ($n_{rep.total}$ = 16 harvests, ~4.35 million seedlings; Extended Data Tables 1 and 2) and tested by simultaneous two-tailed Wald *z*-tests. $\alpha = 0.05$; NS, $P > 0.05$, ***P

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