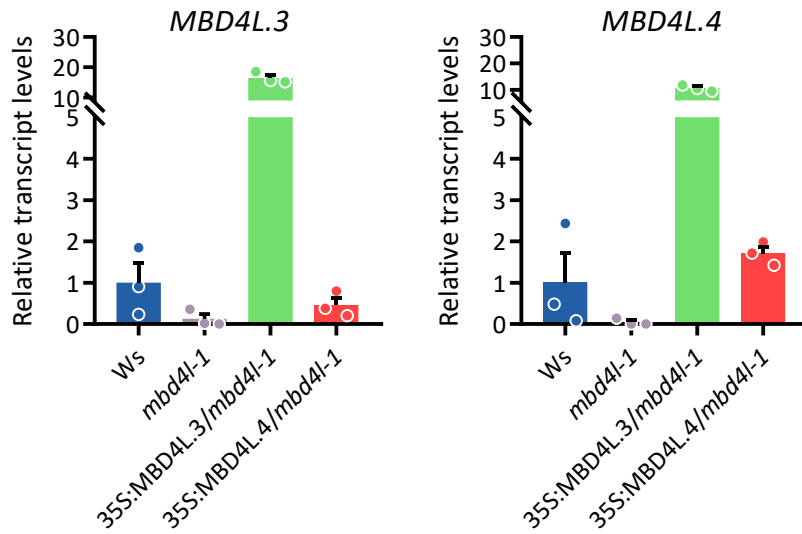
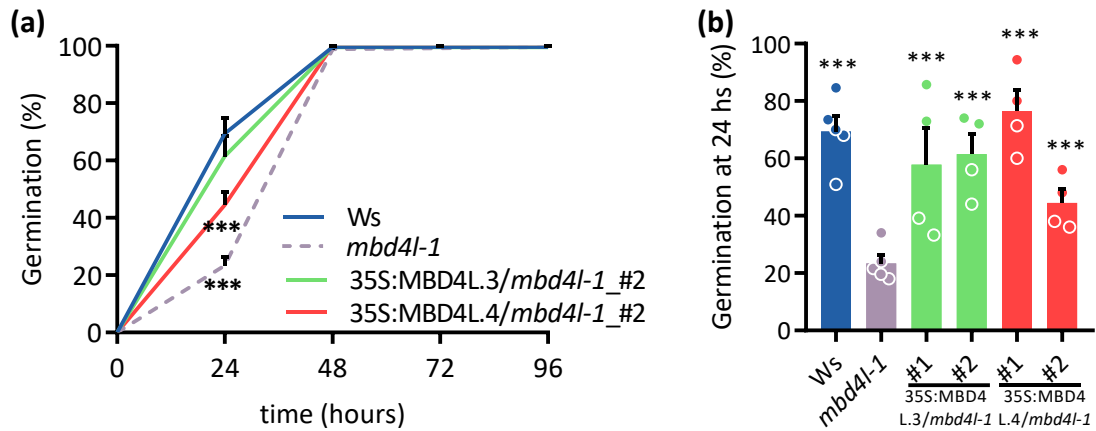


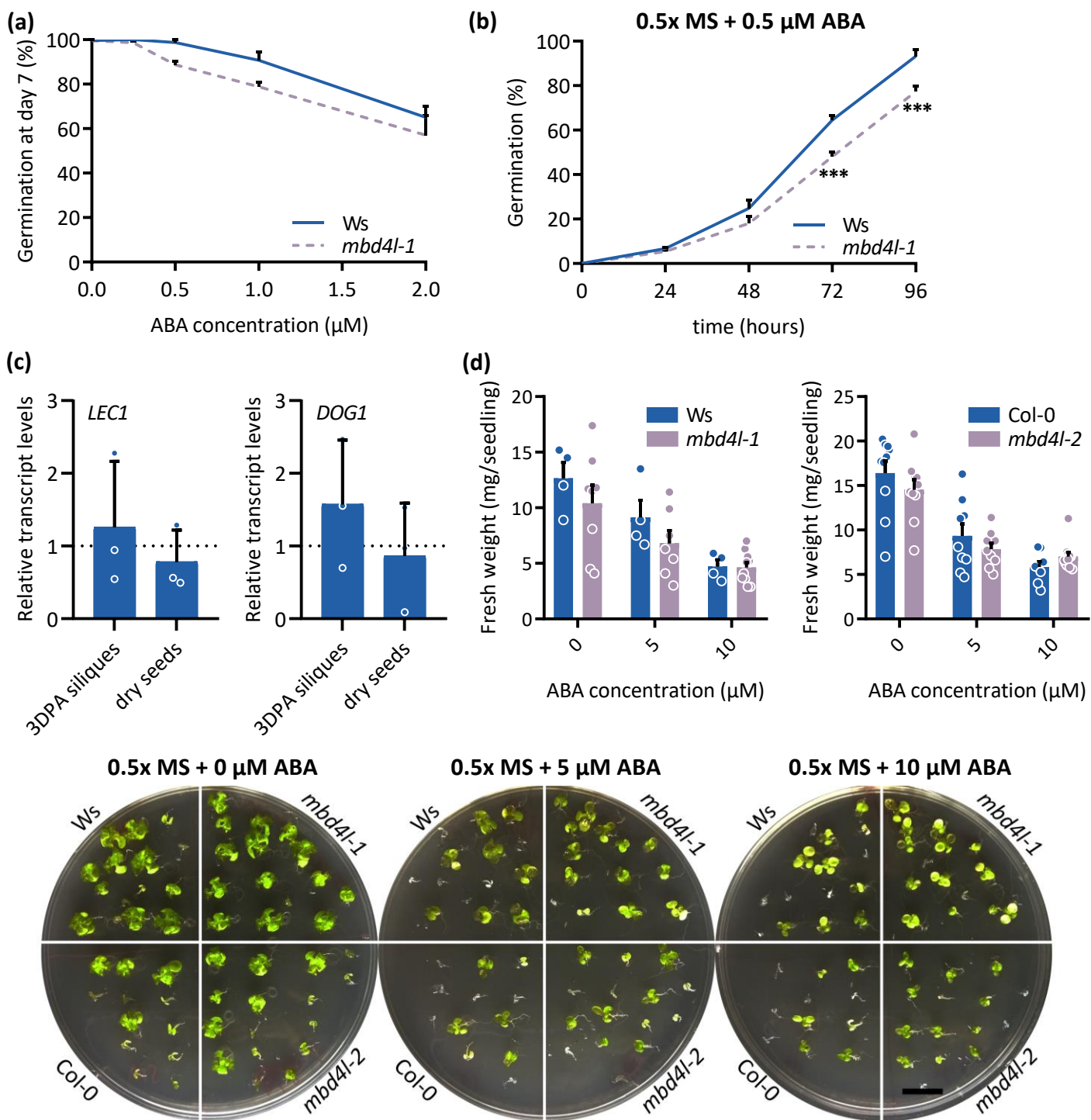
**Figure S1: DNA glycosylases transcript levels during seed development.** Gene expression levels informed based on public transcriptome data (Klepikova et al. 2015; [https://bar.utoronto.ca/eFP-Seq\\_Browser/](https://bar.utoronto.ca/eFP-Seq_Browser/)) using RPKM values. *PP2A-A3* was used as internal standard. Seeds and pods of siliques were separately taken when the first silique was green and 1-1.5 cm long (abscission of the 8th flower) or yellow and ready to open (senescent silique). Color dots not observed in the figure correspond to mean values below 0,0001232.



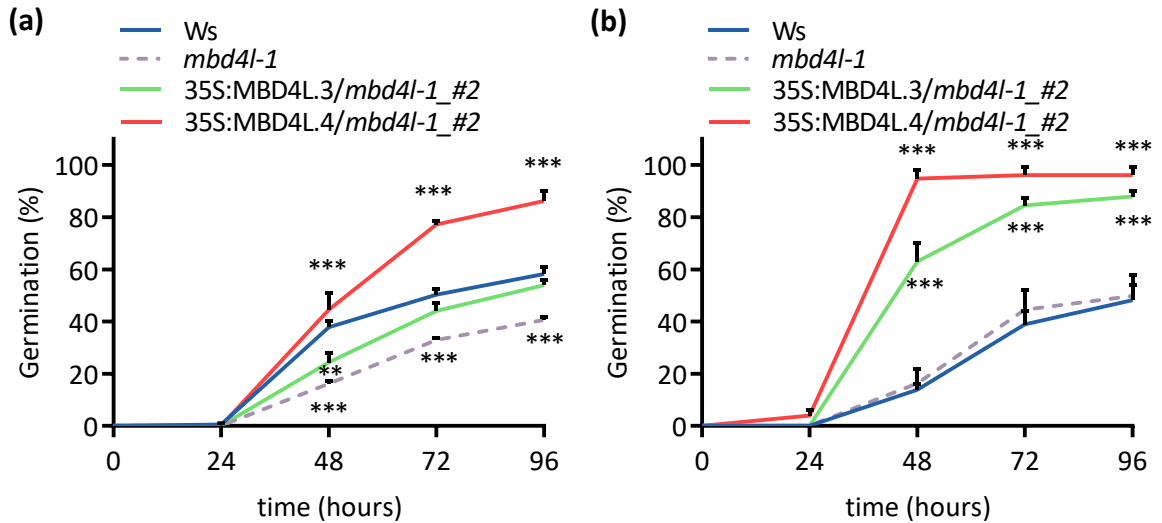
**Figure S2: Abundance of *MBD4L.3* and *MBD4L.4* transcripts in 35S:*MBD4L.3/mbd4l-1* and 35S:*MBD4L.4/mbd4l-1* lines.** Transcripts content was determined in dry seeds 1-month post-harvesting. Values were normalized using the geometric mean of two reference genes (*PP2A-A3* and *EF1 $\alpha$* ). The average  $\pm$  standard error of 3 replicates is shown. Circles represent individual replicates.



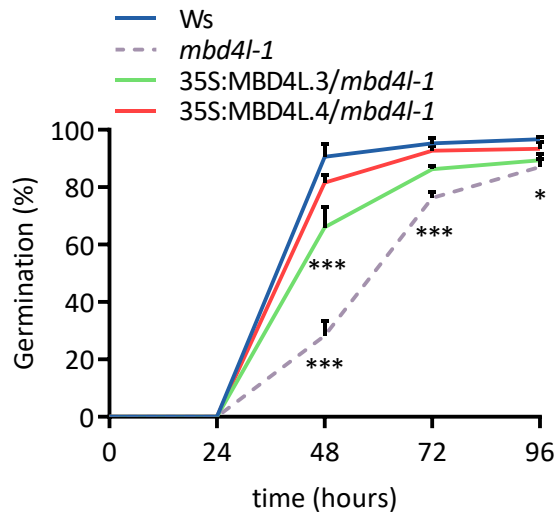
**Figure S3: Germination of independent 35S:MBD4L.3/*mbd4l-1* and 35S:MBD4L.4/*mbd4l-1* lines.** Germination was analyzed along 4 days (a) or after 24 hours of exposing seeds to the light and 22°C (b). Lines denoted as #1 in (b) are those represented in Figure 1. All analyzed transgenic lines are homozygous for the *mbd4l-1* T-DNA insertion and MBD4L.3/MBD4L.4 transgene. The average  $\pm$  standard error of 3-4 biological replicates is shown. Circles represent individual replicates. Asterisks indicate significant differences compared to the *mbd4l-1* mutant (\*\* $p < 0.001$ , ANOVA followed by Bonferroni's Test).



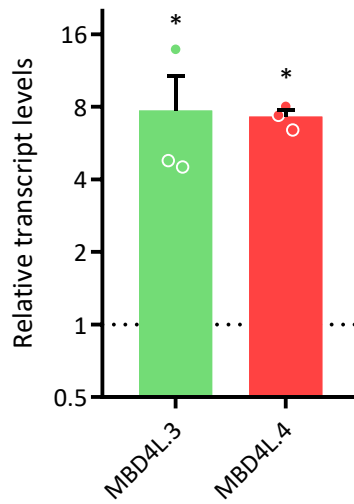
**Figure S4: Response of *mbd4l* mutants to exogenous ABA.** Germination in response to exogenous ABA (a-b). Seeds were germinated in 0.5x MS with the indicated ABA concentrations. Germination percent is shown after 7 (a) and 0-4 (b) days of exposure of seeds to the light and 22°C. Expression of *LEC1* and *DOG1* during early seed development (3DPA siliques) and in dry seeds of *mbd4l-1* (c). Expression values are relative to WT plants. Seedling development in response to exogenous ABA (d). Seedlings were grown in 0.5x MS 1% w/v agar plates for 4 days and then transferred to 0.5x MS 1% w/v agar plates with 0, 5 and 10  $\mu\text{M}$  ABA for 10 days. Fresh weight values (d) and representative images (bottom; scale bar = 1cm) of WT, *mbd4l-1* and *mbd4l-2* seedlings are shown. The average  $\pm$  standard error of 3 (b-c) or 4-11 (d) biological replicates is shown. Circles represent individual replicates. Asterisks indicate significant differences compared to the WT by ANOVA followed by Bonferroni's Test (a-b, d) or Kruskal Wallis followed by Dunn's Test (c), \*\*\* $p < 0.001$ .



**Figure S5: Germination of independent 35S:MBD4L.3/*mbd4l-1* and 35S:MBD4L.4/*mbd4l-1* lines after artificial ageing.** WT, *mbd4l-1*, 35S:MBD4L.3/*mbd4l-1*\_#2 and 35S:MBD4L.4/*mbd4l-1*\_#2 seeds were exposed to a saturated KCl solution at 37°C for 1 week (a) or 45°C for 4 days (b). Then, seeds were sown in 0.5x MS 1% w/v agar plates and stratified for 3 days at 4°C in the dark. The germination capacity was scored between 0 and 96 hours of transferring the plates to the growth room under light and at 22°C. The average  $\pm$  standard error of 3 biological replicates is shown. Asterisks indicate significant differences compared to the WT (\*\* $p < 0.002$ , \*\*\* $p < 0.001$ , ANOVA followed by Bonferroni's Test).



**Figure S6: Germination of 35S:MBD4L.3/*mbd4l-1* and 35S:MBD4L.4/*mbd4l-1* lines after 1 year storage under CC.** WT, *mbd4l-1*, 35S:MBD4L.3/*mbd4l-1* and 35S:MBD4L.4/*mbd4l-1* seeds were stored for 1 year at 22°C and 42% RH. Then, seeds were sown on 0.5x MS 1% w/v agar plates and stratified for 3 days at 4°C in the dark. The germination capacity was scored between 0 and 96 hours of transferring the plates to the growth room under light and at 22°C. The average  $\pm$  standard error of 3 biological replicates is shown. Asterisks indicate significant differences compared to the WT (\* $p < 0.033$ , \*\*\* $p < 0.001$ , ANOVA followed by Bonferroni's Test).



**Figure S7: Imbibition induces higher *MBD4L* expression in aged seeds.** Seeds were stored at 22°C (control) or incubated in a saturated KCl solution at 37°C for 1 week. Then, seeds were imbibed in water and stratified at 4°C for 24 hours in the dark. The *MBD4L.3* and *MBD4L.4* transcript content determined by RT-qPCR is relative to the control condition. The average  $\pm$  standard error of 3 replicates is shown. Circles represent individual replicates. Asterisks indicate significant differences compared to the WT (\* $p < 0.033$ , Kruskal Wallis followed by Dunn's test).