**Arabidopsis glabra2 mutant seeds deficient in mucilage**

**biosynthesis produce more oil**

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SUMMARY

Seed oil, one of the major seed storage compounds in plants, is of great economic importance for human consumption, as an industrial raw material and as a source of biofuels. Thus, improving the seed oil yield in crops is an important objective. The GLABRA2 (GL2) gene in Arabidopsis thaliana encodes a transcription factor that is required for the proper differentiation of several epidermal cell types. GL2 has also been shown to regulate seed oil levels, as a loss-of-function mutation in the GL2 gene results in plants with a higher seed oil content than wild-type. We have extended this observation by showing that loss-of-function mutations in several positive regulators of GL2 also result in a high seed oil phenotype. The GL2 gene is expressed in both the seed coat and embryo, but the embryo is the main site of seed oil accumulation. Surprisingly, our results indicate that it is loss of GL2 activity in the seed coat, not the embryo, that contributes to the high seed oil phenotype. One target of GL2 in the seed coat is the gene MUCILAGE MODIFIED 4 (MUM4), which encodes a rhamnose synthase that is required for seed mucilage biosynthesis. We found that mum4 mutant seeds, like

those of gl2 mutants, have an increased seed oil content in comparison with wild-type. Therefore, GL2 regulates seed oil production at least partly through its influence on MUM4 expression in the seed coat. We propose that gl2 mutant seeds produce more oil due to increased carbon allocation to the embryo in the absence of seed coat mucilage biosynthesis.