

Final Report on Zhang-NPB-Project

Summary

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2010

Project Title: Overexpression of the Arabidopsis *XERICO* gene to increase drought tolerance in peanut

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Goal of the Project:

Drought stress is the limiting factor for crop production in West Texas. In order to diversify crop production in West Texas, especially to make cotton production sustainable, it is advantageous to rotate cotton production with peanut production in West Texas. Firstly, peanut is a legume crop that can fix nitrogen in soil, which reduces the use of fertilizer in the soil; secondly, peanut is an oil crop that has tremendous potential in industry in addition to its traditional use as food. Therefore, peanut can potentially increase farmer's cash and improve the economy of Texas. However, to make peanut a major profitable crop in West Texas, one must increase drought tolerance in peanut, because growing peanut requires large amount of water input. In order to develop a peanut cultivar with significantly improved resistance to drought stress, we proposed to introduce an Arabidopsis gene, *XERICO*, into peanut to reduce water loss under drought stress conditions (early work by a research group at Michigan State University indicated that overexpression of *XERICO* in Arabidopsis would increase drought tolerance, which formed the basis of this project).

Summary of Project:

We first fused a water-deficit inducible promoter, the *RD29A* promoter, to a *XERICO* cDNA to form a *RD29A-XERICO* construct, and then we used this construct to transform wild-type peanut plants (Valencia). We obtained 17 putative transgenic peanut lines in 2009. We then analyzed these lines by conducting PCR experiments and we found that 12 of them are likely transgenic plants because they contain *XERICO* transgene. We have tested these 12 transgenic lines in the USDA-Experimental Farm in Lubbock, Texas. We planted 15 seeds for each line under limited irrigation condition (20 mm per week in addition to natural rainfall). The result from this field experiment indicate that there is no apparent difference between wild-type and transgenic peanut plants under reduced irrigation conditions. It appears that overexpression of *XERICO* in peanut does not confer drought tolerance as we expected.



A



B



2 7-a 12C

and *IPT*-expressing peanut
treatment. Val, wild-type
ncia; 11-2, 7-a and 12C, three
pressing peanut plants.