FROM THE LABORATORY TO THE FIELD: CREATING A TECHNOLOGY-BASED COMPANY

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Key words: phosphorus, phosphite, phosphite dehydrogenase

Introduction. The use of fertilizers and herbicides is fundamental to ensure food production. The case of phosphate (Pi)-fertilizers stands out because of the almost 45,000 million tons used each year globally only 30% is used by cultivated plants. The rest is lost causing environmental pollution and leads to higher food prices. Moreover, phosphorus (P) is a strategic nonrenewable resource whose high quality reserves are predicted to last only between 70 to 150 years from today. Weedy plants also present a major challenge to agriculture, particularly those that have become resistant to herbicides and that also compete with cultivated plants for P. Therefore, we urgently need new agricultural systems to decrease the consumption of P-fertilizer and reduce the negative impact of herbicide resistant weeds on food production.

Methods. As a part of my PhD project in Cinvestav, Irapuato, we genetically modified plants conferring them the capacity to metabolize phosphite (Phi) as alternative P source. Phi cannot be metabolized by weeds and is more soluble and less reactive with the soil than Pi.

Results. The plants we generated were capable of metabolizing Phi and of using it as the sole source of P, displaying similar growth as when fertilized with Pi. When fertilized with Phi under greenhouse in agricultural soils containing their native microflora, tobacco transgenic plants required 30 to 50% less P to achieve optimal productivity when fertilized with Phi as compared to Pi (Fig.1A). Moreover, when growth in competition with aggressive weeds, transgenic plants outgrew the weeds and produced more biomass than control plants (Fig.1B). Having this disruptive technology that in principle is applicable for any crop plant and allows the establishment of novel agricultural fertilization schemes we created StelaGenomics, a Mexican company

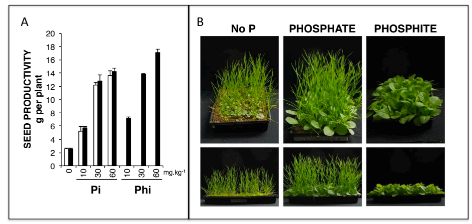

Fig. 1 (A) Seed productivity of tobacco transgenic plants when fertilized with Phi and Pi as P source. (B) Growth competition experiments with tobacco transgenic plants and a grass weed under different regimens of P.

initially supported by Mexican private capital. StelaGenomics is currently implementing this technology in two of the most important cereal crops, maize and soybean, and projects to have performed field trails to validate its efficacy under different location in 2014.

Conclusions. This genetic modification improves the competitiveness of transgenic plants, which allows a more effective use of P resources when Phi is used as a fertilizer. More important, this technology would permit to decrease the consumption of P-fertilizers, further reducing the negative environmental impact of agriculture and significantly reducing production costs.

Acknowledgements. Initial work was supported in part by grant from the Howard Hughes Medical Institute to L.H.-E and for a PhD fellowship from CONACyT to D.L.L.-A. Currently the work is supported by private capital and grants from CONACyT-SE (FINNOVA).

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