

UW College of Agriculture and Natural Resources
Global Perspectives Grant Program

Project Report Instructions

1. COVER PAGE

Award Period (e.g. Spring 2012): Spring 2013

Principle Investigator(s) Sadanand Dhekney Department: Plant Sciences
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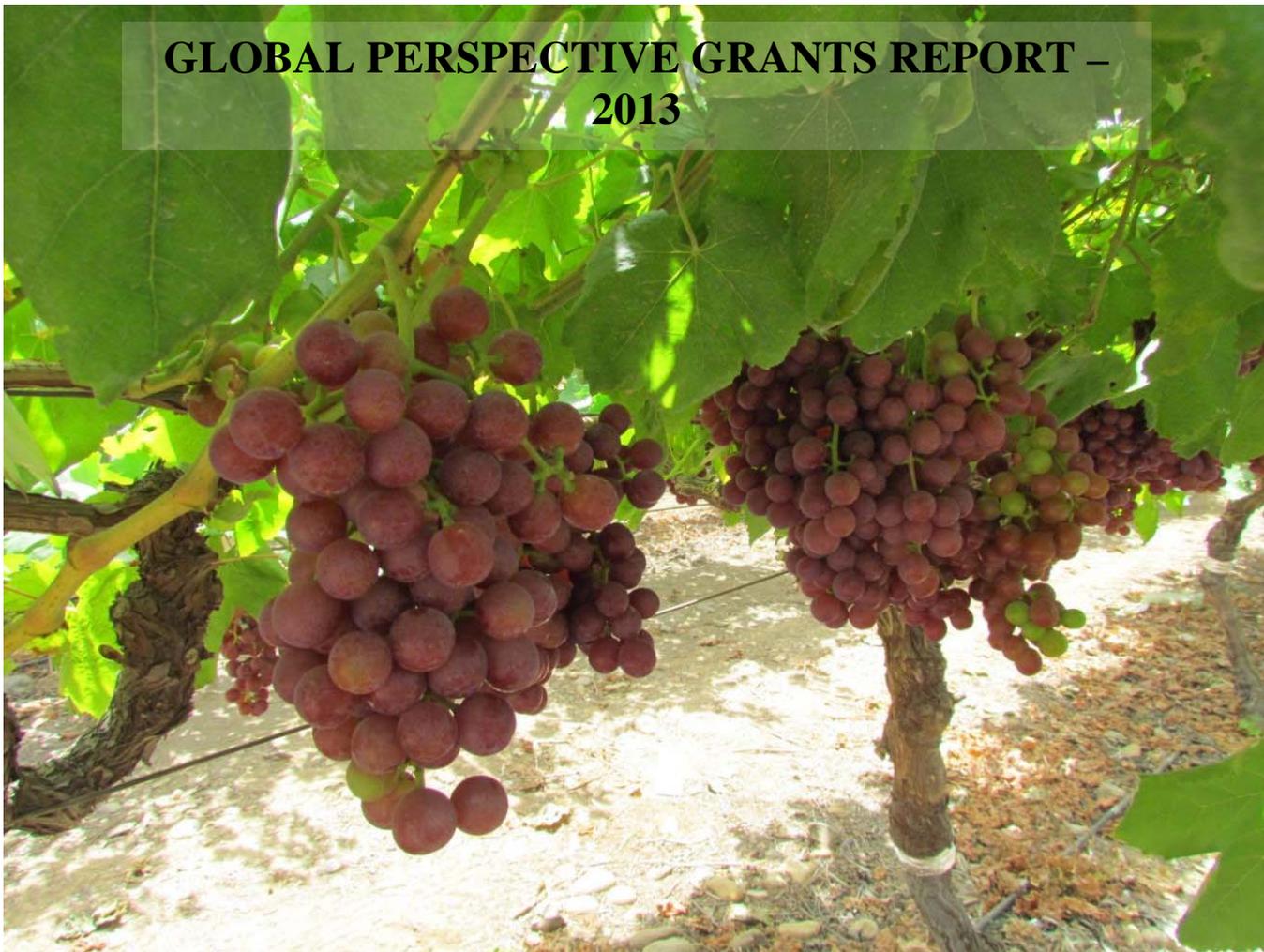
Project Title from Application: United States – Egypt Collaborative Research for Improving Abiotic Stress Tolerance of Grapevines Using Safe and Eco-friendly Technologies

Amount spent: \$ 2882.79

Non-technical summary

The proposed global perspectives project aims at strengthening this established partnership with Ain Shams University further, to increase international collaboration with the University of Wyoming in research and teaching. Dhekney will travel to Egypt during the grape production season to meet with faculty, students and grape growers in the region. Dhekney and El-Kereamy have extensive experience in the areas of grapevine physiology and biotechnology. They will utilize their diverse expertise to seek external funding and obtain sustainable solutions for improving grapevine production. Dhekney will also attempt to increase global perspectives in teaching and research by introducing existing opportunities for Egyptian students and researchers at the University of Wyoming.

GLOBAL PERSPECTIVE GRANTS REPORT – 2013



University of Wyoming PI: Sadanand Dhekney, Assistant Professor of Horticulture, Department of Plant Sciences, Sheridan Research and Extension Center, 663 Wyrno Road, Sheridan WY 82801

Egyptian PI: Ashraf El-Kereamy, Ain Shams University, Cairo Egypt.

Travel Dates: May 17 – May 25, 2013

Introduction. The proposed global perspectives project aims at strengthening a partnership between the University of Wyoming and Ain Shams University to increase international collaboration with in research and teaching. PI Sadanand Dhekney travelled to Egypt during the grape production season to meet with faculty, students and grape growers in the region. He also conducted activities to increase global perspectives in teaching and research by introducing existing opportunities for Egyptian students and researchers at the University of Wyoming. Egyptian agriculture is concentrated in a small area of land surrounding the Nile river. Crops are cultivated in sand with irrigation provided by drip irrigation systems (Figure 1). Mango, *Citrus*, grape and date are major fruit crops grown in the Nile delta in addition to low apple, peach and pear cultivars. Major problems include drought, saline soils/water and nematode infestations. Horticultural research is mainly focused on development of improved fruit cultivars for abiotic stress tolerance including, drought, heat and salinity, early ripening and uniform color development.

Travel Itinerary

The PI visited College of Agriculture, Ain Shams University on May 20, and met with faculty to discuss potential research collaborative projects. Possible discussions included writing grants for development of micropropagation protocols for date palm, grape and mango. Currently date seedlings are imported from Europe for \$ 15 per mature palm, which increases initial investment. Development of in vitro culture and regeneration protocols will ensure adequate planting material of elite date varieties. Improving grape and mango production under saline soil and water conditions were other potential collaborative research projects that were discussed. The PI later gave a seminar to college students, faculty and staff on biotechnological approaches for improving grapevine tolerance to drought and salinity stress.

The PI visited the National Research Center (equivalent of the National Science Foundation-NSF) on May 21 and met with researchers from the department of Plant Biotechnology. Current research projects include banana, date and *Stevia* micropropagation, and improving grapevine resistance to powdery mildew using biotechnology. The PI delivered a seminar and discussed potential collaborative research projects.

The PI visited Cairo University on May 22 and gave a talk on improving grapevine drought and salinity tolerance using cisgenic engineering approaches. He also visited the nanotechnology center and discussed possible techniques for DNA delivery into plant cells using nanoparticles.

The PI travelled on May 23 to visit El-Lebedy nursery and vineyards. The company is involved in the commercial propagation of fruit and ornamental plants, and production of seedless table grapes that are exported to Europe. Two varieties, Superior Seedless (green) and Flame Seedless (red) are grown by the company. The grapes are grown in sandy soil on a vertical shoot positioning trellis system and spur pruning technique. Vines are pruned after entering dormancy for fruit production targeted towards the early European market. Vines are grown in high tunnels for promoting early growth, vigor and fruit production (Figure 3). Major limitations to grapevine production include low availability of water during the growing season, nematode infestation and poor color development in 'Flame Seedless'. Growth regulators including Ethephon and ABA are used to promote uniform color development but have been facing increase restrictions from the European union.

Future prospectives. The UW PI and Egyptian PI have initiated collaborative research for increasing grapevine tolerance to drought and heat stress using cisgenic engineering. The

Egyptian PI is involved in microarray analysis of drought and heat-stressed grapevines. Data obtained from these studies will be used by the US PI to introduce potential drought and heat tolerant genes in table and wine grape cultivars using genetic engineering technology that is currently being optimized at the Sheridan Research and Extension Center. The Egyptian PI will send a graduate student in January 2014 to be trained in grape biotechnology. The grant has provided the impetus to strengthen the collaboration and work towards achieving goals that are of common interest to the Wyoming and Egyptian grape and wine industry.

Figure 1. Horticultural crop production in Egypt. Crops are grown in sandy soils with drip irrigation. B. Date intercropping in a mango orchard.



Figure 2. Table grape production in Egypt. A vineyard (A) growing 'Superior Seedless' (B) and 'Flame Seedless' (C) cultivars of grape



A. A table grape vineyard



B. Superior Seedless



C. Flame Seedless

Figure 3. High tunnel production of table grape cultivars in Egypt to promote early maturity and ripening.



Figure 4. Nursery production of fruit-tree plants in El-Lebedy nursery, Egypt

