Possibilities for Result Demonstrations in Plant Pathology & Horticulture

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A successful result demonstration often involves your personal interest, an important problem or situation in your county, and input from one or more persons in Extension. Do some reading and interview people to become more knowledgeable about your project. Write concise statements on the A) problem [justification], B) objective, and C) strategy. Keep careful notes in a file or notebook.

Here are some projects for your consideration:

1. Tomato variety trial. This would be informative for clientele south of the Hill Country where whitefly populations are very high in the fall as cotton matures and is defoliated. Whiteflies weaken tomato plants due to feeding, and these insects vector *Tomato yellow leaf curl virus* (TYLCV) and other viruses. Request transplants of selected varieties 8 to 10 weeks before planting for spring (early April 2011) and/or fall (late July 2011) trials. Example: 4 varieties x 3 replications x 3 plants/plot; 9 plants of each variety; 36 plants total. Data: estimate marketable yield and maturity dates in both spring and fall plantings; evaluate each plant for symptoms of TYLCV or other viruses.

Table 1. Total marketable yield of four tomato varieties in Ensor County in 2011.

Variety	Spring (lbs/plant)	Fall (lbs/plant)	Maturity	TYLCV, percent plants with symptoms on 1November2011
A	10	2	Early	80
B	5	1	Mid	90
C	7	0	Late	100
Marvin	11	6	Mid	5
Least Significant Difference P=0.05	4	5		35

Results: Tomato yield in Ensor County was greater in spring 2011 than in fall 2011. Spring yields of varieties A and Marvin were greater than yields of varieties B and C. Variety Marvin had the best yield in the fall. Whiteflies vector TYLCV. No virus symptoms were observed in spring. Plants of variety Marvin had significantly less percent plants with symptoms than varieties A, B, and C in the fall. All remaining fruit were harvested green before an early frost on 5November2011 for ripening indoors.

Conclusion: Spring tomatoes performed better than fall tomatoes in 2011 due to high whitefly insect populations after the fall planting and an early frost. A and Marvin performed well in the spring, but Marvin was clearly the best in the fall. Other management practices that reduce risk for whitefly vectored viruses in fall plantings include……

2. Container-grown citrus transplanted for variety trials. Data: response/survival after freezes; yield/quality[sugar/sweetness]/maturity dates?

3. Pomegranate variety trial. Data: response/survival after freezes; yield/quality[sugar/sweetness]/maturity dates? In wet years, the pomegranate shrubs on the north side of District 10 (Uvalde) office building partially defoliate due to Cercospora leaf spot, caused by a fungus. Create favorable disease conditions at 1 or 2 locations by planting varieties in [morning] shade with sprinkler irrigation in order to evaluate Cercospora resistance.

4. Spinach seed or transplants for home gardeners; more than 1 variety. Data: yield/quality and bolting [flowering] dates over multiple planting dates (e.g. 1Oct, 1Nov, 1Dec, 1Jan, 1Feb)

5. Pinyon pine (*Pinus remota*), possible candidate for Texas SuperStar release. Large shrub/small tree, evergreen, native in southwest Texas at higher elevations. Solve the propagation bottleneck for commercial production of this species for landscapes in southwest Texas. Approach A: improve seed production with timely irrigation, rodent/bird predation, and timely harvest. Approach B: Develop techniques to root cuttings from superior specimens. Search scientific literature on rooting pine cuttings from botanical expeditions and forestry work. In some woody species, the percentage of the population that can be rooted is low. Therefore, attempt to root cuttings from several hundred trees in hopes of identifying genotypes that can be rooted. Pine cuttings from top of canopy may produce plants with a different growth habit than plants from horizontal branch cuttings. May be resistant to cotton root rot.
http://treephys.oxfordjournals.org/content/15/1/41.full.pdf
http://www.sauerlaender-verlag.com/fileadmin/content/dokument/archiv/silvaegenetica/13_1964/13-5-133.pdf

6. Texas snowbell (*Styrax texana*), possible candidate for Texas SuperStar release. Shrub, deciduous. Rare and endangered; browsed by deer and livestock; colonies in Uvalde, Edwards, etc. Counties; Jim Biediger (ValTex, Uvalde) and others have propagated from seeds. Impressive with dark green leaves and white flowers with yellow stamens in spring. Compare production from seeds vs. vegetative cuttings. May be resistant to cotton root rot.
http://www.centerforplantconservation.org/collection/cpc_viewprofile.asp?CPCNum=4162

7. Corn fungus (common smut) for specialty food product. *Ustilago maydis* occurs frequently in field and sweet corn in southwest Texas. Immature galls produced by this fungus are edible and have high value in certain markets that cater to Mexican cuisine. Some varieties are more susceptible, and low pollen numbers often increases infection. De-tasseling or male-sterile hybrids can increase production or corn fungus.
http://www.apsnet.org/edcenter/intropp/lessons/fungi/Basidiomycetes/Pages/CornSmut.aspx
http://www.hort.purdue.edu/newcrop/ncnu07/pdfs/tracy233-236.pdf

8. Pecan nut quality. Stress can cause immature fruit drop and low kernel quality. The popular Wichita and Western varieties are prone to low quality under certain management. Grove thinning (remove certain trees), aggressive pruning, fruit thinning (with mechanical shaker), and

attention to irrigation and fertilizer inputs can improve nut quality in existing orchards. New orchards can be planted with varieties with better potential for excellent quality.

9. Oak wilt aftermath. A fungus, *Ceratocystis fagacearum*, causes oak wilt in live oak and red oak in southwest Texas. Most efforts have emphasized diagnosis, prevention, treatment, and eradication. Many landowners get discouraged after the epidemic and do not plant trees. Replanting should emphasize diverse tree species adapted to each site, and resistant oak species.

10. Bacterial leaf scorch aftermath. A bacterium, *Xylella fastidiosa*, causes symptoms ranging from yellow leaves to leaf scorch to dieback in several woody species. Xylem-feeding insects vector the bacteria. Native plants have undergone natural selection after repeated challenges by this bacterium for hundreds or thousands of years. However, some populations of red oak, redbud, sycamore, western soapberry, cedar elm, and red mulberry can still have problems, especially when stressed (thin soil, water deficit). Exotic/introduced plants such as oleander (*Nerium oleander* from southwest Asia?) and winegrape (*Vitis vinifera* from Europe) are uniformly susceptible and epidemics in District 10 often kill 100% of plants. Approach A: Identifying resistant native plant selections/varieties, replanting strategies and improving existing landscapes are possible demonstrations. Because the bacterium is killed by extended freezing weather, northern populations of a native tree species can survive without resistance are apparently more susceptible than more southern populations. Perhaps a nursery in your county would be interested in evaluating plants grown from seeds of 1 or 2 species (red oak, red bud, cedar elm?) collected along a south-to-north gradient (northeast Mexico/Texas gulf coast to Oklahoma or Kansas). For example, Mexican sycamore has become available in local nurseries in the last 10 years or so, and it growers in urban landscapes much better than the local sycamore populations. Approach B: Mass plantings (e.g., on highway medians and near large buildings) and privacy/screen hedges often use a single woody species. Diverse hedges (random or systematic placement of multiple species) may decrease epidemics of *X. fastidiosa* compared to mass plantings of the exotic oleander as well as monoculture of native species listed above, because insect vector efficiency should decrease if feeding must occur on resistant plants.

11. Cotton root rot aftermath. A fungus, *Phymatotrichopsis omnivora*, is endemic in about two-thirds of Texas, and about 99% of District 10. The disease can occur on annual or perennial crops, including woody species. Replanting landscapes after losses should emphasize resistant species, diversification, and management to reduce risk (avoid saturating the soil during irrigation, drainage, mulching).

12. Take-all root rot of turf (AKA take-all patch). A fungus, *Gaeumannomyces graminis* var. *graminis* is endemic in District 10 and much of Texas, including sod farms. Because we cannot eradicate the pathogen, control strategies are to keep turf growing at moderate rates and avoid shocking sod with extremes of soil moisture & temperature, fertilizer, mowing heights, soil compaction, drainage, and minor element deficiencies. Stress is often a risk factor, and stress is often associated with a scale insect species on all turf. Fungicides are labeled but have only short term benefits, increase expenses, and may contaminate the environment. In recent years, mulching turf in the spring and providing minor elements has performed well. If TARR is common in your county, you could help them plan changes in management and evaluate turf condition over time.

Major pathogen groups are viruses, bacteria, water molds (Oomycetes), fungi (singular: fungus), parasitic plants, and nematodes. Local plants also have problems associated with an epiphytic plant (ball moss), ozone pollution, and minor element deficiencies.

Disease management strategies include: host plant resistance (including resistant rootstocks), diversification, crop rotation, weed control, planting date, site selection, site preparation, pesticides, stress mitigation, and covercrops.