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Title: Optimizing seed production and stand establishment of two minimum-input turfgrass species

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Objectives:

1. Determine optimum seed production management for sprucetop grama and curly mesquite native desert grasses.
2. Determine low-maintenance native grass establishment methods for out-of-play areas on golf courses.

Start Date: 2017**Project Duration:** Two years**Total Funding:** \$26,190

This research builds on prior USGA-supported projects that demonstrated potential turfgrass utility for two grass species native to southern Arizona: sprucetop grama (*Bouteloua chondrosioides*) and curly mesquite (*Hilaria belangeri*). This research also resulted in selected germplasm of these species that tolerates regular mowing in spaced-plant nurseries. The current research would provide answers to key remaining questions related to the use of these germplasms in commercial turfgrass plantings at elevations below about 1000 m (3281 ft) in the Southwest. This will involve results from seed production experiments begun in 2014 at two locations in Tucson (elevations: 699 and 717 m), and focus on basic agronomy, harvest, conditioning and yield. It will also involve greenhouse experiments on seed germination, seeding rate, and sod establishment. This will lead to field demonstrations of stand establishment under commercial turfgrass management conditions.

Because of their reduced water requirements, use of the species studied could benefit golf courses that maintain playable (mowed) primary roughs, secondary rough areas (mowed or not), and large-acreage facilities that maintain turf as a mowed cover. No research with these species has addressed seed production or stand establishment under turf management conditions.

This research will address remaining questions related to the commercial utility of sprucetop grama and curly mesquite as minimum-input turfgrass species in commercial plantings in the Southwest. Based on our findings, selected genotypes derived from previous USGA-supported research could be released as cultivars. Results of this work would be delivered via scientific presentations and refereed journal articles as well as in popular, industry, and trade outlets.

I. Context and relevance of this research

This research builds on prior USGA-supported projects that demonstrated potential turfgrass utility for two grass species native to southern Arizona: sprucetop grama (*Bouteloua chondrosioides*, BOCH), and curly mesquite (*Hilaria belangeri*, HIBE). This research also resulted in [selected germplasm](#) (clones) of these species that tolerates regular mowing in spaced-plant nurseries. The current research project would address key remaining questions related to the use of these germplasms in commercial turfgrass plantings at elevations below about 1000 m (3281 ft) in the Southwest. This will involve results from seed production experiments begun in 2014 at two locations in Tucson (elevations: 699 and 717 m), and focus on basic agronomy, harvest, conditioning, and seed yield. It will also involve greenhouse experiments on seed germination, seeding rate, and sod establishment. This will lead to field demonstrations of stand establishment under commercial turfgrass management conditions.

II. Research Objectives

a. Seed production

1. Review and formally describe procedures used in plots at Tucson Plant Materials Center (BOCH) and Campus Agriculture Center (HIBE) since 2014 to:
 - i. Establish and maintain seed production stands.
 - ii. Harvest, condition, and store seed.
2. Establish germination test protocol and use this to evaluate viability and post-harvest dormancy in seed lots produced in 2014-2017.
3. Produce estimated yields of pure live seeds.

b. Stand establishment and management

4. Optimize broadcast seeding rate under greenhouse conditions by assessing plant and stand development with periodic clipping.
5. Establish plot-scale demonstration plantings in the field and manage to promote sod development.

III. Methodology and timetable

a. Seed production (2017-2018)

Working with Heather Dial (TPMC) we will use records of seed production in 2014-2017 to describe formal agronomic protocols for seed production for both

species (Objective 1). We will similarly develop protocols for seed harvest, conditioning, and storage, and germination testing (Objective 2). Using the latter protocol over the period 2017-2019 will permit assessment of post-harvest seed dormancy and changes in viability in storage (Objective 3). Using data on recovery of post-conditioning pure live seeds from the seed production plots will permit estimation of seed yields (Objective 3).

b. Stand establishment and management

1. Greenhouse experiments (2017-2018)

We will determine optimal broadcast seeding rate (Objective 4) in greenhouse experiments in a standard artificial growing medium (Sunshine mix 4:sand in 3:1 volume ratio). Seed used will be conditioned field-grown bulks of ‘Santa Rita’ BOCR and ‘Taber’ HIBE. Experiments will be conducted in 1020 trays (11” x 21.4” x 2.44” = 235 in²) with 1-cm headspace and 5 mm of seed coverage. Initial experiments will involve seeding rates of 1, 2, and 4 PLS/in² for each species. Greenhouse temperatures and day length will be based on those common in early-August in Tucson (high: 36.7°C, low: 23°C, day length: 13.5 hrs.). As seedlings develop leaves/tillers in excess of 15 cm in length, plants will be clipped by hand to approximately 7.5 cm (3”). Data will be recorded weekly on emergence, tiller development, cover, and turf quality. Each species will be included in separate simultaneous experiments, with each organized as randomized complete block design with seeding rate as the independent variable.

2. Field demonstration plantings (2018-2019)

Based on findings from greenhouse experiments, we will establish demonstration field plantings with multiple plots (>2 m² = 21.5 ft²) of both species. This will occur in summer 2018 at the Karsten Turfgrass Research Facility at the University of Arizona in Tucson. Plots will be established with both native species (populations: Santa Rita and Taber) and standard bermudagrass entries as controls in a single experiment using a randomized complete block design with three replications. Irrigation and mowing will be conducted so as to optimize performance of the native grasses. Plots will not be over-seeded to permit evaluation of cool-season performance of the native species. Turf quality and persistence will be evaluated regularly through summer 2019.



Figure 1. Sprucetop grama planted in August 2012 at the University of Arizona, Tucson, AZ. Individual plants were mowed at three inches and flood irrigated once every six weeks. Researchers are now determining the optimum seed production and establishment methods of experimental cultivars.