Machaeranthera gracilis - New Crop Summary & Recommendations

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Series: New Floricultural Crops: Formulation of Production Schedules for Wild, Non-domesticated Species

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FLORATECH
New Crop Report—Andy Montain

Taxonomy
Scientific Name: *Machaeranthera gracilis* (Nutt.) Shinners
Translated:
Machaeranthera means sword-like anthers; where as *gracilis* means slender or graceful.
Synonyms:
Dieteria gracilis
Haplopappus gracilis
Haplopappus ravenii
Sideranthus gracilis
Most recently renamed *Xanthisma gracile*
Common Names: Yellow Aster, Slender Goldenweed.
Family: Asteraceae

Geographic Distribution
Continent: North America
Countries: United States and Mexico native
States: CA, NV, UT, AZ, CO, NM, TX, ME, NY[13]
General Climactic Conditions[5]: Plant is not documented sufficiently to determine USDA hardiness zones, but it is present in scrublands, woodlands, and primarily deserts.
Altitude: Sandy or rocky places to 5000'[5]
No reports of naturalizing.

Native Habitats:
⬧creosote bush scrub[5],
⬧joshua tree woodland[5],
⬧east Mojave Desert[5]

Plant Community:
Creosote bush scrub is a community where creosote bush is prominent.
Joshua Tree woodland is a community where creosote bush is prominent.

Taxonomic Description[7]
Overall Plant Habit/ Description: Annual with erect stems, 3.25cm, leafy, branched at or above base, bristly throughout.
Root System Type:
Underground Storage organs: Rhizomes may or may not function in vegetative reproduction.[1]
Machaeranthera spp. tend to have several short rhizomes arising from the caudex (woody base of a perennial).[1]
Leaves: 1-3cm long, 3-7mm wide; lower oblanceolate, elliptic, or oblong in outline, 1-2 pinnately lobed; upper linear, reduced, lobes and teeth bristle-tipped.
⬧Inflorescence: heads radiate, solitary or in cymes; involucre 6-7mm, 7-12mm wide, hemispheric; phyllaries (bracts) in rows of 4-6, linear-lanceolate, bristle-tipped, hairyRay flower: 16-18; ligules 7-12mm, yellow.

♦Disk flower: 44-65; corollas 4.5-5.5mm, yellow.
♦Season of Bloom: Flowering time often from April-June.
♦Biseasonal (germinates in winter, but flowers and sets seed in summer).[2]
♦Seed set greatly varied from season to season and shows significant responses to microhabitat differentiation.[2]

Indigenous Ramah Navaho used *M. gracilis*[3]:
♦In a cold infusion used as lotion for pimples, boils and sores.
♦In a cold, compound infusion of plant used as an eyewash.
♦ In a decoction of the plant taken for internal injury.
♦As snuff to cause sneezing, clearing of a congested nose.
♦ Dried seeds for food.

Name and Description of Varieties/Cultivars on the Market: none

Propagation Methods
♦Propagation by rhizome may be possible, but only seed is readily available and has propagation protocols documented.
♦Seed: small (1000 seeds=0.318g)[4]
has a pappus (like a dandylion seed, for wind dissemination)
Number of seeds per flower: unknown.
Dormancy: unknown mechanism
♦Rocky Mtn. Nat. Park reports germination success using a 65-70F day/55F night greenhouse providing 70F from a heat pad under tent with misters set 8AM-8PM, with 10sec/15min watering intervals. One week after germ. mist without tent. Fafard Germinating mix was used. Manually sown on 36pk seed flat, 2-3 seeds/slot. Germination in 3 days was uneven.[6]

Product Specifications →Ideal Phenotype
♦Very geometric with flowers opening to be completely spread open together to emphasize the radiating, sun-like effect.
♦Very bristled foliage in open habit.
♦Fragrant
♦Cut flowers with longevity and holding color, that rivals sunflowers because the exposed stem adds rather than detracts from designs.
♦Persisting ornamental phyllaries & flowerhead.

Market Niche---Identification and Justification
Target sales date: Mid-Feb. with a March 27th focus and then sales expected to taper off.
♦Can deliver a **burst** of spring color when the winter is dragging-on after mid February.
Potential Holidays: The yellow or gold of the flower would fit well into the Easter holiday.
♦Can deliver a **burst** of spring color when the winter is dragging-on after mid February.
♦Programmability: little evidence, but desert race should be used because its modified photosynthetic system allows it to flower approximately 25 days prior to the foothills race when grown under glasshouse conditions.[8]

♦Crops with which this well compete in the market:

⬧Easter-time daisies, because this desert plant won't wilt and droop like daises.

Story to sell the product: Bored of violet, pansies and bulb-flowers boring foliage, lacking any structural interest?

A new day for Easter flowers is the yellow sun at the pinnacle of the strong upright stems of Slender Goldenweed.

Will this ever be a major crop? Yes

⬧Because of its very quick life cycle,

⬧Because it could be sold in before spring in cold areas and then be planted out for early flowering in the home and garden.

⬧If the flowers all look their best at the same time on the same plant and across the populations sown by seed,

⬧If the structural beauty appeals to the consumer.

Could be marketed at as **tough** crop because:

⬧It is a small ruderal herb[9], making it good disturbed environments like annual beds and xeroscapes, rock gardens.

⬧The high salt levels in desert soils where this plant grows makes it a candidate for sandy, salty, warm roadsides.

Initial crop limitations/problems:

⬧Germination requirements need to be determined along with % viable.

⬧Great quantities of seed need to be produced every year for seed producers to supply the customer base, but in the wild abundance varies greatly from year to year[10] suggesting that this may limit early bulking.

⬧Risk of becoming invasive is limited by its narrow habitat of deserts and mesic foothills, its small volume of seed produced and the fact that it doesn't readily germinate. Still some further work is necessary.

⬧The crop must be made known to growers and consumers before it's release, which could be very quick considering the standard breeding can be advanced quickly with its short life-cycle.

Anticipated Cultural Requirements

Winter Hardiness: not exactly applicable because of the annual nature of the plant.

Heat and drought tolerance: inherent, especially in desert races.

Temp. 65-70 degrees F day/55 degrees F night greenhouse, if heat costs are not prohibitive ideal day temp is 77 degrees F.[6]

Container size: 196 cell trays for germination transplanted into 6, 8 or 12" azalea pots, so that the spreading stems reach beyond the pot lip by sale.

Light: maximum irradiance, provided by natural sunlight was 575 plus or minus 100 uE/m2.

Relative humidity: fluctuated between 10-30% and 30-45% respectively in the two greenhouses.

Media: germinating mix (sand-clay in wild)

Nutrition: grower should test, but be careful to apply low levels of nutrients in irrigation water rather than a granular fertilizer that might stress a desert/ mesic plant not used to receiving as much irrigation as greenhouse production would provide.

PGRs: may be necessary if high intensity light isn't provided to keep plant stature low, but little canopy competition in natural environment hasn't selected for tall plants.

No known disease susceptibility or insect problems.

Production Schedule

♦**Plug stages**:

♦allow 55 degrees F nights throughout and EC of less than 0.5mmhos/cm from a 2:1 dilution.

♦Gaps filled in by using sunflower production schedule, appropriate because *Helianthus annuus* shares the same SW environment as *Machaeranthera gracilis* and they are found together in Tuscon, AZ[12]

1. 3-7 d; seed lightly covered, under mist, 77 degrees F.
2. 3-11 d, medium moisture (like sunflower); 65-70 degrees F.
3. 8-14 d; 65 degrees F,100-150ppm N once per week; consider PGRs and concentrations.
4. 2-6 d; fertilize as needed.

Do not hold plugs; transplant into final azalea container, grow on for 19-33 days to flower.

Needs Assessment for Genetic Improvement

There is a need for more predictable days until flowering that could be achieved through traditional breeding efforts.

Additional traditional breeding to achieve the ideal crop phenotype with improved fragrance, even flowering, and suitability for cut flower arrangements.

Literature Cited and Image Sources:

1.Cade, B.S., Guo, Q. 2000. Estimated effects of constraints on plant perfomance with regression qualities. Okios. 9(2): 245-254.

2.http:///biology.umn.edu/jhbrown/Published/LongTermDynamicsWinterSummer.pdf

3. Vestal, Paul A. 1952 The Ethnobotany of the Ramah Navaho. Papers of the Peabody Museum of American Archaeology and Ethnology 40(4):1-94 (p. 47)

4. Baker Seed Herbarium. www.kew.org Seed Info Database.

5. http://www.calflora.net/bloomingplants/slendergoldenweed.html

6. http://www.nativeplantnetwork.org/network/view.asp?protocol_id=908

7. http://ucjeps.berkeley.edu/cgi-bin/get_JM_treatment.pl?609,1560,1572

8. Monson, R.K., Szarek, S.R., 1979. Ecophysiological studies of Sonoran plants. Oecologia, 41, 317-327.

9. Jackson, R.C., Crovello, T.J. 1971. A comparison of numberical and biosystematic studies in Haplopappus Brittonia 23, 54-70.

10. Guo, Q., Brown, J.H., Valone, T.J., 2002. Long-term dynamics of winter and summer annual communities in the Chihuahaun Desert. J. of Vegetation Sci. 13, 565-574.

11. Anderson, D.A., Szarek, S.R., 1981. Ecophysiological studies on Sonoran Desert Plants, VI. Seasonal photosynthesis and production of *Machaeranthera gracilis*, a winter ephemeral. Plant, Cell and Environment 4, 243-250.

12. http://www.fireflyforest.com

13. USDA NRCS Plant List. http://plants.usda.gov

14. Image for slides 2,3 and 13.
http://www.fireflyforest.com/flowers/images/yellow/yellow_33/Machaeranthera_g_400.jpg

15. Image for slides 10 and 11: Andre, J. M. 2005.
http://elib.cs.berkeley.edu/cgi/img_query?stat=BROWSE_IMG&query_src=photos_browseimgs_plant_sci&where-genre=Plant&where-taxon=Machaeranthera+gracilis