

## Seed Production of Black-Eyed Susan

Florida Dept. of Transportation Contract B-B475

*Final Report*

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### SUMMARY

Use of native wildflowers along Florida's roadsides is a goal not only of the Florida DOT but is being encouraged at the federal level as well. Florida DOT has set 1998 as the deadline to start using Florida-grown seed of native wildflowers. Unfortunately, there are no sources of Florida-grown seed that can currently supply FDOT's needs.

There are five wildflower species widely used by FDOT along roadsides. We chose to increase seed of a Florida ecotype of black-eyed susan (*Rudbeckia hirta*) for the following reasons:

- Native throughout Florida
- Documented evidence that flowering, height, and leaf number of black-eyed susan are substantially affected by ecotype origin
- Widely used for roadside stabilization and beautification - showy flowers, long blooming period, and will self-seed (thereby minimizing the need for reseeding)
- High likelihood of success - A protocol for growing 'Golden Jubilee' black-eyed susan was developed at the NRCS Big Flats Plant Materials Center in Corning, New York. However, that protocol will need to be modified for Florida conditions, and because of ecotype differences.

Black-eyed susan seed – collected during mid to late summer 1997 – originated from native populations in the Red Hills region of north Florida/extreme south Georgia (USDA Cold Hardiness Zone 8b; American Hort. Soc. Heat Zone 9). Seed was planted into plots at the USDA NRCS Plant Materials Center in Brooksville. Seed harvesting commenced in July and is continuing as of August 31, 1998. To date, the yield is 0.7 lb of clean seed; PMC personnel anticipate a total yield of about 2 lb. This lower than anticipated yield was probably due to excessive winter rains and deer/rabbit predation in the largest of the four plots.

A preliminary economic analysis shows estimated per acre cost of production - exclusive of harvest and cleaning - is about \$230 per acre, and less than \$200 per acre if no fertilizer is used (if this source-identified seed is procured from the PMC or NFREC at no charge, which we intend to do at least initially). While seed yield was much less than anticipated, we have made substantial progress in developing a seed source for a Florida ecotype of black-eyed susan as well as working out seed production methods.

The first draft of the extension publication is in review. Final editing cannot be completed until harvesting and cleaning are finished, since recommendations will be partially based on the economic analysis.

## INVESTIGATORS

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## SPECIES DESCRIPTION

Black-eyed susan, *Rudbeckia hirta* L., has showy yellow ray flowers that contrast beautifully with the dark brown disc flowers. This 1 to 3-foot native wildflower blooms from late spring through early summer. It is represented in Florida by two geographic variants - var. *angustifolia* (Moore) Perdue, which occurs only in the lower south and is the primary variety in the Florida panhandle, and var. *pulcherrima* Fern., which occurs primarily east of the Rockies. The different varieties are very difficult to distinguish.

## JUSTIFICATION

Use of native wildflowers along Florida's roadsides is a goal not only of the Florida DOT but is being encouraged at the federal level as well. The failure of wildflower plantings -- even native wildflowers, and especially in the southern half of Florida -- may be related to the sole use of seed from out-of-state sources, that is using seed from plants not adapted to Florida's environment. Criticisms from the Department of Environmental Protection, the Florida Water Management Districts, the Florida Native Plant Society, and others have focused on the use of seed produced outside the state. Research is necessary to improve the wildflower program and remain abreast of public concern.

Florida DOT has set 1998 as the deadline to start using Florida-grown seed of native wildflowers. Unfortunately, there are no sources of Florida-grown seed that can currently supply FDOT's needs; however, publicity about the wildflower seed production program at the University of Florida's NFREC has generated sincere interest from potential growers around the state. Moreover, since the initial wildflower research project in 1984-87 entitled "Establishment of Wildflowers Along Highway Rights-Of-Way", there has been no further investigation into other aspects of the program, including facilitating the development of Florida seed sources.

There are two major impediments to those wanting to produce seed. First, there is no source of seed derived from Florida ecotypes of native wildflowers. Secondly, there is no technical information about wildflower seed production in Florida.

Black-eyed susan was selected for this project because 1) it is native throughout Florida, 2) there is documented evidence that flowering, height, and leaf number are significantly affected by

ecotype origin, 3) it is widely used for roadside stabilization and beautification - showy flowers, long blooming period, and will self-seed (thereby minimizing the need for reseeding), and 4) there is a high likelihood of success since a protocol for growing 'Golden Jubilee' black-eyed susan was developed at the NRCS Big Flats Plant Materials Center in Corning, New York. However, that protocol will need to be modified for Florida conditions, and because of ecotype differences.

## OBJECTIVES

The objectives of this study were as follows:

- Increase seed of black-eyed susan so that it can be made available to those desiring to grow seed commercially.
- Develop a protocol for commercial seed production of Florida ecotypes of black-eyed susan.
- Write an extension publication on how to grow a Florida ecotype of black-eyed susan for seed production in Florida.

## METHODS

### Seed Collection, Cleaning, and Storage

Seed was collected from July 28 to August 20, 1997 primarily from nine native populations growing in the Red Hills region of north Florida/extreme south Georgia (USDA Cold Hardiness Zone 8b; American Hort. Soc. Heat Zone 9), or from plants grown from seed collected from native populations in 1996. It was collected primarily from plants growing in upland or upland-type sites. Native populations typically occurred either on the edges of woodlands, or in pine forests that were being managed with prescribed burns. Seed were manually cleaned at the NFREC-Monticello using soil sieves. Seed were stored in plastic bags at room temperature.

### Field Characteristics, Preparation, and Planting

The soil was a Kendrick fine sand (1.1% O.M. at 0-4 inches, declining to 0.26% O.M. at 11-23 inches). Soil tests (standard field fertility test: pH, lime req., P, K, Ca, Mg) and nematode tests were conducted by University of Florida diagnostic labs in late fall 1997. These were primarily for informational purposes but also to make sure there were no major problems with the fields. Soil pH ranged from 6.7 to 7.1, ppm Ca ranged from 677 to 754, P and Mg were high, and K was low. Nematodes (stubby root, stunt, and/or ring depending on field) were below levels considered to be damaging to *R. hirta*.

Germination tests were conducted at the USDA Plant Materials Center in Brooksville during November 1997 to determine seeding rate. Germination rate ranged from 50 to 76%.

PMC personnel prepared fields during summer and fall of 1997. Roundup (glyphosate; Monsanto) was applied one time followed by disking/rototilling as needed for weed control. Beds were smoothed prior to planting.

On December 10, 1997 seeds were manually broadcast (Ev-N-Spred Model No. 2700A, EarthWay Products, Inc., Bristol, IN) over four different fields (total of approx. 0.65 acres) so as to yield 35 plants/ft<sup>2</sup> (based on 100% germination of Pure Live Seed). A total of 1.06 lb seed was planted yielding a per acre rate of 1.6 lb. This was a greater than the 1 lb/A bulk seed rate recommended by the Big Flats PMC (USDA, SCS Big Flats PMC. 1985. 'Golden Jubilee' black-eyed susan for seed production. 2 pp.)

Seed were incorporated about 1/4 to 1/2 inch into the soil with a Brillion cultipacker. Planting and cultipacking required about 3/4 to 1 hour. Estimated population density in April was about 10 plants/ft<sup>2</sup>.

### Weed Control

Plateau (imazapic; Cyanamid) at 6 oz/A (plus 0.25% [v/v] nonionic surfactant) was applied as a broadcast spray (25 GPA) on April 6 for control of *Richardia* sp. (pusley) and *Cyperus rotundus* (purple nutsedge; field 119 only), although there were some *Gnaphalium* sp. (cudweed) and *Brassica* sp. (mustard) observed as well. It was reapplied to field edges on April 19 because of high weed pressure. As of April 27, control of cudweed, mustard, and purple nutsedge was deemed good to excellent, and the pusley was chlorotic. A slight twisting of *R. hirta* leaves was observed. However, after talking to a Cyanamid representative, it seems very unlikely that the epinasty was due to Plateau.

In June, overall weed control was fair to good. Control of pusley did not seem too good but since there was no unweeded control for comparison, it was not possible to make any definitive statements about pusley control. Pusley was the primary weed present in the plots but should pose no problems with seed harvesting since pusley is a low growing plant.

### Harvesting, Cleaning, and Storage

Most accessions were flowering by July 1; however, it seemed that accessions that originated from Greenwood Plantation (Thomas County, in extreme southern Georgia; Red Hills region of N. Florida/S. Georgia) were the earliest flowering.

Seed harvesting commenced near the end of July. Seed heads were harvested by hand or with a seed stripper purchased from Prairie Habitats, Inc. (Manitoba, Canada). A combine was not used for harvesting as planned due to variable flowering times among the accessions.

Harvested seed heads were spread out on paper in a barn and allowed to dry for 2 days before cleaning was started. Seed was cleaned with an M2B air-screen cleaner (Clipper Separation Tech., Bluffton, IN). The first fraction of cleaned seed was the heaviest and purest. The second fraction was lighter and contained more chaff. Seed harvested with the seed stripper had more trash in it than the hand-harvested seedheads. The PMC does not have the 6 X 28 screen recommended by the Big Flats PMC so they have ordered one. Hopefully, the new screen will result in cleaner seed.

As of August 31, 1998, total yield of clean seed is about 0.7 lb. The PMC anticipates an additional pound of clean seed from harvesting within the next month. The much lower than expected yield was probably due to excessive winter rains that occurred after planting and the seed possibly being buried too deep after cultipacking. The predation by deer and/or rabbits in the largest of the four production fields was probably only a minor factor affecting yield. While the largest production field represented over 30% of the total production area, only 0.3 lb clean seed would have been expected from the large plot based on yields from the other fields.

Clean seed is being stored at 40°F and 40% relative humidity at the PMC.

### COST ANALYSIS

The PMC has kept records on equipment used on man-hours expended during the entire production process. Dave Zimet prepared a preliminary cost analysis based on figures provided by the PMC. A final analysis will be submitted once harvesting and seed cleaning are complete. His preliminary analysis is below.

Based upon the experimental field work performed under the project, costs of production - exclusive of harvest and cleaning - are about \$232 per acre. The use of an 80 HP tractor is assumed for all field operations that require a tractor. The cost was calculated as follows:

**Soil testing, herbicide application, soil preparation, and seeding:** The following equipment is assumed - a 10-foot disk, a 5-foot rotovator, and a 10-foot cultipacker that has a roller before the seeder and a double roller after the seeder.

Soil test	\$ 100
Herbicide	8
Seed	N/C
Tractor, all operations	
variable costs	14
fixed costs	19
Equipment, including seeder and sprayer	
variable costs	4
fixed costs	10
Subtotal	\$ 155

**Cultural practices and plant maintenance:**

Fertilizer and lime	\$ 46
Machinery and equipment	
variable costs	3
fixed costs	6
Subtotal	\$ 55

**Labor, all operations**

4 hours @ 5.50 per hour \$ 22

**ESTIMATED TOTAL COSTS, exclusive of harvesting and cleaning (per acre)** \$ 232

**Harvesting** – For production fields of less than one acre, hand-harvesting may be more cost-efficient than using the seed stripper (Sharon Pfaff, pers. comm.). Hand-harvesting has the advantage of selecting only those seed heads that are fully ripened. However, this cannot be confirmed until all harvesting and cleaning data have been analyzed.

**EXTENSION PUBLICATION**

*See Attachment*

The extension circular is being reviewed. It cannot be completed until harvesting and seed cleaning are finished as recommendations will be partly based on the cost analysis.

**CONCLUSIONS**

While seed yield was much less than anticipated, we have made substantial progress in developing a seed source for a Florida ecotype of black-eyed susan as well as working out seed production methods.

The PMC has agreed to maintain one of the four plantings so that additional seed can be harvested in 1999. I anticipate that yield for this plot will be substantially greater next year because the population density will be greater (due to reseeding) and existing plants will probably be more productive. Also, I will be establishing a 'seed increase' field at the NFREC-Monticello during fall 1998 for harvest in 1999. Given the low quantity of seed from the 1998 harvest, seed from the 1999 harvest will be given to the FDOT for roadside testing. A second NFREC 'seed increase' field will be established at the NFREC-Quincy in fall 1999. Establishing these additional sites at the NFREC will also allow me to gain further insight into production methods.

Seed of this Florida ecotype of black-eyed susan may be available to potential growers as early as fall 1999. Several potential growers from around the state have expressed a strong interest in growing wildflowers for seed. These growers will be sent a copy of the extension circular and contacted when seed is available.