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Survival of the Coastal Halophyte Sea Beach Amaranth (*Amaranthus pumilis* Raf.) in Loamy Soils.

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Abstract:

The purpose of this study was to determine if sea beach amaranth could be grown in soils other than native coastal sands and to
observe and evaluate the need for innovative commercial nursery production techniques for sea beach amaranth. This study was conducted in order to provide inter-agency technical assistance to Natural Resources Conservation Service (NRCS) partners U.S. Fish and Wildlife Service and the U.S. Army Corp of Engineers. To date, very little information was available pertaining to whether or not the plant could be successfully grown in loamy soil typically found in commercial nursery operations in the mid-Atlantic region.

When the study was being planned, there was little information on nursery propagation protocols available. The NRCS Cape May PMC (PMC) staff attempted to build a beach like habitat located in the PMC research fields. A field was established by installing geo-synthetic woven weed barrier and covering it with 3" of light colored sand. It was speculated that the reflective properties of a light color sand located immediately under the plant branches and leaves could increase the chances of survival and optimize plant performance.

Results indicated that the plant can be grown in typical loamy soils and experienced 100% survival. Commercial seed production of seabeach amaranth on loamy soils can be cost effectively accomplished.

Introduction

Sea beach amaranth (*Amaranthus pumilis*) is an annual (monocarpic) vascular plant of the Amaranth family (*Amaranthaceae*). Sea beach amaranth is endemic to Atlantic barrier island beaches from Massachusetts to South Carolina. It is federally listed as threatened. The species primary habitat consists of over wash flats at accreting ends of barrier islands, lower fore dunes and upper strands of non-eroding beaches.

Historically, sea beach amaranth has occurred along the coast in nine states from Massachusetts to South Carolina. It had been presumed to be extirpated from six of the nine states in its natural range and to be limited to Long Island, New York and to the barrier islands from Dare County, North Carolina to Charleston, South Carolina.

During the winter of 1998 personnel from the USDA Natural Resources Conservation Service Cape May Plant Materials Center (PMC) were invited to attend a conference on sea beach amaranth held in the Outer Banks of North Carolina. The meeting was attended by the U.S. Army Corp of Engineers and the U.S. Fish and Wildlife Service Endangered Species coordinator Nora Murdock. The purpose of the meeting was to discuss what potential impacts an Army Corp beach replenishment project would have on existing populations of sea beach amaranth occurring in that area. During this meeting PMC personnel agreed to provide interagency assistance to both the Army COE and the U.S. Fish and Wildlife Service by carrying out investigations to improve effective propagation protocols for this species.

Materials and Methods:

In the fall of 1998, PMC personnel obtained samples of Amaranthus pumilis from the North Central Regional Plant Introduction Station of the United States Department of Agriculture's Agricultural Research Service. They were identified with Plant Introduction (PI) numbers 553081, 553082, 553084, 553085. The samples were seeded in the greenhouse into 5 cm^2 containers containing a mixture of half peat and half sand thoroughly moistened to saturation.

(Field 1 with created beach habitat. Photo by Bill Skaradek USDA NRCS)

The field planting site on the Cape May PMC property in Cape May, NJ was prepared by installing geo-synthetic woven weed barrier; the placement of three inches of sand over the barrier to mimic the natural sand eco-system where the species occurs. The natural soils in this field are classified as Sassafras sandy loam.

Transplant stock was grown (forced) in the greenhouse with diurnal temperatures of 80 degrees Fahrenheit during the day and 50 degrees Fahrenheit during the night. The seeded flats were exposed to 40 watt Gro-Lux lamps until emergence. Plants were then exposed to 400 watt high pressure sodium lights with both light treatments extending light photo period to 14 hour days.

Transplant materials were planted in the field by cutting through the weed barrier and installing plants on three-foot centers. There were a total of four replications randomly arranged plots of 16 plants per plot, 4 plants per accession with the four accessions represented. Plants were installed on three foot centers.

Results and Discussion:

The planting was considered highly successful in that 100% of those individuals in the sample plots survived. There was plant damage caused by common insects and web worms.

(Ant damage to sea beach amaranth. Photo by Bill Skaradek USDA NRCS).

Insect control was eventually achieved through the application of granular diazinon at a rate of one pound per 500 square feet by broadcasting on the soil surface. Harvest of the seed was accomplished through the use of a 16 gallon shop vac powered by a generator.

(Photo: Sea beach amaranth in anthesis. Photo by Bill Skaradek USDA NRCS.)

One intention of the project was to randomize populations within the planting to form a polycross nursery and broaden the genetic diversity of the first seed crop produced in the nursery (F-1 population). However, after consulting with the U.S. Fish and Wildlife Service, we agreed that the F-1 materials would not be distributed or used in artificial reintroduction of the species to its native habitat. Materials will be used for cultural studies at the USDA NRCS Cape May PMC only.

Summary and Conclusions:

Large scale nursery production of the coastal halophyte Seabeach amaranth will depend on its ability to grow in loamy soils typically found in coastal plain commercial nurseries. A field study was established at the Cape May Plant Materials Center in Cape May, NJ to determine if this species could be grown in a loamy soil. Weed Barrier was installed over the plot and covered with two to three inches of sand. Greenhouse propagated seedlings were transplanted into holes cut in the fabric. This allowed the roots to penetrate the loamy soil while also providing a sand surface mimicking the dune environment. There was 100% survival of the seedlings. Seed growers will have to be attentive to insect and disease issues. The seed production of sea beach amaranth on loamy soils is a feasible, for commercial seed producers.

(Seed of sea beach amaranth mixed in with sand after vacuum harvest method. Photo by Bill Skaradek USDA NRCS).

(Seed of sea beach amaranth mixed in with sand after vacuum harvest method. Photo by Bill Skaradek USDA NRCS).

References and Citations:

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Professional meetings and discussions with some of the authors of these documents.

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[1] U.S. Fish and Wildlife Service Asheville Field Office Asheville, North Carolina.
[2] The Nature Conservancy, Southeast Regional Office Chapel Hill, North Carolina.
[3] The Nature Conservancy North Carolina Field Office Durham, North Carolina.