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Investigations into Cultural Techniques for Enhancing the Production of the Halophyte Sea beach Amaranth (*Amaranthus pumilis)* in Commercial Nursery Conditions.

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Abstract

The purpose of this study was to determine if sea beach amaranth responds to different color plastic mulches.

Four treatments of plastic color mulch were chosen based upon anticipated variations in soil temperatures associated with solar radiation transmissivity and reflectivity of the membrane. They were red, black, green and white. Preliminary results indicated that the red and black mulches did improve overall plant growth. Additionally, the use of the plastic mulch did drastically improve seed harvest efficiencies when compared to the 1998 study.

Final data will be collected in the summer of 2005 when the treatment randomization design will be improved upon.

Introduction

Sea beach amaranth (*Amaranthus pumilis*) is an annual member of the Amaranth family (*Amaranthaceae*). 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.

Sea beach amaranth was considered extirpated from the State of New Jersey since about 1918. In about 1995 the U.S. Army Corp of Engineers conducted a beach replenishment project in the Sea Bright NJ area. In 2000, the plant was observed and reported as occurring in the National Park Service Sandy Hook Unit and southward to Monmouth Beach Borough. Because the plant is on the List of Endangered and Threatened Wildlife and Plants, the U.S. Fish and Wildlife Service had jurisdictional authority over the management and recovery of this species.

Three years prior to the re-appearance of sea beach amaranth in New Jersey, personnel from the USDA Natural Resources Conservation Service Cape May Plant Materials Center were invited to an Amaranthus pumilis conference held in the Outer Banks of North Carolina and attended by the U.S. Army Corp of Engineers and coordinated by U.S. Fish and Wildlife Service Endangered Species coordinator Nora Murdock. The purpose of the meeting was to discuss potential impacts of Army Corp beach replenishment to existing populations of amaranth occurring in the Bogue Banks region of North Carolina. During this meeting, the USDA NRCS Cape May PMC agreed to provide some interagency assistance to the U.S. Fish and Wildlife Service on better understanding effective propagation protocols for this species.

In 1998 USDA NRCS Cape May PMC staff conducted initial evaluations pertaining to the survivability of producing this coastal halophyte in loamy soils. The experiment was successful with 100% survival in five replicated polycross nursery plots. The difficulty of harvesting seed and separating the seed from the sand/soil indicated that some other nursery protocol needed to be evaluated.

During the fall of 2002, the USDA NRCS Cape May PMC entered into a Military Interdepartmental Procurement Request (MIPR) with the U.S. Army Corp of Engineers New York District. The MIPR agreement was entered into to assist the Army in mitigating the impacts that a beach maintenance project was anticipated to have on existing populations of sea beach amaranth. The U.S. Fish and Wildlife Service were consulted and each agency agreed on a course of action.

During the fall of 2002 PMC personnel collected seed from existing populations of sea beach amaranth at Sea Bright NJ and the Sandy Hook unit of the National Park Service. Materials were cleaned and stored properly.

Materials and Methods:

Seed of sea beach amaranth was stratified for 45 days at 37 degree F in zip lock bags containing a mixture of 50% sand and 50% pro-mix growing media. Stratified materials were then placed in standard solid bottom nursery flats and placed into the greenhouse. Upon emergence materials were transplanted into 2 ½ inch containers using a mixture of peat/sand 9:1. Greenhouse conditions were simulating 14 hour photo period using 400 watt high pressure sodium lights and diurnal temperatures of 80 degrees F day; 50 degrees F night.

Field plots were prepared and red, green, black and white plastic mulch 1.25 cm thickness was installed in the field. T-tape with emitters every 12" for drip irrigation was installed under the plastic mulch.
On June 20th, the plants were transplanted 1' apart directly into the plastic mulch treatments with one control planted without plastic mulch along the southern edge of the experiment. The treatments were arranged in a randomized complete block design (RCDB) with nine replications (df=36). Each experimental unit consisted of 5 plants (n=180). Shoot height (cm) and length (cm) were measured eight weeks after planting in the field. Shoot length was defined as the distance from the crown to the terminal bud of the longest shoot growing horizontally to the ground. Shoot height was defined as the distance from the crown to the terminal bud growing vertically to the ground.

Results and Discussion:

There was a highly significant effect ($P<0.0001$) of color of plastic mulch on height and length of shoot growth (see Table 1). Plants grown on red plastic and black plastic had significantly longer shoots (27.3 and 26.6 cm respectively) than plants grown on green plastic (19.9 cm) or white plastic (12.8 cm). Plants grown on red plastic (9.1 cm) produced shoots with the greatest height in the study.

Summary:

Results suggest that red plastic and black plastic mulches improved overall plant growth in comparison to the other mulches evaluated.

Table 1. Effect of plastic mulch on growth of Amaranthus pumulis (seabeach amaranth) in Cape May Court House, N.J., 2003.

	Shoot Growth (cm)[1]	
Treatment	Length	Height
Red Plastic	27.2a	9.1a
Black Plastic	26.6a (-2.2%)	8.0b (-12.1%)
Green Plastic	20.0b (-26.5%)	6.8c (-25.3%)
White Plastic	12.8c (-52.9%)	5.9c (-35.1%)
Pr > F	<0.0001	<0.0001

[1]Mean separation performed within column.

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