

Beach Plum: Small Farm Sustainability through Crop Diversification and Value-Added Products

Project # LNE01-153

SARE Annual Report

December, 2001

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Summary

Beach plum, *Prunus maritima*, is a fruiting shrub native to coastal dunes of the Northeastern United States. The fruit has been collected from the wild for making preserves and jelly since colonial times. Today, native stands support a cottage industry in the Northeast. Interest in bringing beach plum into commercial production has necessitated small-scale production trials to optimize horticultural practices to increase yield. Our goals are to develop an integrated system for a sustainable beach plum industry, including fruit production, processing the crop into value added commodities, developing niche markets for these products, and the education of growers, processors and marketers.

Objectives Performance Targets

TARGET 1. By spring 2002, we will contact all New England cranberry growers and 500 small farm entrepreneurs to identify early innovators desiring to enter the beach plum industry. By the end of this project, we will help early innovators plant 7 beach plum production orchards.

TARGET 2. Using the project's business plans, early innovators will mentor others. 40 new partners will be enlisted by project's end.

TARGET 3. Establish a germplasm collection for a beach plum improvement program; make an initial distribution of improved clones to producers.

TARGET 4. Establish quality control and assurance standards for fresh fruit, juice, pulp, jelly, jam and preserves.

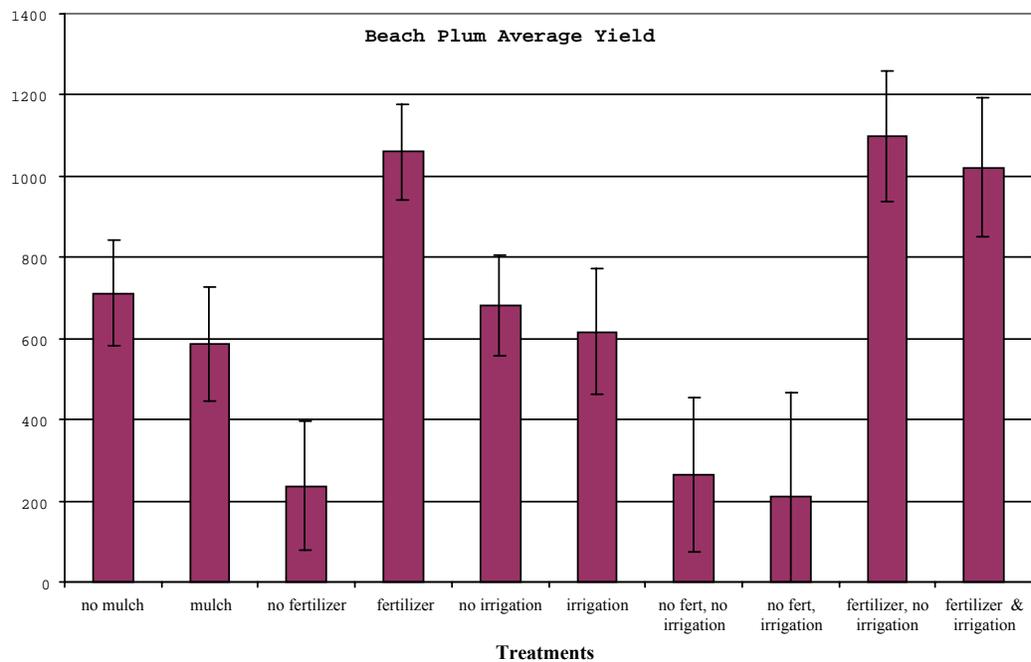
TARGET 5. Link growers, producers and marketers; catalyze formation of a Beach Plum Cooperative to promote a sustainable niche market industry.

Accomplishments/ Milestones

HORTICULTURE

Research and Demonstration, Massachusetts

Located at Coonamessett Farm, a community supported agriculture farm in Falmouth, MA, this beach plum planting has served as a research and demonstration facility since 1997. Plants are being grown in a complete factorial experiment with the treatments of mulch (4" woodchip), fertilizer (lbs./a)-- N=60, P=138 pre, K=88, pH=6.5, and irrigation (1 inch supplemental water/week). This year's results show that fertilized plants grown without irrigation had both the greatest yield *and* growth (trunk diameter). Neither yield nor growth showed significant differences between fertilized treatments receiving and not receiving irrigation.



A pest management phenological calendar was developed. This will be an important tool in preparing pest management plans in the future because it links pest activity and harvest to degree days.

Beach Plum Phenology and Management Inputs 2001

<u>Date</u>	<u>Degree Days</u>	<u>Pest/Path</u>	<u>Action</u>
14 April	6	----	Prune
22 April	43	----	Scouting
27 April	43	----	Scouting
28 April	43	Brown Rot	Sulfur ¹
3 May	80	----	Scouting
10 May	166	----	Scouting
20 May	228	Brown Rot	Scouting/Sulfur ²
29 May	273	Coleoptera ³	Scout/AzaDirect ⁴
4 June	332	----	Scouting
7 June	332	----	Scouting
11 June	405	----	Scouting
18 June	536	Coleoptera	AzaDirect ⁵
24 June	696	----	Scouting
10 July	1000	----	Scouting
30 July	1373	----	Scouting
7 August	1500	Brown Rot	Sulfur ⁶
13 August	1673	---	Harvest I
19 August	1800	---	Harvest II
24 August	1976	---	Harvest III
28 August	2100	---	Harvest IV
30 August	2100	---	Harvest V
4 September	2245	---	Harvest VI
6 September	2452	---	Harvest VII

¹ sulfur applied at 2.5 tsp/gallon (5 gallons finished)

² sulfur applied at 1.0 tsp/gallon (10 gallons finished)

³ Coleoptera includes plum curculio (*Conotrachelus nenuphar*) and plum gouger (*Anthonomus scutellaris*)

⁴ azadirect applied at 8 oz/20 gallons finished

⁵ azadirect applied at 4 oz/10 gallons finished

⁶ sulfur applied at 1.0 tsp/gallon (10 gallons finished)

Research and Demonstration, New York

At the Long Island Horticultural Research and Extension Center in Riverhead, New York the first year of a three year trial was conducted to determine beach plum's sensitivity to herbicides labeled for use on other fruit producing Prunus species. The trial was conducted generally following IR-4 protocol. In June of 2001 two test plots were planted with beach plum which had been grown from wild collected seed. Plot A was planted with three-year-old plants that were trimmed to a single stem (as a tree). Plot B was planted with first year seedlings. All plants were staked. Over two hundred beach plum plants were

included in this field trial/demonstration planting.

The three-year-old plants were treated with Simazine and Oryzalin at the IR-4 protocol 1X and 2X rates (Princep 90WDG at 1 and 2 lbs. a.i./ac. and Surflan 4 AS at 2 and 4 lbs. a.i./ac). The first year seedlings were treated with Simazine, Oryzalin, Napropamide, and Fluazifop at the IR-4 protocol 1/2X, 1X, and 2X rates (Princep 90WDG at 0.5, 1, and 2 lbs. a.i./ac.; Surflan 4 AS at 1, 2, and 4 lbs. a.i./ac.; Devrinol 50DF at 2, 4, and 8 lbs. a.i./ac.; and Fusilade 2L at 0.125, 0.25, and 0.5 lbs. a.i./ac.). Results indicate that Simazine at 1 and 2 lbs. a.i./ac. injured the first year seedlings. This test has shown that many of the materials labeled for other fruit bearing Prunus species appear to be safe for beach plum.

Plants for Early Innovators

During the summer of 2001, beach plum plants were grown from seed at Cornell University.

Approximately 3000 plants will be distributed to farms in the Northeast for planting in spring 2002.

Farms in the following locations have requested plants for spring 2002 planting:

<u>Type of Farm</u>	<u>Number Requested</u>	<u>Location</u>
community organic farm	200	East Hampton, NY
cranberry	500	Carver, MA
cranberry	1000	Rochester, MA
cranberry	200	Plymouth, MA
CSA	200	New Paltz, NY
field crops	200	Long Island, NY
fruit	25	Trumansburg, NY
fruit	100	Long Island, NY
fruit	10 w/yellow fruit	Nantucket, MA
fruit/horses	40	Brewster, MA
homestead	40	Dryden, NY
research facility demo	40	Ithaca, NY
research facility demo	200	Long Island, NY
research facility demo	40	Hudson, NY

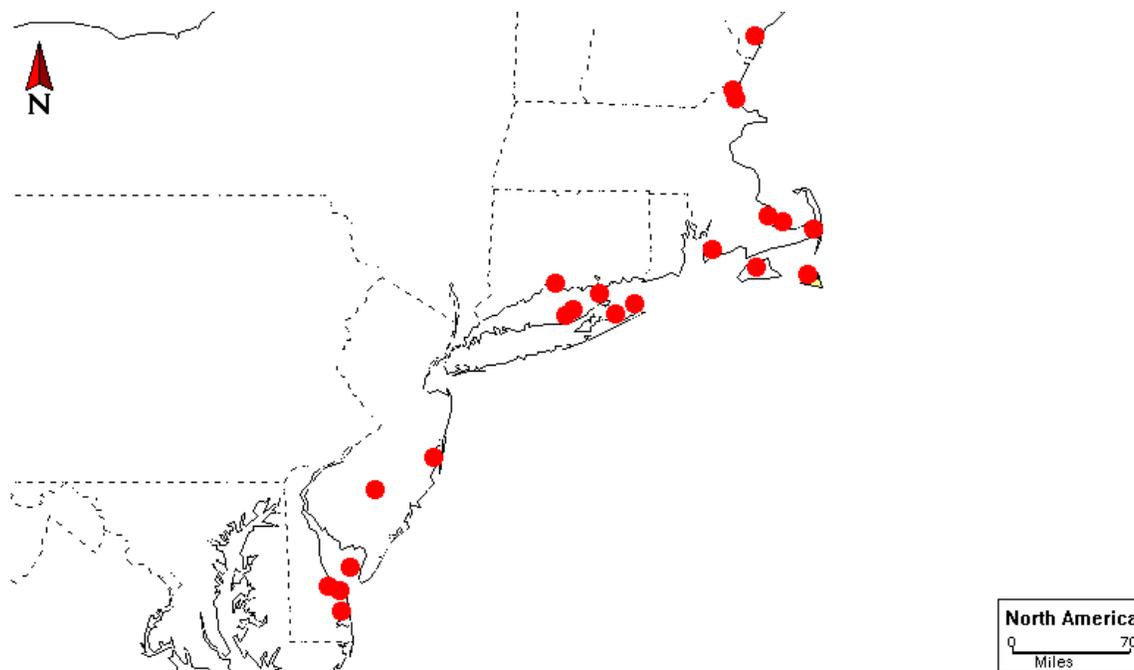
FRUIT QUALITY

Germplasm Collection and plant improvement

In the summer of 2001 botanists at herbaria across the northeast were contacted and polled as to the

location of significant beach plum populations in their respective states. Access permission was obtained for the various sites and in late August/early September of 2001, a germplasm collection of beach plum seeds was made throughout the plants' native range. Additionally, fruit samples were collected and sent to the Department of Food Science and Technology, Cornell University, Geneva, NY where fruit quality analysis were performed (see fruit processing below). The sites listed below were visited and seed from several plants per site were collected. Currently the seeds are in storage and will be grown in containers at Cornell University in the summer of 2002. In 2003, plants will be field planted at two sites: one planting at Cornell University and one at another location in the Northeast. In the future plants resulting from this collection will be evaluated for fruit quality, variation, and disease susceptibility.

Collection Sites



Site	City	State	Latitude	Longitude
marsh path	Ogunquit	ME	43°15'57.5"	70°35'23.1"
Plum Island	Newburyport	MA	42°46'24.0"	70°48'23.4"
Crane Beach	Ipswich	MA	42°41'	70°46'
East Sandwich Beach	East Sandwich	MA	41°45'13.3"	70°26'52.5"
Sandy Neck Beach	Barnstable	MA	41°43'57.6"	70°21'33.3"
Gillis property	Chatham	MA	41°40'	69°55'
Westport Point	Westport	MA	41°30'39.2"	71°04'45.0"
North Neck	Martha's Vineyard	MA	41°23'	70°30'

Chaffinch Island	Guilford	CT	41°18'	71°41'
York and Madaket	Nantucket	MA	41°17'	70°
Orient Beach State Park	Orient Point	NY	41°07'47.0"	72°15'55.7"
Montauk Point State Park	Montauk	NY	41°04'33.7"	71°51'57.5"
Goldsmith Inlet	Southold	NY	41°03'25.4"	72°28'13.8"
Mattituck Inlet	Mattituck	NY	41°00'48.2"	72°33'33.6"
Hither Hills State Park	Montauk	NY	41°00'	72°02'
Island Beach State Park	Seaside Park	NJ	39°51'	74°05'
Wharton State Forest	Atsion	NJ	39°44'21.3"	74°43'32.2"
Higbee Beach	Cape May	NJ	38°57'43.1"	74°57'46.9"
Beach Plum Island	Broadkill Beach	DE	38°48'12.3"	75°11'11.5"
Cape Henlopen State Park	Lewes	DE	38°47'	75°05'
Deleware Seashore S. Park	Dewey Beach	DE	38°36'15.9"	75°03'43.0"

FRUIT PROCESSING

Fruit Quality Variation

In August 2001 fruit samples were collected from cultivated and wild stands for fruit quality analysis. Fruit samples were kept at 35°F until the analyses were performed. A total of 38 lots were studied. A sub-sample of each lot was reserved and frozen for additional analysis such as total phenolics, acid composition, and antioxidant activity. Whole fruit was evaluated for size, color and pulp yield. Juice samples for chemical analysis were produced by crushing the fruit and manually squeezing it through cheesecloth. The prepared samples were analyzed for color, pH, acidity and soluble solids (Brix).

The fruit was evaluated for size by measuring the height, width and depth of 10 randomly selected berries from each lot. The color was measured by placing approximately 15 plums into a glass holder and by taking color readings using a colorimeter (HunterLab UltraScan XE). Pulp yield was estimated by weighing the pulp and the pits manually separated using a single fruit cherry pitter. Juice measurements were performed using a colorimeter, a pH meter and a manual refractometer for Brix readings. Acidity was determined by a standard titratable acidity procedure. All measurements were conducted in duplicates.

The results show a large variation on all measurements for the beach plum samples studied. The fruit

color values showed differences in intensity, hue, and lightness. Darker fruit had lower lightness “L” values such as 27.8 while lighter samples had higher values such as 41.9. Pulp yield varied from a low of 81 to a high of 91 %. Fruit size presented significant variations in the three measurements taken. The height values ranged from 13.5 mm to 19.7 mm, the width ranged from 13.5 mm to 20.8 mm, and the depth from 14.5 mm to 19.8 mm. The soluble solids (Brix) readings in the juice samples ranged from 9.4 to 19.0 while the acidity varied from 0.7 to 3.2 % (expressed as citric acid). The pH values ranged from 3.1 to 4.1. The total phenolics content, acid profile and antioxidant capacity analysis will be performed during the winter/spring months.

Sample Product Development

Samples of beach plum jam and jelly was produced following customary industry procedures and standards at the Food Ventures Center of the New York State Agricultural Experiment Station. The plums were pitted with a manual cherry pitter; the pulp was ground with a commercial food processor, blended with sugar and pectin mix, and cooked in a small kettle to make the jam. The jam conformed to the standards of identity with a Brix of 70 and a pH of 3.4. The jelly was prepared by partially chopping the fruit in a food processor, heating the fruit in a kettle to extract the color and flavors, and extracting the juice by squeezing the fruit through cheesecloth. The juice was then mixed with sugar and pectin mix, and cooked in the kettle to make the jelly. The prepared jelly had a Brix of 68 and a pH of 3.1. The jam and jelly samples will be used to explore market opportunities.

Additional products were made by our industry cooperators, The Chatham Jam and Jelly Shop, Chatham, Ma., who are producing jelly from 3 selections of superior beach plum fruit developed at the Rutgers Cream Ridge Experiment Station. This will enable us to compare fruit from a cultivated source to the standard wild product. Beach plum wine is being produced by Steve Richards, a home-based wine maker in upstate NY. Dried plum products are under development at Decas Cranberry Co., Carver, Ma.

Products from the Food Ventures Center and our industry cooperators will be used in future consumer focus group research (funded by Cornell University Agricultural Experiment Station Federal Formula Funds) and to demonstrate beach plum's potential to growers, processors, and marketers.

ECONOMICS

Cost evaluation templates were constructed to estimate costs of establishing and producing beach plum. Worksheets were prepared for growers to evaluate their own costs and profitability of producing beach plum. Information needed to complete the cost evaluation, including capital requirements for establishing a beach plum orchard and cultural practices for producing beach plum in years 1 to 5, are being assessed by horticulturists and grower collaborators. Assumptions for input prices, potential crop yields, and fruit prices will be collected based on experts opinions, grower and processor collaborators inputs, and input suppliers quotes. Standard cost budgets and break-even analysis will be developed based on the assumptions in Spring 2002.

OUTREACH

A web site is under development which will include a project summary, a photo gallery, the U. Mass Beach Plum Grower's Guide, a list of beach plum plant and product suppliers, and a cultural management photo gallery. The site will be on the Cornell University web site with links to our stakeholders and collaborators and links to other stone fruit production and marketing sites around the country. This site will act as a critical magnet to bring those interested in beach plum together.

Other outreach activities included the following articles and presentations:

Uva, R. and T. H. Whitlow 2000. Beach plum cultivation: a high value native fruit. Bogside, the newsletter of the Cape Cod Cranberry Grower' Association 12(7): 3.

Uva, R.H., T.H. Whitlow, and M.P. Pritts. Yield component analysis of beach plum, a new fruit crop.

ASHS Annual Conference, June 24, 2001

Senesac, A.F. Research overview: beach plum, A Symposium on Landscaping with Native Plants, Calverton, (Long Island) NY, Nov. 6, 2001

Uva, R.H., From sand dunes to the orchard: beach plum new crop development. Liberty Hyde Bailey Garden Club, Nov 13, 2001

Uva, R.H., Low input beach plum production. HORT 415 Principles and Practices of Agroforestry, Cornell University, Nov. 28, 2001

ACCOUNTABILITY

Industry Advisory Board Convened

An Industry Advisory Board formed and met at Coonamessett Farm in May of 2001. The committee of 6 industry advisors met with 7 beach plum investigators to discuss the overall goals of the project.

Discussed was the possibility of forming a collaborative group where different constituencies could exchange information. It was decided to keep in touch via e-mail and that the future web site should be the catalyst for any such group. A list of stake-holders was generated, potential producers and processors who were interested in working with beach plum. Future challenges for the new industry were discussed.

Impacts and Contributions / Outcomes

It has been a successful first year of this two year project. Our research has shown that it may be feasible to grow beach plum without supplemental irrigation, thus reducing costs. Also, A. Senesac's herbicide research has shown that herbicide products labeled for other fruit bearing Prunus species appear to be safe for beach plum. The lack of suitable pest control methods has been a stumbling block for other new crops but this will not be the case for beach plum. Plants have been grown to supply beach plum plantings and we have commitments from 11 farms in the Northeast to grow beach plum, as well as 3 additional demonstration sites. Our germplasm collection and the initial assessment of fruit variability are complete. The amount of variation found in fruit quality indicates that there is ample opportunity for selecting superior traits. Successful outreach activities brought in an additional 5 early innovators to our project. Our sample products together with our future web site and cost evaluation worksheets will serve as ambassadors for our research and education programs.

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12/2001 Progress Toward 2003 Targets

