Growing Cold Hardy Figs in the High Tunnel
By Bill Errickson

In the Northeast, where farmers consistently struggle with climatic challenges presented by a short growing season, cool temperatures, and harsh, unpredictable winters, it behooves agricultural producers to increase the diversity of their enterprises, building sustainable farms that provide a livelihood and comprise the local food system. When considering a farm system's resilience and the security of a local or regional food system, fruit production is an area of particular interest. There is currently a high consumer demand for local fruits in the Northeast, though the production of many traditional species presents ecological and financial challenges. Apples and plums, for example, frequently suffer from insect and disease pressure and are subject to crop failure when pollination is disrupted due to cold spring temperatures and rain during bloom times. The pesticides necessary to produce a marketable fruit crop pose both environmental risks and a health danger to farmers and consumers. As pest, disease, and moisture issues increasingly plague the traditional fruits of the Northeast, farmers must begin to consider alternative approaches for fruit production, including the incorporation of additional species into our agricultural systems.

Figs, native to the Middle East and Western Asia are one of the earliest cultivated plants in the world, with origins that go back over 11,000 years. Exceptionally high in calcium, the fruits are produced on self-fertile trees with minimal pest and disease issues. They can be enjoyed fresh, and also dry well for winter storage, having the potential to provide income for the farmer and local fruit for consumers beyond the window of harvest. Figs are currently shipped great distances to consumers in Maine; however, they have the potential to be produced in this region if given adequate microclimate conditions. While annual crops such as tomatoes and overwintered greens, and occasional specialty crops such as ginger, are currently produced in high tunnel growing spaces, perennial crops offer the prospect of reduced soil disturbance and therefore less nutrient, moisture, and organic matter loss during production. Expanding the use of high tunnel structures to include perennial crops such as figs opens a new window of sustainable agriculture opportunity in the Northeast while decreasing the region's dependency on fossil fuels for the production and import of fruit. The major challenges of producing a fig crop in the Northeast lie in the success of overwintering the plants and ripening the fruit.

While some home gardeners have been experimenting with growing figs in the northeastern United States in recent years, there is a significant lack of scientific field trials to date. Variety trials in such countries as Egypt(1) and Turkey(2), and in the state of Hawaii(3), have evaluated multiple fig varieties for productivity; however, these studies have not evaluated the productivity of cold-hardy figs specifically, nor pressed the climatic limits of the species. Previous SARE-funded research in New Jersey demonstrated that figs are a viable high tunnel crop, producing higher yields of marketable fruit and exhibiting higher rates of winter survival when compared to field-grown figs(4). Additional research has demonstrated the viability of perennial fruit crops such as strawberries(5,7), blackberries(6), and raspberries(7) in high tunnel production systems. Ginger, which thrives in a tropical environment, has been shown to be a viable northeast hoop house crop(8); renowned Maine grower and consultant Mark Fulford suggests that perennial figs have an even higher likelihood of survival and success as a northern high tunnel crop than tropical ginger (personal communication, December 1, 2013).

In 2014, Singing Nettle Farm received a SARE Farmer Grant to evaluate the potential of growing cold hardy figs in a high tunnel in Maine. Our research built upon the New Jersey fig study by applying successful findings (using appropriate high tunnel technology) to further test the climate boundaries of the fig tree and assess whether a marketable, and economically viable, crop could in fact be produced in a northern New England state. The fig varieties selected for this study were suggested to be hardy, when planted unprotected, to approximately -15 degrees F (Zone 5). Brooks, Maine is currently rated as Zone 5b. High tunnels, which are generally understood to moderate the extreme temperature fluctuations during the coldest winter months, are also expected to raise temperatures inside the tunnel anywhere from approximately 7 to 12 degrees F(9). The addition of the high tunnel as a standard cultivation practice for fig trees suggests that growers can hold a reasonable degree of confidence in both the survivability of the figs, and their ability to successfully ripen fruit in northern New England. Building on related research from the northeastern United States and beyond, this study took the first steps toward building a comprehensive body of data specific to the fig tree in northern New England that will be useful to fruit growers now and in the future as the perennial agricultural systems of the northeast shift in response to changes in our climate, economic, and societal fabric.

The major objective of this research was to identify one or more varieties of fig tree that can be successfully grown to produce marketable fruit in USDA Zone 5b with the protection of a high tunnel. In addition to showing varietal differences, the results suggest how variation in winter protection practices influences fruit production and survivability. This study was conducted at Singing Nettle Farm in Brooks, ME during the 2014 and 2015 growing seasons, with figs that were sourced from Kerry Sullivan in Laconia, NH.

In the spring of 2014, four varieties of zone 5 hardy fig trees (Gino's Black, Marsailles Black VS (MBVS), Ronde de Bordeaux (RDB), and Sal's GS) were planted in a 26x48 foot high tunnel. Eight trees of each variety (a total of 32 trees) were planted on five foot centers into soil that had been amended for optimum fig tree nutrition (based on a soil test taken prior to planting) with a mineral and worm castings blend, which included granite meal, colloidal phosphate, bone char, and kelp meal. All trees were mulched with wood chips and landscape fabric and were watered with drip irrigation at regular intervals throughout the growing season. In the fall of 2014, four trees (half the total number) of each variety were wrapped with fabric row cover for the winter to assess whether there is a benefit to providing extra protection from freezing temperatures.

In 2014 and 2015, data was collected to assess the following parameters: flowering dates, harvest dates, total yield of fruits, yield of marketable fruits, yield of unripe fruits, fruit size (average weight per fruit), peak plant height, Brix levels, and taste. Winter survival data was collected in the spring of 2015 by measuring the percentage of winter injury/die back on each tree. The effects of wrapping trees in the winter are quantified by comparing wrapped vs. un-wrapped trees on the basis of the above parameters.

The winter of 2014-2015 saw temperatures of -15 degrees F, and resulted in all the fig trees dying back to the ground, regardless of whether they were wrapped for additional winter protection or not. In the spring, all tress began growing again from the base, with the single exception of the GB trees, which experienced winter mortality in two out of four uncovered plants.

Figs produce an inflorescence, called a syconium, which contains numerous unisexual flowers that are not outwardly visible; thus, flowering dates were recorded as the first observance of syconium formation. In 2015, the first syconiums were observed on SGS on June 19th, followed by MBVS on June 26th, and RDB and GB on July 3rd.

Vegetative growth was calculated for each variety by measuring stem length for covered and uncovered trees (Figure 1). Vegetative growth was greater in covered varieties of GB, MBVS, and RDB, while winter protection did not result in greater vegetative growth for SGS. RDB displayed the greatest amount of vegetative growth of the four varieties.

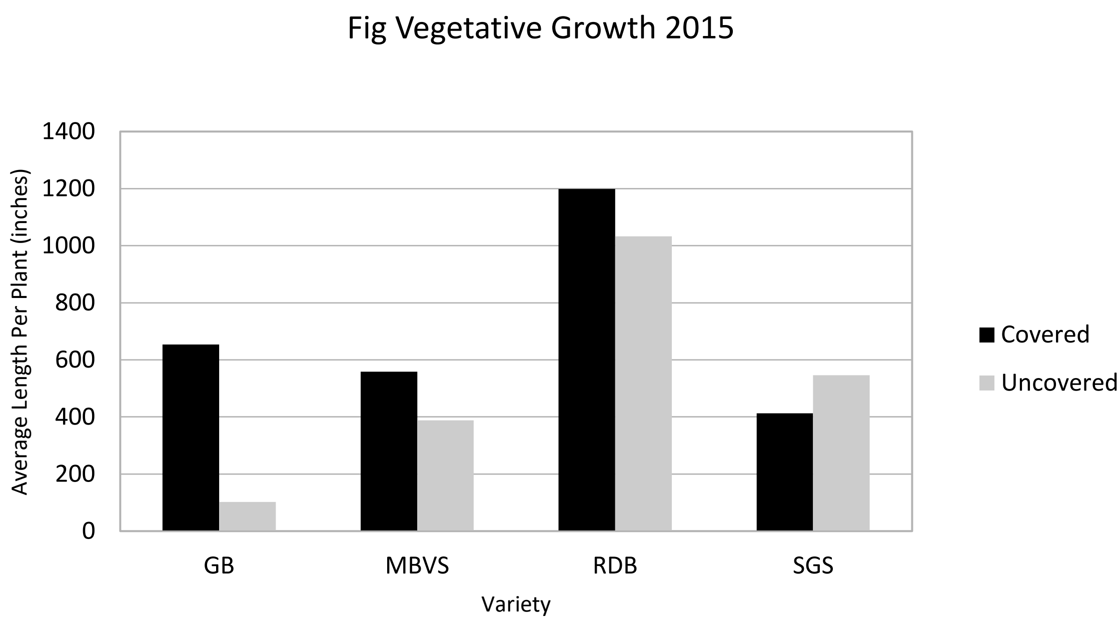

Figure 1: Fig Vegetative Growth in 2015.

Fruit set for each variety is displayed in Figure 2, with covered GB and MBVS trees showing greater fruit set when compared to uncovered trees. Fruit set in RDB and SGS does not appear to have increased with winter protection with row cover. Uncovered RDB set the most fruit per plant, closely followed by covered MBVS.

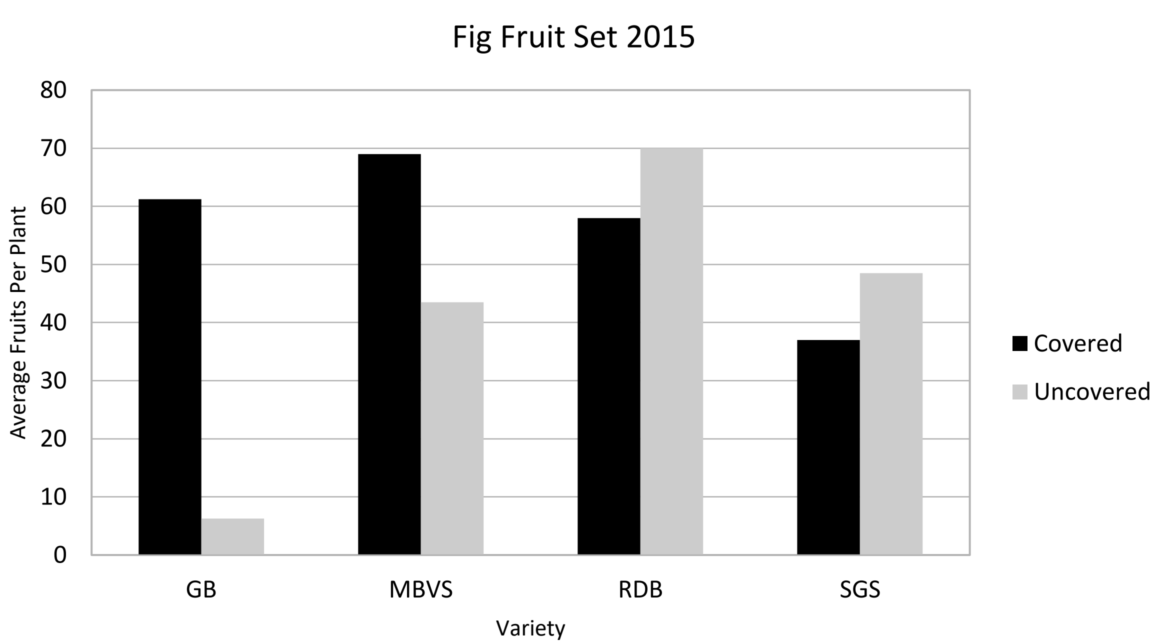

Figure 2: Fig Fruit Set in 2015

For covered trees, each variety did successfully produce ripe fruits, which were weighed and evaluated for Brix levels. From the covered GB trees, 3 fruits were harvested, with an average weight of 0.33 oz, and an average Brix of 16. Covered MBVS trees yielded 17 fruits, with an average weight of 0.57, and an average Brix of 19. Covered RDB trees produced 12 fruits, with an average weight of 0.56 oz, and an average Brix of 16.5. Covered SGS trees were the first to bear, and produced 23 fruits, with an average weight of 0.52 oz, and an average Brix of 17.7. RDB was the only variety to ripen fruit on trees that were not covered through the winter, yielding 2 fruits, with an average weight of 0.55oz and an average Brix of 16 (Figure 3).

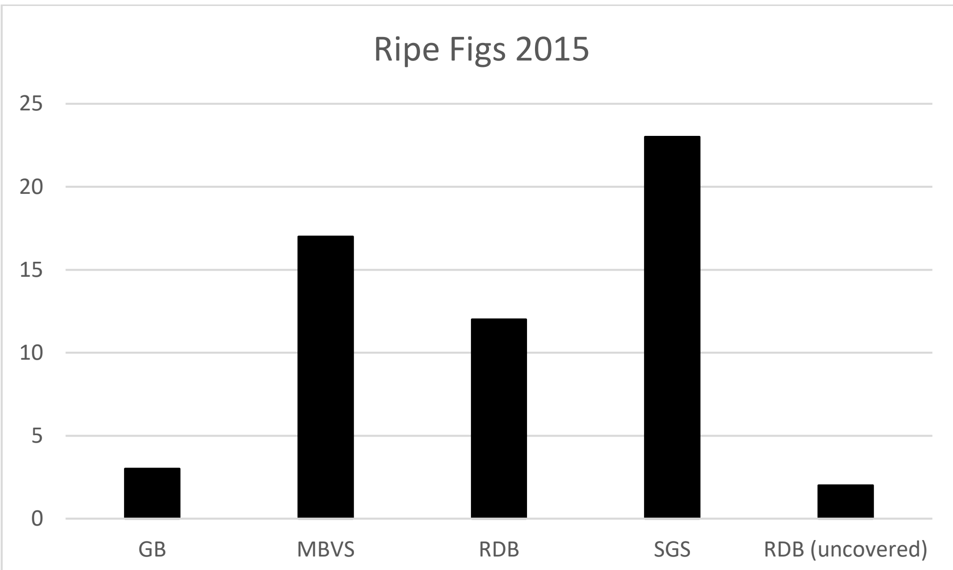

Figure 3: Total ripe figs harvested from trees in 2015.

Independent blind taste tests were also conducted for each variety in 2015. Taste test participants were given one variety at a time, with a scorecard to rank the qualities of each variety ranging from one to five for texture, sweetness, floral/aromatic, and overall flavor, with five being the highest score. An open ended “comments” section was also included on the cards for additional feedback. Participants were unaware of which variety they were sampling during each phase of the taste test. MBVS scored highest overall, followed by SGS, GB, and RDB. Descriptive comments during the taste test suggest banana flavors for GB; sweet melon flavors for MBVS, a subtle spicy sweetness for RDB, and a very good, complex flavor for SGS. It is also worth noting that the RDB figs may not have ripened to their full potential, affecting their scores in the taste test (Table 1).

Table 1: Fig Taste Test 2015

Variety	GB	MBVS	RDB	SGS
Texture	3.3	3.7	2.6	3.6
Sweetness	3.0	3.6	2.5	3.4
Floral/Aromatic	3.0	3.6	2.5	3.1
Overall Flavor	3.0	3.8	2.6	3.6
Taste Test Average	**3.1**	**3.7**	**2.6**	**3.4**

In 2015, Singing Nettle Farm hosted an on-farm field day in which 20 participants visited the farm to observe the figs growing in the high tunnel and to learn about the research underway. Each participant received a handout summarizing the variety trials. Attendees were able to tour the high tunnel, ask questions, and even sample ripe figs on this day.

The outreach component of this study also extended to the MOFGA Common Ground Fair, where Errickson delivered a presentation to 75 participants. Attendees received handouts summarizing the study, while viewing a slideshow summarizing the research. A question and answer session followed the presentation, and participants were invited to continue the conversation at the Singing Nettle Farm booth in the Farmers Market.

Our initial findings regarding hardy fig production in an unheated high tunnel in Maine suggest that, while it is possible to successfully ripen fruit, yields would improve with additional winter protection. While the majority of our trees regrew from the base after dying back in the frigid winter of 2014-2015, this level of winter injury most likely set them back in terms of earliness and overall amount of fruit that was able to ripen. If growers can maintain a greater degree of above ground winter survivability, the plants will have a better start, and potentially produce a better crop the following year. One way to achieve this is to lay the trees down in the fall by cutting the roots on one side with a spade, and covering them with a heavy layer of mulch. In the spring, the trees can be stood up again, though they may need additional support on the side with the severed roots. A minimal amount of supplemental heat may also be an option for growers who have that capability. Additional crops, such as winter greens, may simultaneously be grown in a heated winter greenhouse with the dormant fig trees, in order to maximize the use of the space, further justifying the extra expense and energy use of the supplemental heat. In the summer, additional crops such as melons, cucumbers may be grown as an understory companion to the figs that will become the greenhouse canopy.

Figs are also fairly easy to propagate from cuttings in the spring. This can provide both an additional source of plants for home use and/or another source of income from the sale of plants.

Exploring the possibilities of new crops for the region can be an exciting endeavor, and there is nothing like eating a fresh fig right off of the tree. In addition to the four figs trialed at Singing Nettle Farm, Brown Turkey and Hardy Chicago may also bring success if you can be sure you have a true strain. If you are encouraged to attempt growing figs, start small, with a few trees of different varieties. Hone your winter protection skills, and enjoy!

(1) Abo-El-Ez, A., Mostafa, R., and Badawny, I. “Growth and productivity of three fig (Ficus carica) cultivars grown under upper Egypt conditions.” Australian Journal of Basic & Applied Sciences, Feb2013, Vol. 7 Issue 2, p709-714. (2) Caliskan, O. and Polat, A. “Morphological diversity among fig (Ficus carica) accessions sampled from the Eastern Mediterranean region of Turkey.” Turkish Journal of Agriculture & Forestry, Apr2012, Vol. 36 Issue 2, p179-193. (3) Love, K. 2007. “Choosing the best figs for Hawaii.” SARE project number FW07-034. (4) Sheets, M. 2011. “Raising fig trees in high tunnels in the northeast.” SARE project number FNE11-727. (5) Coldwell, D. and Wells, O. 1997. “High tunnel strawberries for New England.” SARE project number FNE97-164. (6) Gundacker, E. 2009. “Growing blackberries organically under high tunnels for winter protection and increased production.” SARE project number FNC09-749. (7) Mielke, D. 2002. “The use of moveable high tunnels in the organic production of strawberries, potatoes, and raspberries.” SARE project number

FNC02-387. (8) Bahret, M. 2007. “Greenhouse ginger cultivation in the Northeast, Part II.” SARE project number FNE07-596. (9) Rutgers New Jersey Agricultural Experiment Station. “High Tunnels in New Jersey.” Accessed 2013 Nov 22