University of New Hampshire
NH Agricultural Experiment Station

Research Report: Figs for Cold Climates

April 2021

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Introduction

Figs are grown commercially in mild climates throughout the world. Figs have the potential to be a high-value crop in New England (current growers report crop value of $50 or more per plant); but to be profitable, the production system must involve low-cost winter protection, and give high yields per plant that ripen during the frost-free period each year. Fig trees are described as being able to survive low winter temperatures of 15-20F (Himelrick 1999), or 12-14F (Lawrence 1916); critical temperatures may be affected by cultivar, site microclimate, and specific planting conditions, all of which are generally known to affect susceptibility to cold temperatures.

Developing a fig production system for cold climates that is both reliably productive and feasible for commercial producers is a challenge. At least three distinct commercial operations have been awarded SARE grants to study protection systems for figs (Errickson 2013, Sheets 2011, Stoilov 2016), and there are a few commercial farms that grow and sell figs in cool climates; in Massachusetts (Dancing Bear Farm, Leyden MA, USDA hardiness zone 5b), Rhode Island (Paul 2013, USDA hardiness zone 7a) and Missouri (Stoilov 2016, zone 6a). While several producers have experimented with different protection strategies, none have conducted systematic evaluation in replicated experiments over years. In fact, the scientific literature completely lacks studies of the growth of this crop in cool climates.

Many hobby-gardeners have described successful strategies to grow figs in New England; using various strategies to protect them from freeze damage, such as growing them in pots that can be moved into a protected environment, growing in a heated greenhouse, or digging, wrapping and burying them in soil trenches (Vossbrinck 2015). We hypothesize that some combination of these strategies may provide sufficient protection to enable production of marketable figs for at least some cultivars.

Our objective was to study systems of winter protection of figs grown in-ground in Durham NH (zone 5B), and to begin investigating the effects of different pruning systems and protection strategies on growth and fruiting patterns for four fig cultivars: Ronde de Bordeaux, Marseilles Black, J.H. Adriatic, and Takoma Violet. Specifically, we explored the effects of rowcover, low tunnels, and/or high tunnels on overwinter survival and subsequent plant growth and fruit set for several fig cultivars.

What we did:

In summer 2017, we obtained large mother plants of several cultivars from Kerry Sullivan (Osborne's Agway Winnisquam, Belmont NH). Kerry has been propagating and selling a

diverse collection of figs to New England gardeners for several years. Once the plants had lost their leaves and gone dormant in the fall, plants were moved into a storage cooler and held at 40F until the following April. We watered occasionally to keep pots from drying out.

In 2018, fig cuttings were taken and rooted on 4/13 and 4/16/18. 12-18" pieces with 4-6 nodes were cut, dipped in IBA (Hormodin 2 or Hormodin 3, OHP, Mainland PA), and stuck in SureRoot 50 trays filled with ProMix BX. They were maintained in a high humidity greenhouse and watered with clear water as needed until well-rooted. Rooted cuttings were transplanted on 6/13 and 6/15/18. They were put into trade 1-gallon nursery pots, with Fafard #52 Metro mix 852, and fertilized with 15 grams per pot of Everris 15-9-12 Osmocote Plus 5-6month. Depending on variety, at the end of season, plants had 1-3 shoots that were each 2-4 feet long. In November, plants were moved into 40F storage for the winter, as described above.

In 2019, one-year old figs that were pruned back to 2 buds were transplanted in the ground *inside* a high tunnel on 26 April, and into the ground *outside* the high tunnel on 7 May 2019. Spacing was 4' within row and 4' between row. We used a split block design with winter protection treatments as the main plot, and variety as the subplot. A single plant was considered an experimental unit. Each plot included five plants. The following were included in all plots: RdB – Ronde de Bordeaux, TV – Takoma Violet, SR – Saint Rita, and JHA – J.H. Adriatic. The 5th plant was Maltese Beauty (half of the plots) or Malta Black (half of the plots).

Results: First Year Yields - 2019

In the high tunnel, ripe figs were harvested between 18 Sept and 8 Nov. Outdoors, ripe figs were harvested between 26 Sept and 22 Oct, when frost damage occurred.

Ripening was greatly advanced in the high tunnel compared with outdoors. Fig varieties differed greatly in their ability to ripen fruit during the frost-free period of their first year. In the high tunnel, Ronde de Bordeaux and Takoma Violet produced the most fruit, followed by Malta Black and Saint Rita. Outdoors, Ronde de Bordeaux did not ripen fruit, and Norella (which was not included in the high tunnel trial) produced a few ripe fruit.

Average number of ripe fruit produced per plant during the first year production.

Variety	Description	High Tunnel	Outdoors
J.H. Adriatic	Green (AKA White Madeira)	0.8	0
Saint Rita	Purple, Mt. Etna type	12.7	1.6
Takoma Violet	Purple, Mt. Etna type	21.9	1.5
Ronde de Bordeaux	Purple, small round fruits	22.0	0
Malta Black	Purple, Mt. Etna type	16.5	1.4
Maltese Beauty	Extremely large fruit, ripen to purple	1.3	0
Norella	Purple, Mt. Etna type	n/a	1.2
	Harvest period:	**9/18-11/8**	**9/26-10/22**

Winter Protection

The fig plants were kept in place over winter. Figs were left unpruned, and we tied all branches down to cinder blocks laid in the rows so we could observe the amount of winter dieback. We applied winter treatments on 6 November 2020, and deployed temperature sensors in soil (1 sensor per treatment) and air (2 sensors per treatment) all winter long.

Inside the high tunnel, our winter treatments were:

- Winter protection fabric (6 oz/yd^2) – one layer
- Bare – no protection
- Heavy rowcover (1.25 oz/yd^2) – two layers

Outside, our winter treatments were:

- Winter protection fabric (6 oz/yd^2) – two layers
- Low tunnel: Heavy rowcover (1.25 oz/yd^2) *AND* 6mil GH plastic supported by hoops.
- Leaf cage: Chicken wire cage built around plants, filled with chopped up leaves to a depth of around 3'tall and 3' wide.

Inside the high tunnel, there were four reps per treatment. Outdoors, there were three reps per treatment for leaf and winter protection fabric; two for low tunnels. Outdoors, guard rows had additional plants under winter protection fabric.

Results: Winter Survival and Temperatures

Inside the high tunnel, plants covered with ***two layers of heavy rowcover*** *OR* with ***winter protection fabric*** were more vigorous and had better winter survival (number of overwintered shoots that survived the winter and leafed out, length of shoots that survived the winter) than plants that were ***not protected***. Overall, all but two fig plants survived. The two plants that did not survive were not protected.

Outside of the high tunnel, plants ***buried in leaves*** were much more vigorous and had nearly complete winter survival (number of overwintered shoots that survived the winter and leafed out, length of shoots that survived the winter) compared with plants that were covered with ***two layers of winter protection fabric*** *OR* with ***low tunnels***. Overall, all but four fig plants survived. The four plants that died outdoors were killed by severe vole feeding that girdled the plants, rather than from winter injury per se. Vole damage was spotty throughout the planting; plants in all treatments were attacked; with damage more prevalent on plants buried in leaves. **Varieties did not show differences in winter survival**.

Temperature data were recorded throughout the late fall, winter and spring, until coverings were removed (14 April in the high tunnel, and 29 April outdoors). The 2019-2020 winter was relatively mild. The winter minimum cold temperature, -3.6°F, was reached on 15 Feb 2020. At the same time, it was 2.3°F inside the high tunnel. Under winter protection fabric or under two layers of rowcover inside the high tunnel, the temperature was 9.6°F. Outdoors, it was 8.1°F under the low tunnel and 11.9°F under two layers of winter protection fabric alone. Inside the leaf cage treatment, the winter minimum temperature was a surprisingly warm 38.8°F.

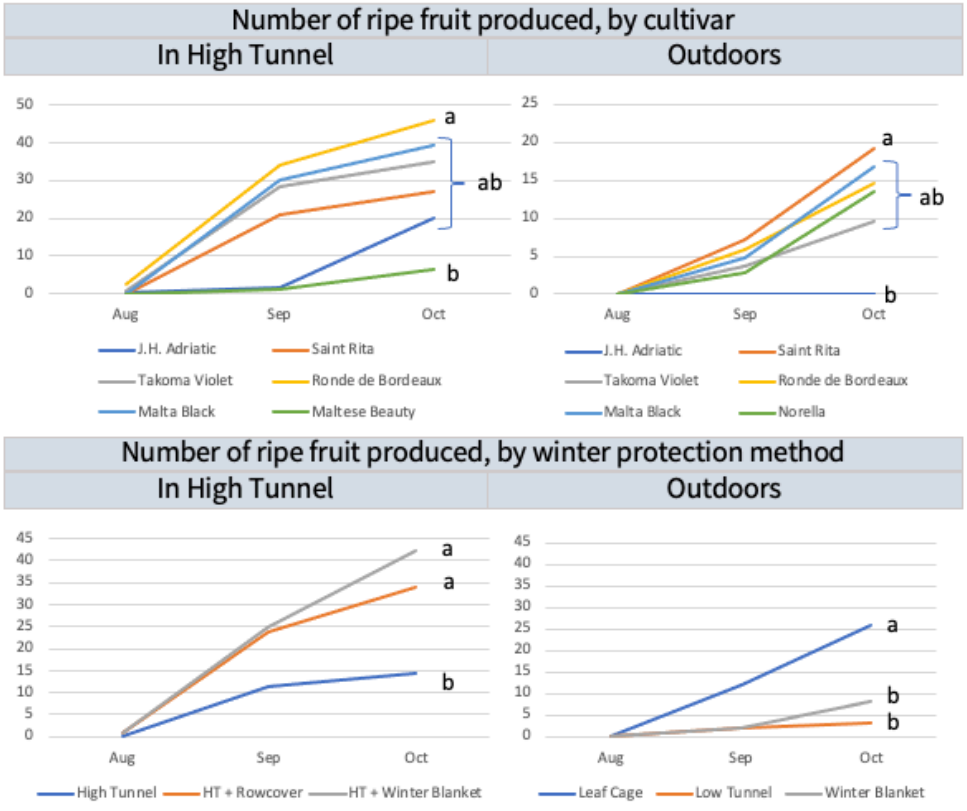
Results: Second-Year Yields & Variety Descriptions

After evaluating winter survival in early May, all dead branches were pruned. On 6 August, selected branches were removed on figs inside the tunnel, to permit access to each row for data collection (it was a jungle in there). Fruit were harvested from 19 Aug to 26 Oct in the tunnel, and from 1 Sept to 19 Oct outdoors.

Average number of ripe fruit produced per plant during second year production.

Variety	High Tunnel[x]	Outdoors
J.H. Adriatic	21.9 c	0.0 b
Saint Rita	47.8 bc	44.5 a
Takoma Violet	63.8 ab	15.3 ab
Ronde de Bordeaux	82.2 a	22.0 ab
Malta Black	84.1	27.3
Maltese Beauty	7.7	0.0
Norella	n/a	16.4
Harvest period:	**8/19-10/26**	**9/1-10/19**

[x]Values followed by the same letter are not significantly different from one another. We were only able to make statistical comparisons between the first four varieties, highlighted in green.



Outdoor fig production. Figs growing outdoors produced relatively low yields of ripe fruit quite late in the season. Of the varieties we evaluated, later varieties (JH Adriatic, Maltese Beauty) never fruited when grown outdoors. Even though nearly all plants survived the 2019-20 winter and regrew, the winter protection strategy greatly impacted yields. Plants protected by a leaf cage produced significantly higher yields, earlier, than those protected by a winter blanket or a low tunnel.

High tunnel fig production. In a high tunnel, ripe fruit were harvested as early as mid-August, and we were able to continue harvesting until the very end of October or early November, an additional 2 weeks after outdoor plants were impacted by frost. Ronde de Bordeaux was the earliest variety to ripen, and produced the greatest number of fruit overall. Even in the high tunnel where figs had nearly 100% survival over winter, winter protection strategy did affect subsequent yields. Those protected by an additional winter blanket or double layer of heavy rowcover outyielded those that were unprotected.

Variety Descriptions:

Ronde de Bordeaux – fruits 20-27g; 10 fruit per dry pint clamshell. Small, dark purple. Early and productive.

Malta Black – fruits 30-40g; 5-7 fruit per dry pint clamshell. Dusky purple mid-sized fruit.

Maltese Beauty – fruits 60-75g. Giant late-ripening fruit, purple with yellow background.

Saint Rita – fruits 30-45g; 5-7 fruit per dry pint clamshell. Dusky purple mid-sized fruit.

Takoma Violet – fruits 30-45g; 5-7 fruit per dry pint clamshell. Dusky purple mid-sized fruit.

JH Adriatic – fruits 30-40g; 4-6 fruit per dry pint clamshell. Large fruit ripen to green-yellow when mature; flesh is a deep rich red.

Malta Black

Ronde de Bordeaux

Saint Rita

Takoma Violet

J.H. Adriatic

Maltese Beauty

Economic Viability and Marketing

Maximum fruit quality is obtained when fruit are harvested completely ripe; at these stages, they are extremely soft and perishable. Fresh market figs must be harvested when almost fully ripe; must be handled with care to prevent wounding, and they should be cooled to 0°C (32°F) immediately. At optimum temperature and relatively humidity, the maximum postharvest life ranges from 1-2 weeks without controlled atmosphere storage; in practice it is often less than this.

We have not conducted research focused on marketing and economic viability, but we share the following information to help facilitate those calculations. Assuming the spacing we used in the high tunnel (4' in all directions), the following calculations can be used to estimate the value per square foot of tunnel space, based on a range of fruit yields. For comparison, high tunnel tomato sold at $3.50/lb, using typical plant spacing and yields typically produces values from $2.04-$8.17/square foot).

Estimated production value ($ per plant, $ per square foot) for figs assuming an average of 7.7 fruit per pint and a price of $5 per pint.

No. Fruit per Plant	Weight (g)	No. Dry Pints	Price/Pint	$ per Plant	$ per square foot of tunnel
20	611	2.59	$5.00	$12.96	$0.54
50	1527	6.48	$5.00	$32.41	$1.35
70	2138	9.07	$5.00	$45.37	$1.89
100	3054	12.9	$5.00	$64.81	$2.70
150	4581	19.4	$5.00	$97.22	$4.05

Average second-year yields (number of fruit) for all combinations of variety and winter protection strategy in a high tunnel.

	High Tunnel alone	High Tunnel plus Rowcover	High Tunnel plus Winter Blanket
JH Adriatic	10.8	27.8	27.3
St. Rita	4.8	74.0	64.8
Takoma Violet	34.5	64.5	92.3
Ronde de Bordeaux	76.5	63	107

Current and Future Work; Challenges and Areas to Explore

- Currently, similar winter treatments were applied in Fall 2021 to the same plots; we will update results as soon as spring growth and overwinter survival become obvious.
- Vole damage in very protected treatments (under winter blankets, low tunnels, and within leaf cages) can be severe. It will be key to find successful strategies to protect plants from vole damage using these systems.

- We still need to optimize pruning strategies. Our current thinking is that it makes sense to prune back in fall to low lateral branches that run along the length of the rows prior to overwintering, but this may change.
- Methods to promote early season growth to allow fruit to ripen prior to fall frost; especially outside of high tunnel, could dramatically improve yields. This could include the use of moveable tunnels, caterpillar tunnels, and/or temporary low tunnels – but as of yet, we have not explored this.
- Our results suggest that there were not dramatic differences in winter hardiness between the varieties we evaluated. We can't infer about other varieties, and it would be very interesting to expand this work to include additional popular varieties.
- Fig is certainly susceptible to spotted wing drosophila. In our experience, regular harvest and immediate chilling minimizes problems, but this is a concern that would warrant management in commercial operations.
- Culture in pots is a viable approach for those who have access to protected winter storage space and a way to move pots in bulk between winter and summer locations.

Conclusions

While our preliminary results have shown that figs can be grown in-ground in northern New England, there are many challenges that must be addressed. Note that these are preliminary results, and we would suggest exercising caution before establishing extensive plantings of fig; we don't yet have sufficient data to provide research-based recommendations.

Works Cited & References

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Acknowledgements

This work is supported by NH Agricultural Experiment Station, the NH Vegetable & Berry Growers' Association, and UNH Cooperative Extension. We are grateful to Evan Ford, Kyle Quigley, David Goudreault, Luke Hydock, Iago Hale, Will Hastings, and Kerry Sullivan for technical support, inspiration, and collaboration.

Sources of Fig Plants

There are many nurseries that specialize in fig varieties, both as established plants and as cuttings. There are also avid communities of fig enthusiasts (https://www.figbid.com/, https://www.ourfigs.com/) who discuss, sell, and trade fig cuttings and plants. Among local nursery sources, the following online sources, listed in alphabetical order, are provided as a service. We do not endorse the sources listed, nor discriminate against those not listed.

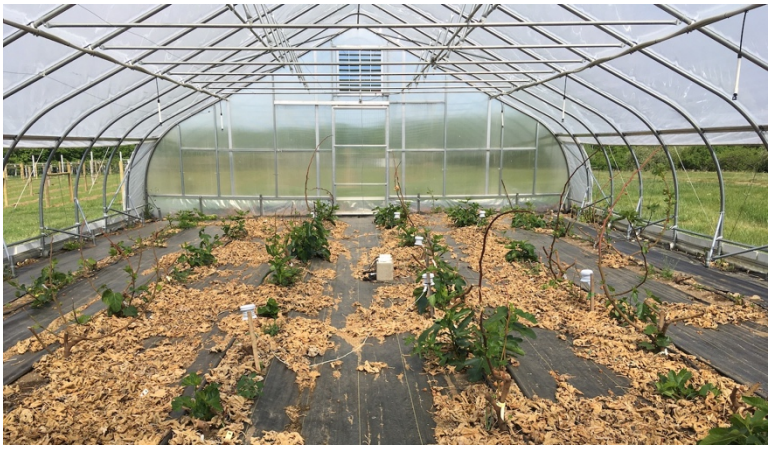
Almost Eden Plants, Merryville LA
Bay Flora, Berkeley CA
Burnt Ridge Nursery, Onalaska WA
Edible Landscaping, Afton VA
Encanto Farms, San Diego CA
Figaholics, CA
Four Winds Growers, Watsonville CA
Gurney's Seed & Nursery Co., Greendale IN
Hirts Gardens, Medina OH
Just Fruits & Exotics, Crawfordville FL
Kremp Florist, Willow Grove PA
Logee's Nursery, Danielson CT
Off the Beaten Path Nursery, Lancaster PA
Peaceful Valley Farm, Grass Valley CA
Planting Justice, East Oakland CA
Rabbit Ridge Nursery, Coats NC
Raintree Nursery, Morton WA
Stark Brothers, Louisiana MO
Three Fold Farm, Mechanicsburg PA
Top Tropicals, Fort Meyers FL
Trees of Antiquity, Paso Robles CA
Trees of Joy, Bethlehem PA
Wellspring Gardens
Whitman Farms, Salem OR
Willis Orchard Co., Cartersville GA
Wills Figs, FL

Questions?

With any questions, please contact the author at: becky.sideman@unh.edu or 603-862-3203. You can follow the Sideman Lab's work on Instagram @unh_sidemanlab.

Illustration of winter protection treatments for outdoor figs: winter protection fabric (far left), low tunnel (just left of center), and leaf cage (center of photo).

High tunnel figs showing protection methods during January: unprotected, heavy rowcover, and winter blanket (front of photo from left of center to right).



High tunnel figs in early May of their second year, beginning to leaf out.

High tunnel figs in October, near the end of the harvest season in second year.