

Variety Trial for Overwintered Spinach Production in Low Tunnels

INTRODUCTION

In response to increasing demand for local vegetables, growers are extending their production into the colder months. Low tunnels are one cost-effective option for prolonging the fall harvest season until just prior to snow cover, as well as for growing hardy crops for early spring harvest. These temporary, unheated structures afford less winter protection than the more widely used high tunnels, and are inaccessible after the ground freezes. However, low tunnels provide sufficient winter protection for hardy fall-planted crops to survive and regrow, speeding up spring harvest by 4-5 weeks compared to spring-planted crops. Low tunnels can be erected for under \$1.00 per square foot of usable bed space, estimated to be 5% of the cost of a 4-season greenhouse (Coleman 2009) or 15-30% of the cost of an unheated tunnel (Sideman). They offer the advantage of being moved annually, allowing rotation of winter production areas. Spinach is one of the hardiest, freeze-tolerant greens and is widely grown and overwintered in the Northeast, both in unheated high tunnels and in the open. In this trial, we explored the potential for inexpensive production of spinach under low tunnels, and evaluated varieties for their spring yield and quality.



Spinach transplants three weeks after transplanting, following a late October snowstorm.

METHODS

We established 100' long low tunnels over 5' raised beds covered with black plastic mulch. Our hoop system consisted of 10' electrical conduit pipe shaped with a hoop bender (Johnny's Selected Seeds, Albion, ME) to be 5 ft wide at the base. Hoops were placed 5 ft apart over the bed.

We tested two varieties of savoyed spinach, Tyee and Spargo, one semi-savoyed variety Space and two smooth-leaf varieties Red Cardinal and Corvair (see Table 1). Red Cardinal had heavier, more succulent leaves than the others. All varieties were obtained from Johnny's Selected Seeds.

Variety	Type	Days to maturity
Tyee	savoyed	40
Corvair	smooth leaf	39
Spargo	savoyed	37
Space	semi savoyed	39
Red Cardinal	smooth leaf	32

Spinach was seeded in the greenhouse on September 9, 2011 and transplanted to the field on October 11. Each plot consisted of 60 plants, in 3 rows of 20 plants each on black plastic, 6 inches between rows and 4 inches between plants. The plants were covered with a layer of 1.25 oz row cover on November 2, around the date of first frost, and a layer of 6 mil Greenhouse plastic was added on December 13. Greenhouse plastic and row cover were removed on March 21. We measured % survival, % bolting, and cut harvestable leaves from the center 10 plants of each row on March 26. After measuring total weight of leaves per plot, undamaged leaves of suitable quality for direct market sales were separated and weighed to give marketable weight.

RESULTS

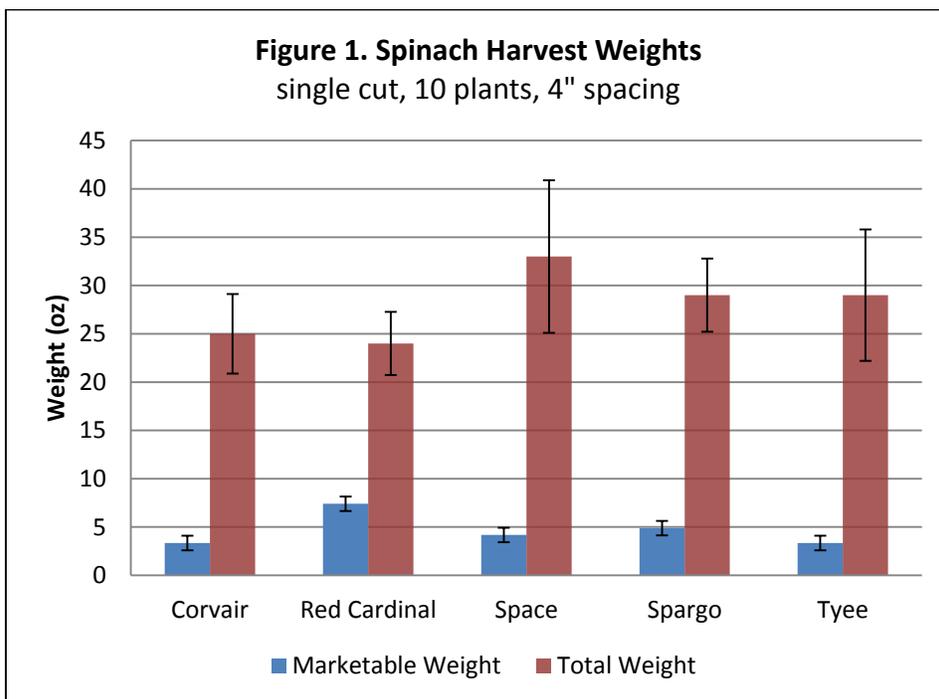
Spinach grew well in the fall and had produced harvestable, high quality leaves by mid-December when the plastic cover was applied. When plots were uncovered on March 21, many of the larger leaves had died back over the winter but new growth was strong. All the varieties showed high winter survival, averaging 97.3% across varieties with the lowest being Spargo at 94% survival. On March 26, bolting was 0% in all varieties except Red Cardinal, which had 75% of plants bolted. Bolting consisted of elongated stalks with smaller leaves, but did not include flowering, so the plants still had marketable leaves.

Both the plastic and the row cover were removed on the same day, exposing the plants to cold and desiccating winds. By the time the harvest sample was taken five days later, tip burn from wind was widespread in all varieties, causing a large reduction in marketability of leaves. Across all plots, we also observed some limp leaves and gooey or slippery stems and clusters of aphids that had survived the winter under the cover. Total weights ranged from 24 to 33 oz/10 plants with Spargo being the highest, while marketable harvest weights were 3.3 to 7.4 oz with Red Cardinal having the highest marketable yield. (see Figure 1, below).

CONCLUSIONS

The timing of planting produced full grown plants before winter. To maximize total yield from spinach, fall harvest in late November or December before tunnels are covered with would possibly result in fewer winter-killed leaves in spring, leaving mainly fresh leaves from early spring regrowth that is easier to pick. Winter survival was very high in all varieties and bolting was not a problem when the crop was harvested in late March, except the variety Red Cardinal. The first cut after covers were removed produced a total

1.5 to 2 lb per 10 ft of row. However, spinach regrowth in the tunnel produced tender leaves that were highly sensitive to windburn which dramatically reduced marketable yield. It is possible that removing the two covers in stages would prevent excessively high temperatures without as much wind damage. Harvesting immediately after the row cover is removed may be critical to maintaining crop quality. In this study, subsequent harvest samples were not taken, but the spinach did continue to regrow and produce good quality leaves in April which would add to the total yield from the crop. Variety availability changes frequently in spinach. Among varieties trialed here, Spargo and Red Cardinal are no longer available in 2014. There are new spinach varieties every year, and growers may benefit from trailing new varieties on a regular basis, to be ready to adapt if favorite varieties leave the marketplace.



Authors: Amanda Brown, Zara Dowling, Ruth Hazzard, Lisa McKeag, UMass Extension Vegetable Program. Published December, 2014.

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See accompanying photographs.