

High Tunnel Spinach Production

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Introduction

Spinach (*Spinacia oleracea*) is one of the most productive and adaptable leafy green vegetable crops which can be grown in high tunnels (Figure 1). Spinach is a cool season vegetable and can be established by either direct seeding or transplanting. The typical seeding window for spinach in a high tunnel is August through April. Spinach is extremely cold tolerant and will be one of the most reliable deep winter vegetable crops in the high tunnel. Generally, spinach is not seeded in the summer since most cultivars will flower during the extended day length.

For fall production of spinach, the crop can be seeded in August. Since high soil temperatures can reduce germination and vigor, spinach seed can be chilled in a refrigerator (38-45°F) 48 h prior to sowing. After sowing, watering will be needed to promote uniform germination and growth. When transplanting spinach, the seed (2 seeds/cell) is sown in a 120-200 cell germination tray and planted as a 4-5 week old plug. Transplanting may be more efficient if the soil temperature is not conducive to direct seeding. Prior to seeding, approximately 2.5 lbs./1000 ft² of actual nitrogen should be applied. Spinach can be seeded about 1-2 inches between seeds and 6-8 inches between rows. Transplants can be seeded 4 inches apart within the row. Spinach can be seeded or transplanted into a plastic or paper mulch for weed control or bare soil. Beets and Swiss chard are botanically related to spinach, so these crops must not be chosen for rotation. Spinach can be effectively rotated with other leafy greens such as kale or lettuce. For continuous production, spinach is sequentially seeded every 2-3 weeks. Baby leaf spinach is harvested when the leaf is approximately 2 inches long while full-leaf spinach is typically 4 inches in length. The leaves are cut with the stems attached, triple-washed, bagged and placed in a cooler (32-36°F) until market. Typically 4-5 harvests are made from each planting.



Figure 1. Spinach can be grown 10 months per year within high tunnels.

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Materials and Methods

Spinach was seeded in a 4-row bed within a single layer high tunnel at the WVU Kearneysville Farm in early March, 2017. The soil at this farm is a silt loam with a pH of 6.8. Prior to seeding, 46 lbs./1000ft² of 5-4-3 Harmony® fertilizer was applied and tilled into the beds. The spinach was hand-seeded with each seed ≈1 inch apart in-row and 6 inches between rows. Each plot was 6 ft². In addition, spinach was transplanted within a double-layer high tunnel in Hardy County, WV in November, 2016. The transplanted spinach was spaced 4 inches apart in a 4-row bed covered with black plastic mulch. Twenty varieties of spinach were evaluated for yield and quality. Two sequential harvests were made per variety. The cut leaves were sorted and fresh weight recorded. In addition, color, flavor and overall quality were subjectively rated. Each variety was replicated twice in a randomized complete block design.

Results

‘UniPack 12’, ‘Regiment’, ‘Violin’ ‘Cello’ and ‘Mandolin’ were excellent cultivars, exhibiting both high yield and quality (Table 1; Figure 2). ‘Violin’ was the highest yielding smooth leaf cultivar while ‘Regiment’ and ‘Unipack 12’ were the highest yielding savoy cultivars.

Table 1. Marketable yield and quality of select spinach cultivars Spring-2017.

Cultivar	Fresh wt. (g)/ft ²	Color ^z	Quality ^y	Leaf description
Abundant Bloomsdale	38.6	4.8	4.8	Savoy leaf
Caladonia	21.9	3.8	3.9	Smooth leaf
Cello	59.5	4.8	4.8	Savoy leaf
Corvair	52.0	4.7	4.6	Smooth leaf
Escalde	33.1	4.3	4.2	Semi-savoy leaf
Emperor	56.9	4.9	4.5	Savoy leaf
Freja	45.8	4.5	4.5	Smooth leaf
Molokai	36.6	4.6	4.6	Smooth leaf
Mandolin	59.3	4.7	4.5	Semi-savoy leaf
Red Kitten	38.3	4.4	4.5	Red vein and smooth leaf
Regiment	76.1	4.9	4.9	Savoy leaf
Scorpius	44.3	4.7	4.7	Smooth leaf and heat tolerant
Toucan	42.3	3.8	4.0	Smooth leaf
Unipack 12	80.4	4.8	4.6	Semi-savoy leaf
Verdil	43.2	4.0	4.0	Smooth leaf
Violin	64.2	4.8	4.8	Smooth leaf
Woodpecker	54.0	4.2	4.3	Semi-savoy leaf
<i>Standard error</i>	<i>3.6</i>	<i>0.1</i>	<i>0.1</i>	

^{xy}Rating scale: 1-5; 1=poor color (light green) or quality and 5= dark green, glossy with excellent quality

In late spring, ‘Scorpius’ was observed to have heat tolerance (i.e., no bolting) and thus, could possibly be grown as a summer spinach.

‘Regiment’ and ‘Emperor’ were productive during the winter season (Table 2). ‘Red Kitten’ had red veins and can be blended with traditional green spinach for a color mix.

Table 2. Marketable yield and quality of select spinach cultivars- Winter 2016-17.

Cultivar	Fresh wt (g)/ft ²	Quality ^z	Leaf description
Abundant Bloomsdale	44.6	5.0	Savoy leaf
Acadia	51.8	5.0	Semi-savoy leaf
Corvair	53.8	4.6	Smooth leaf
Giant Winter	83.8	4.0	Savoy leaf
Escalde	61.6	4.0	Semi-savoy leaf
Emperor	107.3	5.0	Semi-savoy leaf
Flamingo	71.3	3.5	Arrowhead shaped leaf (poor flavor)
Red Kitten	47.8	5.0	Smooth leaf
Regiment	71.8	5.0	Savoy leaf
Verdil	49.5	4.0	Smooth leaf
Woodpecker	95.3	5.0	Smooth leaf
<i>Standard error</i>	<i>3.7</i>	<i>0.1</i>	

^zRating scale: 1-5; 1=poor color (light green) or quality and 5= dark green, glossy with excellent quality

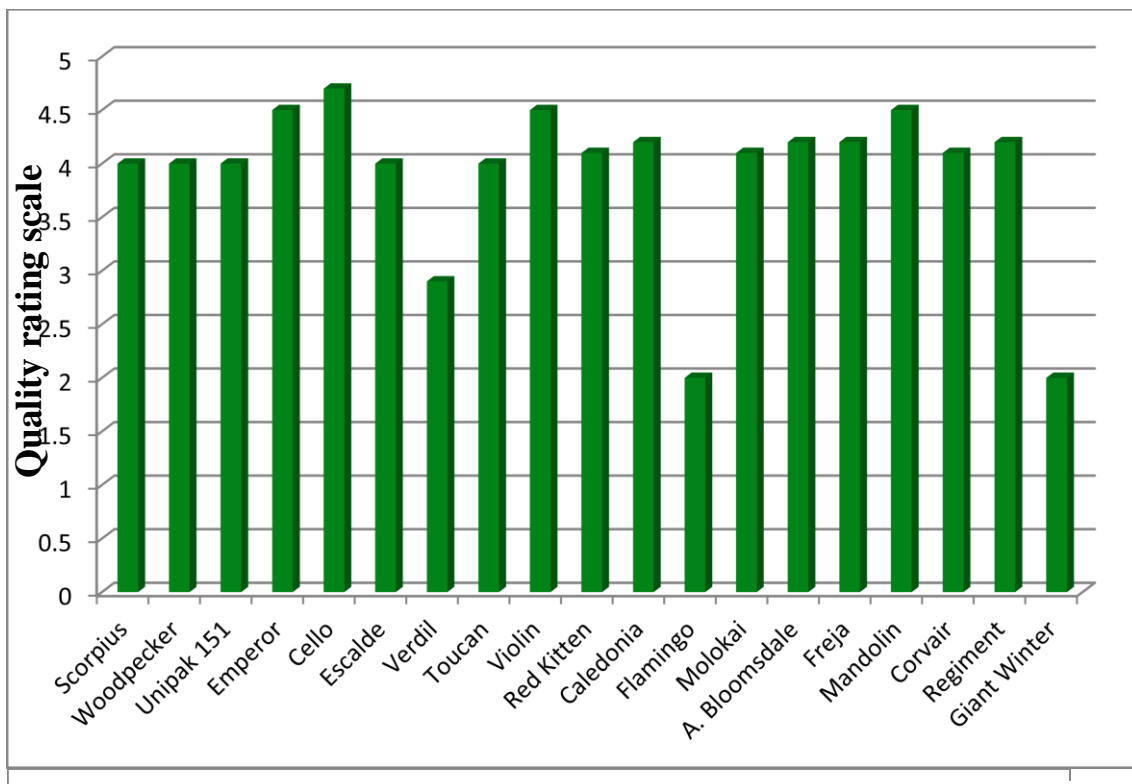


Figure 2. Flavor rating of spinach cultivars^zRating scale: 1-5; 1=poor texture/flavor and 5= excellent flavor/texture



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