Bok Choi Cultivars for High Tunnel Production

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Introduction

Bok choi is a cool season annual vegetable that is a popular cooking salad green. There is growing demand for locally grown bok choi as grocery chains continuously diversify their produce within the state. A number of local grocery chains carry the product in Iowa. A large number of Community Supported Agriculture operations grow this crop but need information about cultivars that can perform well inside high tunnels.

This study evaluated the performance of nine bok choi cultivars under high tunnel production. Cultivars evaluated included Black Summer, Feng Qing, Joy Choi, Mei Qing, Red Choi, Shiro, Toy Choy, White Flash, and Win-win Choi (Figure 1).

Materials and Methods

The study was conducted in a 30 ft by 96 ft high tunnel at the Armstrong Research Station, Ames, Lewis, Iowa. A pre-plant nitrogen fertilizer application of 50 lb/A was made in April 2015. Bok choi cultivars were seeded in 72-celled trays on March 26, 2014, and grown inside the greenhouse for four weeks. Plants were acclimatized for a week under a lathhouse and later transplanted on raised beds with white-on-black plastic mulch on May 5, 2014.

Each cultivar had 14 plants per bed (two rows with 7 plants in each row). The distance between plants within row and between rows was 12 inches. Rows were staggered to provide maximum space for growth. The experimental design was a randomized complete block design with four replications. The crop was harvested on June 10, 2014. Before harvest, observations were made on plant characteristics and quality. The crop was graded and separated into marketable and non-marketable categories.

Results and Discussion

The high tunnel was side-ventilated throughout the growing period to keep the air temperature optimal for bok choi growth. Observations made at the time of harvest are presented in Table 1. Treatment differences were observed between cultivars for marketable and non-marketable number and weight. Black Summer, Feng Qing, and White Flash produced higher number marketable heads than Red Choi, Shiro, and Toy Choy (Table 2). Two cultivars that produced higher yields than all other cultivars were Joy Choi and White Flash. The next best cultivars were Black Summer, Feng Qing, Mein Qing, and Win-win Choi. Shiro and Toy Choy did not produce any marketable heads. Red Choi also did not produce good yields. Non-marketable head weights were higher for Shiro and Toy Choy than any other cultivar.

Low yield and poor performance of Red Choi, Shiro, and Toy Choy cultivars can be attributed to premature bolting. All 14 Shiro and Toy Choy plants were bolting at the time of harvest. Bolting is triggered when bok choi plants are exposed to temperatures below 50°F for a period of time, and that response is cultivar-dependent (Figure 2). Higher temperature can also reduce bok choi quality as it leads to soft and bitter heads.

Based on results from this study, growers should avoid planting Red Choi, Shiro, and Toy Choy cultivars if extended periods below 50°F are expected. These cultivars may be more appropriate for fall harvest. Given the increase in direct market sales of vegetables through Community Supported Agriculture, farmers markets, farm stands, etc., there is huge potential for growers to diversify leafy green production. Bok choi cultivars tested in this study such as Joy Choi and White Flash can produce high yields and increase profitability of the high tunnel enterprise.

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Black Summer: Broad, vase-shaped head, dark green leaves; light green petioles.	Joy Choi: Dark green leaves; thick, flattened, white petioles. Leaves have crinkled appearance.	Red Choi: Dark maroon leaves; greenish petioles; small plant; tendency to bolt under heat; tendency to wilt sooner after harvest.
		(Photo not available.)
White Flash: Upright; compact heads; large leaves; white petioles.	Win-win Choi: Vase-shaped; large leaves; white petioles.	Mei Qing Choi: Vase-shaped; large leaves; greenish petioles.
(Photo not available.)	(Photo not available.)	(Photo not available.)
Shiro: Small; flat head; susceptible to bolting.	Toy Choy: Compact, dark green leaves; white petioles; susceptible to bolting.	Feng Qing: Vase-shaped; large leaves.

Figure 1. Characteristics of bok choi cultivars grown at the Armstrong Research Station, Lewis, Iowa in 2014.

Figure 2. Bok choi plants flowering after exposure to extended periods of temperatures below 50°F.

Table 1. Observations made at the time of harvest at Armstrong Research Station, Lewis, Iowa, in 2014.

Cultivar(s)	Observations
Black summer	Plants large but excessive insect damage
Feng Qing	Green petiole; very less insect damage; not a very tight head
Joy Choi	Center leaves collapsing due to heat; some rotting at the base; insect damage observed
Mei Qing	Very little insect damage but excessive basal rotting
Red Choi	Less insect damage than Black Summer or Joy Choi but 50% of the plants are bolting
Shiro	100% of the plants have bolted and have seed pods
Toy Choi	Similar to Shiro; 100% of the plants have bolted and carry seed pods
White Flash	Older leaves smooth while the younger leaves are crinkled; older leaves have insect damage
Win Win Choi	20% of plants bolting; not a very tight head

Table 2. Yield response of bok choi cultivars grown at the Armstrong Research Station, Lewis, Iowa, in 2014. Each treatment was replicated four times and had 14 plants/replication.

Treatment	Marketable		Non-marketable	
	Number	Weight (kg)	Number	Weight (kg)
Black Summer	13 a*	5.3 b	1 b	0.7 bc
Fen Qing	13 a	5.1 b	1 b	0.2 c
Joy Choi	13 b	6.9 a	1 b	0.4 bc
Mei Qing	12 a	5.0 b	2 b	0.7 bc
Red Choi	4 a	0.5 c	10 a	1.2 b
Shiro	0 c	0 c	14 a	2.8 a
Toy Choi	0 c	0 c	14 a	2.5 a
White Flash	13 a	6.5 a	1 b	0.4 bc
Win-win Choi	11 b	5.6 b	3 b	1.1 b

*Mean separation within columns by Fisher's protected LSD ($P \leq 0.05$). Means followed by different alphabets are statistically significant.