Collard Cultivar Evaluations in Northern Florida

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SUMMARY. Nine collard (*Brassica oleracea* acephala group) cultivars were evaluated on six experiments over 4 years to determine how well they performed with respect to yield, plant weight, and bolting tolerance. Experiments covered spring, fall, and winter seasons to determine if one cultivar would be useful for all conditions. 'Top Pick', 'Flash', and 'Blue Max' were found to be the best performing cultivars with respect to yield and plant weight. In general, the hybrid cultivars outperformed the open-pollinated cultivars. Only during one experiment were the cultivars subjected to environmental conditions favorable for bolting, but there were no significant differences in incidence of bolting among the cultivars. Although top-performing cultivars were hybrids, the cost associated with hybrid seed must be considered.

Collard greens are a primitive member of the Brassicaceae that are grown for their rosette of thick, dark green leaves, which are eaten primarily as cooked greens or pot herbs. Collards, along with most greens, are an excellent source of fiber, vitamins A and C as well as minerals (Peirce, 1987). The acephala group of *Brassica oleracea*, which includes collard and kale, are thought to have originated in western Europe or the Mediterranean (Boswell, 1949; Rubatzky and Yamaguchi, 1997). Collards traditionally have been a crop that was grown primarily during cool seasons in the southern and eastern United States. However, expanding markets have led to year-round production in some areas. The last year in which the U.S. Department of Agriculture collected production data on collards was 2001. In that year, there were 14,100 acres of collards harvested in the United States with the primary production states being Georgia, North Carolina, South Carolina, and Alabama (U.S. Department of Agriculture, 2001).

Collards are tolerant of a wide range of temperatures, but bolting may be initiated by prolonged exposure to cold temperatures, 40 °F or less, followed by a period of warmer weather (Peirce, 1987). Multiple

open-pollinated and hybrid collard cultivars are available that vary in phenotypic characteristics, tolerance to disease and environmental conditions, and tendency to exhibit nutritional disorders (Dufault et al., 1992; Farnham and Garrett, 1996; Farnham et al., 2001; Johnson, 1991).

The objective of this research was to evaluate collard cultivars over multiple seasons to determine the top-performing cultivars for the northern Florida and southern Georgia growing areas.

Materials and methods

Experiments were performed at the North Florida Research and Education Center (NFREC) in Quincy, FL, between 2003 and 2006. Soil type at NFREC was Norfolk loamy sand (fine-loamy, kaolinitic, thermic Typic Kandiudults). Six experiments were conducted using nine collard cultivars. Cultivars evaluated were 'Blue Max', 'Champion', 'Flash', 'Georgia', 'Heavi-Crop', 'Morris Heading', 'Top Bunch', 'Top Pick', and 'Vates'. These cultivars were chosen because they are a representation of nearly all commercially available collard cultivars that were available during the entire experiment. Five of the cultivars used were

hybrids ('Blue Max', 'Flash', 'Heavi-Crop', 'Top Bunch', 'Top Pick') and four cultivars were open-pollinated ('Champion', 'Georgia', 'Morris Heading', 'Vates'). Complete cultivar information is presented in Table 1.

Seeds were sown in the greenhouse into expanded polystyrene flats of the inverted pyramid design with cell dimensions of 1 × 1 × 3 inches deep. Seedlings were grown for 4 to 6 weeks before transplanting, depending on season. Plots consisted of a single row 26 ft long with between-row spacing of 3 ft and in-row spacing of 12 inches corresponding to a planting density of 24 plants/plot and 14,520 plants/acre. Fertilizer was applied at a rate of 160 lb/acre nitrogen, 35 lb/acre phosphorus, and 66 lb/acre potassium. Fertilization was based on University of Florida Institute of Food and Agricultural Sciences (UF-IFAS) recommendations (Olson et al., 2006). Experimental design was a randomized complete block with four replications on each experiment. Pest management practices recommended by UF-IFAS were used as needed (Olson et al., 2006). Overhead irrigation was used to supplement rainfall as needed.

Once-over harvests of marketable collard plants were made at 74, 73, 66, 104, 71, and 73 d after transplant for the six experiments (the following dates are transplant dates: 11 Sept. 2003, 9 Mar. 2004, 24 Sept. 2004, 11 Jan. 2005, 3 Oct. 2005, 25 Sept. 2006, respectively). Plants that had bolted or exhibited a growth habit different from the remainder of the plot were considered nonmarketable or an off-type and not included in yield data. Yield from individual plots was converted to number of 25-lb boxes per acre. Analysis of variance for yield and average plant weight was performed using the GLM procedures of SAS (version 9.1; SAS Institute, Cary, NC) and means separation was accomplished using Duncan's multiple range test.

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Units

To convert U.S. to SI, multiply by	U.S. unit	SI unit	To convert SI to U.S., multiply by
0.4047	acre(s)	ha	2.4711
0.3048	ft	m	3.2808
2.54	inch(es)	cm	0.3937
0.4536	lb	kg	2.2046
1.1209	lb/acre	kg·ha ⁻¹	0.8922
(°F - 32) ÷ 1.8	°F	°C	(1.8 × °C) + 32

Results and discussion

Collard cultivar significantly affected yield and plant weight but did not affect the percentage of bolted plants. Complete yield and plant weight data are presented in Tables 2 and 3.

Cultivar averages are discussed because they provide the greatest insight into the cultivars' performance. The top-yielding cultivar was 'Top Pick', which produced 1996 boxes/acre; however, it was not significantly greater than 'Flash', 'Blue Max', or 'Top Bunch' at 1922, 1868, and 1762 boxes/acre, respectively (Table 2). 'Top Pick' did yield significantly more boxes per acre than the remaining cultivars. There were no significant differences in yield among 'Flash', 'Blue Max', 'Top Bunch', 'Heavi-Crop', and 'Morris Heading'. 'Flash' and 'Blue Max' did yield significantly more boxes per acre than 'Champion', 'Vates', and 'Georgia', but 'Morris Heading', 'Heavi-Crop', and 'Top Bunch' did not.

'Top Pick' had the largest plant weight at 3.5 lb, which was not significantly greater than 'Flash' and 'Blue Max' at 3.3 lb (Table 3). There were no significant differences in plant weight among 'Flash', 'Blue Max', 'Morris Heading', 'Heavi-Crop', 'Champion', and 'Top Bunch'. 'Georgia' produced plants with the lowest weight but were not significantly different from 'Vates', 'Top Bunch', 'Champion', 'Heavi-Crop', or 'Morris Heading'.

During the crop that was planted on 11 Jan. 2005, conditions were favorable for bolting and some plots exhibited bolting in up to 100% of the plants. Average percentage of bolted plants by cultivar ranged from 7% to 31% (data not presented). Although bolting was prevalent, variability was such that cultivar did not significantly affect the percentage of bolted plants.

These cultivar evaluations were performed during a wide range of environmental conditions that are representative of nearly all environments in which collard are produced. The top-performing cultivars for both plant weight and yield were 'Top Pick', 'Flash', and 'Blue Max', all hybrid cultivars. In both categories, 'Top Pick' outperformed all open-pollinated cultivars and yielded

Table 1. Collard cultivars evaluated on multiple planting dates in Quincy, FL, from 2003 through 2006.

Cultivar	Seed source	Hybrid or open-pollinated (OP)
Blue Max	American Takii, Salinas, CA	Hybrid
Champion	Multiple sources	OP
Flash	Sakata Seeds America, Morgan Hill, CA	Hybrid
Georgia	Multiple sources	OP
Heavi-Crop	American Takii	Hybrid
Morris Heading	Multiple sources	OP
Top Bunch	Sakata Seeds America	Hybrid
Top Pick	Sakata Seeds America	Hybrid
Vates	Multiple sources	OP

Table 2. Collard cultivar yield data from cultivar evaluations in Quincy, FL, during 2003 through 2006.

Cultivar	Yield [no. 25-lb (11.3 kg) boxes/acre] ^a						Cultivar avg ^x
	11 Sept. 2003 ^y	9 Mar. 2004	24 Sept. 2004	11 Jan. 2005	3 Oct. 2005	25 Sept. 2006	
Top Pick	2,342	2,613	1,230	2,202	1,973	1,613	1,996 a
Flash	2,273	2,701	1,374	1,561	1,921	1,704	1,922 ab
Blue Max	2,033	2,541	1,536	1,890	1,717	1,490	1,868 ab
Top Bunch	1,909	2,919	1,056	1,230	1,771	1,689	1,762 abc
Heavi-Crop	1,727	2,245	1,005	2,114	1,510	1,448	1,675 bc
Morris Heading	1,635	2,182	1,102	1,981	1,434	1,648	1,664 bc
Champion	1,478	2,206	953	2,223	1,598	1,392	1,642 c
Vates	1,672	1,993	1,102	1,410	1,597	1,657	1,572 c
Georgia	1,700	1,907	1,104	1,482	1,459	1,530	1,530 c

^aYield estimates are based on plant populations of 14,520 plants/acre (35,879.7 plants/ha); 1 box/acre = 28.0213 kg·ha⁻¹.

^yDates are planting dates.

^xMeans with the same letter are not significantly different at $P \leq 0.05$ by least significant difference.

Table 3. Collard cultivar head weight data from cultivar evaluations in Quincy, FL, during 2003 through 2006.

Cultivar	Head wt (lb) ^a						Cultivar avg ^x
	11 Sept. 2003 ^y	9 Mar. 2004	24 Sept. 2004	11 Jan. 2005	3 Oct. 2005	25 Sept. 2006	
Top Pick	4.1	4.5	2.1	4.1	3.4	2.8	3.5 a
Flash	4.0	4.6	2.3	2.8	3.3	2.9	3.3 ab
Blue Max	3.5	4.3	2.6	3.5	2.9	2.8	3.3 ab
Morris Heading	3.0	3.7	1.9	3.9	2.4	2.8	3.0 bc
Heavi-Crop	3.0	3.8	1.7	3.9	2.6	2.5	2.9 bc
Champion	2.5	3.6	1.6	4.4	2.7	2.6	2.9 bc
Top Bunch	3.2	4.3	1.9	2.2	3.0	2.9	2.9 bc
Vates	2.9	3.4	1.9	3.3	2.7	2.9	2.8 c
Georgia	3.0	3.2	2.0	2.6	2.5	2.6	2.6 c

^a1 lb = 0.4536 kg.

^yDates are planting dates.

^xMeans with the same letter are not significantly different at $P \leq 0.05$ by least significant difference.

greater than the hybrid 'Heavi-Crop'. Other hybrid cultivars also performed well but did not yield significantly greater than all open-pollinated cultivars. There were no significant differences in yield among the open-pollinated cultivars. No response in bolting tolerance was observed between or among hybrids or open-pollinated cultivars.

Although the hybrid cultivars performed well, the cost of hybrid seed must be taken into consideration because it can be 10 to 15 times greater than open-pollinated seed.

'Top Bunch' performed as well as the top three cultivars with respect to yield, but may be expected to produce significantly smaller plants than these cultivars. 'Top Pick',

'Flash', or 'Blue Max' collards would most likely be the best performing collard cultivars for the northern Florida and southern Georgia growing areas under most environmental conditions.

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