University of Kentucky College of Agriculture
New Crop Opportunities Center

The potential of *Capsicum baccatum* as a new crop for Kentucky Farmers

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Introduction

Bell pepper production has a long history in Kentucky, and pepper remains an important crop for Kentucky vegetable growers. One reason for this long history of pepper production is that Kentucky producers have a reputation for growing high quality peppers. Over the years, shifts in production have occurred. Twenty years ago, most of the peppers were open pollinated varieties, planted late on bare ground in single rows, were not irrigated, and were harvested red to be canned. Now common production practices include the use of hybrid varieties resistant to disease, planted on raised beds through plastic mulch. Irrigation and fertilization is provided through trickle lines. Planting occurs early in the season, peppers are harvested green for the fresh market. Production of specialty peppers such as Jalapeno, Anaheim, and Serrano is also becoming more common in Kentucky. There is no doubt that Kentucky farmers can produce high quality peppers, reflecting their skills for managing and marketing peppers. A goal of this project is to build on these skills, providing new opportunities for Kentucky farmers.

The scientific name of the common bell pepper and most specialty peppers is *Capsicum annuum*. A close relative of this species is *Capsicum baccatum. C. baccatum* is not commonly grown in the United States; however, it has been grown in South America, mainly by indigenous people. So, *C. baccatum* is not an undomesticated species, but is a species with which we have less experience.

Prior to the establishment of this research project, the core collection of *C. baccatum* was grown at the UK Horticulture Research Farm in 2000. A core collection represents the breadth and depth of genetic variability available in the species. We noted that there were some novel characteristics present in certain members of this species. As a result of funding by the New Crop Opportunities Center, we have been able to begin to evaluate whether these novel characters might provide the basis for a new crop for Kentucky farmers.

Based on our initial evaluation in 2000, we determined that certain lines of *C. baccatum* might have value as ornamental plants, and other lines, due mainly to the shape of the fruit, might have value as a novelty pepper.

The main ornamental characteristics that were present were numbers of fruit per node, leaf variegation, branching pattern, and fruit color and shape. The main culinary characters present were a novel fruit shape (Figure 1) and variation in pungency. The illustrated fruit shape is very distinctive, and may lend itself to use as the base for an hors d'oeuvre.

Objectives

Since we have little experience with the species *C. baccatum,* one objective is learning how to best grow these particular lines. Another objective includes evaluation of

yield, shape, flavor, pungency, earliness, and for ornamental lines, fruit color, stem length, number of fruit, degree of variegation, plant shape and size, etc.
The third objective is to select, mainly by pure line selection, for characteristics that may improve the potential of this species for Kentucky farmers. A fourth objective is to evaluate market potential for these novel crops.

Materials and methods

In 2002, approximately 40 different lines of *C. baccatum* were grown (5 plants per plot) at the Horticulture Research Farm. The seed was seed obtained from the USDA germplasm collection in Griffin, Georgia. All plots were single row, raised beds with trickle irrigation and black plastic mulch. Fifty lbs N/A was applied at planting, and this was supplemented with 40 lbs N/A during the season, applied through irrigation. These small plots mainly provided material for preliminary evaluation of potential use as ornamental plants. Fifteen plots containing 40 to 70 plants each provided material for evaluation of culinary quality. The source of this material was either single plant selections of lines that were field grown in 2000, or had been acquired from USDA or were purchased from Pepper Gal, Ft. Lauderdale, Florida. All lines were seeded in the greenhouse in early April, and were planted in the field in early June. At the time of planting, the weather was unusually hot and dry. After approximately 4 weeks of growth, plants were staked using a modified Florida weave system. Lines planted for ornamental value were evaluated visually. These evaluations included plant stature, fruit color, and degree of fruitfulness, foliage color, and any other notable characteristics. Fruit from the culinary lines were harvested when mature. Because of unusual and late fruit set due to environmental conditions, seed were saved from early fruit as a selection for earliness, and fruiting under adverse environmental conditions. Later fruit was harvested and sent to several chefs, in Kentucky and elsewhere, for their preliminary evaluation of quality and potential desirability as a base for an hors d'oeuvre.

For 2003, four experiments were planted in the field. All plots were planted on raised beds 6 feet apart, with black plastic mulch and trickle irrigation. Normal methods for insect and disease control and supplemental fertigation were used. Prior to planting, N at the rate of 25 lbs/A was broadcast on the plots.

For the ornamental pepper, 6 segregating breeding lines were planted in the field. Characters segregating in these lines include type and degree of variegation, plant stature, fruit color and shape, fruit per node, fruit size, stem length, earliness, as well as other characters. These characters will be evaluated, with an eye toward use as either a potted ornamental, or for the large-statured plants, for use as cut stems in the floral trade. Ornamental peppers were planted in black plastic-mulched, trickle irrigated, double rows on raised beds. Plants were 15 inches apart in the row and between double rows. Beds were 6 feet apart center to center.

For the culinary peppers, three distinct experiments were planted. The culinary peppers, due to their larger plant size, were planted in single rows in the center of the bed, at a spacing of 12 inches between plants. One experiment was designed to evaluate the effect of N-fertility at planting. The experimental design was a randomized complete block with 4 replications and 4 rates of N (25, 50, 100 and 200 lbs of N/A). Plots were 20 feet long. Data to be collected include yield, earliness, leaf size, and plant height.

Another experiment was designed to provide estimates of yields among lines of culinary *C. baccatum*. The experimental design was a randomized complete block with 4 replications and 14 lines of 15 plants each. Data to be collected include yield, earliness, plant height, and fruit characteristics including shape, pungency, size, and color, and overall quality rating. Data from this experiment will be used to calculate potential returns from culinary *C. baccatum*.

The third experiment was aimed at genetic improvement of horticultural characteristics, including yield, earliness and fruit quality. Fourteen lines of culinary *C. baccatum* were planted in a randomized complete block experiment with two replications. Plant numbers per plot ranged from 36 to 142 plants per plot, depending on the line. This experiment will allow for pure line selection for earliness, and yield, and will also provide fruit for culinary evaluation, and for development of tools or methods for culinary preparation. Harvested fruit will be sent to chefs in Kentucky and elsewhere in the U.S. for culinary evaluation.

Results

Culinary peppers, 2002

When planted in the field, conditions were hot and dry. As a result, about 40-60% of pepper plants were severely injured by desiccation. For most of the injured plants, axillary buds near the base of the plant developed, and allowed the survival of most plants. However, growth and subsequent harvest were severely delayed. Harvest began about September 1.

The culinary peppers produced were distinct in appearance (Figure 1) and flavor. This particular shape is not currently available commercially. Samples of the culinary peppers were distributed to a small number of chefs in late summer. Those chefs having 'high end" clientele were especially interested and used them stuffed with various ingredients as appetizers. The product was equally desirable when consumed fresh or cooked. Those chefs having a more general clientele were not as interested because of the preparation time involved in cleaning the center from the pepper.

The novel appearance of the peppers attracted a great deal of attention and the taste was distinct from that of other peppers.

Based on the results in 2002, a group of master chefs has expressed interest in helping determine which color, shape and taste qualities would be the most desirable to chefs as well as the general consumer. Their input will help to ensure the selection of a marketable product and grading guidelines.

Ornamental peppers, 2002.

Two types of variegation were identified, stippled and sectored. Genes for branching, and fruit number per node were also isolated. Variation in fruit color and size were noted. Several lines were selected for additional study. Some of these lines have potential as cut stems. Others have potential as pot plants.

Culinary and Ornamental peppers, 2003

Since this report was written in early July 2003, we have yet to harvest any fruit, and consequently results are not available.

Conclusions

Because of the novel shape, flavor, and texture of the culinary peppers, they will have a ready market. However, the size of this market remains to be determined. In this regard, the initial response from the chefs concerning the potential of culinary *C. baccatum* was very gratifying. Additional research is needed to: 1) determine whether these peppers will be a profitable crop for Kentucky farmers; 2) identify potential production problems; 3) better adapt the lines to Kentucky conditions through breeding by pure line selection; 4) explore market potential; and 5) identify methods or tools that will allow for easier preparation of the raw product.

Figure 1.

With regard to ornamental peppers, the economic potential of these lines needs to be established. Furthermore, additional breeding needs to take place, in order to provide pure lines for release.