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Cover Page Footnote

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Economic Potential of Okra Cultivation for Limited Resource Farmers

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Abstract

Background: Okra (*Abelmoschus esculentus* L. Moench), is an economically important vegetable crop with a potential to increase farm incomes of small producers. This is because okra is popular, easy to grow, and valuable with average retail prices of up to $7.07/kg. In Texas, research has shown that diversification of farm operations boosts income and farm sustainability. Hence, exposing farmers to economically important crops that are not typically grown is necessary. Production success is linked to crop variety choices. As result, the objective of this study was to evaluate the performance of multiple varieties of okra (Red Burgundy, Jambalaya, Zarah and Hybrid Green Sparkler) to determine the variety with the highest yield and profitability. We hypothesized that yield and revenue will differ among the okra varieties. **Methods:** In this study, each okra variety was grown in replicates on three plots. The plants were established at a density of 16,600 plants ha^{-1} using plasticulture and drip irrigation. N and K were

supplied at 33.60 $kgha^{-1}$ and 11.2 $kgha^{-1}$ respectively according to soil test recommendations. The okra was picked every other day to prevent development of undesirable pods. **Results and Conclusion**: When comparing the number of pods per plant, Red Burgundy had a greater yield as compared to Jambalaya ($p < 0.05$), but the yield was similar to the Zarah and Hybrid Green Sparkler varieties. Similarly, Zarah had a greater yield as compared to Jambalaya but similar to Hybrid Green Sparkler. In terms of pod weight per plant, Red Burgundy's weight was statistically greater than Jambalaya but similar to the other varieties. Estimated revenue per hectare for Red Burgundy, Zarah, Jambalaya, Hybrid Green Sparkler were $9,565.00, $7,018.20, $6,290.60 and $6,020.00, respectively. These represent 58.9%, 16.6% and 4.5% revenue increase over the green hybrid sparkler variety. Frozen okra revenue estimates followed the same trend. These findings suggests that Red Burgundy provides the highest revenue potential in terms of production and economics and would be the best variety for farmers in East Texas to grow.

Introduction

Okra (*Abelmoschus esculentus* L. Moench), is a nutritious and economically important vegetable that is typically produced in tropical and subtropical climates (Kochhar, 1986, Raemaekers, 2001; Iqbal et al., 2008; Philip et al., 2010). Other names of okra, which is an annual plant, include "lady's finger" or "gumbo" (Tiwari et al., 1998; Sabitha et al., 2011). It belongs to the mallow family, which also includes the hibiscus and cotton plants.

Okra contains several minerals and vitamins in addition to carbohydrates, fiber, sugar and fat. These include calcium, magnesium, phosphorus, potassium, iron, sodium, zinc, vitamins A, B (B_1, B_2, B_3, B_6, B_9), C and K (USDA Nutrient Database, 2016). In retail markets, okra is expensive, yet popular, particularly in the southern United States, Africa, Asia and the Caribbean (Calisir et al., 2005; Adelakun et al., 2009; Sengkhamparn et al., 2009).

Thus, okra has a high value with average retail market prices ranging between $3.45/kg in the frozen form to $7.07/kg when sold fresh (USDA ERS, 2016). It can also be pickled or canned. It is relatively easy to grow and has high yields (Franklin et al., 2015). These attributes make okra a good crop for small producers to consider for cultivation, especially if they are considering diversifying their operations. This is especially important in Texas where research has shown that farm diversification is good for sustaining farms (Barbieri and Mahoney, 2009).

Choosing the right variety of a crop is important for a famer's production success. Though there is information on popular okra varieties, there is scant material on the specialty varieties. Production and economic information on specialty and non-specialty varieties will help farmers to select varieties based on their production and economic goals. Hence, the objective of this study was to evaluate the performance of multiple varieties of okra to determine the variety with the highest yield and profitability. We hypothesized that yield and revenue will differ among the okra varieties.

Materials and Methods

This study was carried out on raised beds at the Agricultural Research Farm of Prairie View A&M University in the first week of June 2017. The four varieties of okra used in this study were Red Burgundy, Zarah, Hybrid Green Sparkler, and Jambalaya. Seeds of these okra varieties were purchased from various commercial seed companies. Red Burgundy was bought from Seed Savers Exchange (Decorah, IA); Zarah seeds were attained from Stoke Seeds (St. Catharines, ON); and Hybrid Sparkler and Jambalaya seeds were purchased from Evergreen Seeds (Bloomington, IL) and Johnny's Selected Seeds (Winslow, ME), respectively. The beds were covered with plastic mulch to control weeds and conserve water. Watering was done using drip irrigation, which was laid in the beds.

The okra seeds were planted 0.6 m apart in the row and about 1.3 cm deep in a completely randomized design with three replications. The okra varieties were randomly assigned to plots in rows. Nutrient needs were supplied based on pre-plant soil test results using calcium (15.5-0-0) and potassium (13-0-46) nitrate fertilizers. Irrigation was supplied when needed to supplement natural rainfall. Harvesting commenced for Red Burgundy, Jambalaya, Zarah, and Hybrid Green Sparkler at 55, 55, 42, and 50 days after planting, respectively. Fruits were picked every other day (Figure 1). The number and weight (g) of okra produced per replication was recorded at each harvest. Analysis of variance (ANOVA) was done using JMP software version 11 (SAS Institute Inc., Cary, NC). Means were compared using the all pairs Tukey-Kramer HSD method, p values of < 0.05 were considered significant.

Figure 1. Photo of each variety of harvested okra.

Results and Discussion

Fresh pods per plant and pod fresh weight

When comparing the number of fresh pods produced per plant, Red Burgundy produced the most. However, Red Burgundy, Zarah and Hybrid Green Sparkler all had similar production rates (3.1-4.2) and were 50% greater than Jambalaya ($p=0.003$) (Table 1). Similarly, differences in fresh pod weight per plant was recorded, and Jambalaya pods were 65% less than Red Burgundy. Jambalaya was similar in weight to Zarah and Hybrid Green Sparkler ($p<0.0001$) (Table 1).

Table 1. Fresh pods per plant and pod weight per plant for four okra varieties

Okra Variety	Fresh Pods/ Plant[†]	Fresh Pod Weight/ Plant (g)
Red Burgundy	4.2[a]	90.5[a]
Zarah	4.0[a]	62.3[a,b]
Hybrid Green Sparkler	3.1[a,b]	56.4[a,b]
Jambalaya	2.0[b]	31.9[b]
p-value	0.0033	<0.0001

[†]Means within column followed by same letter(s) are not significantly different.

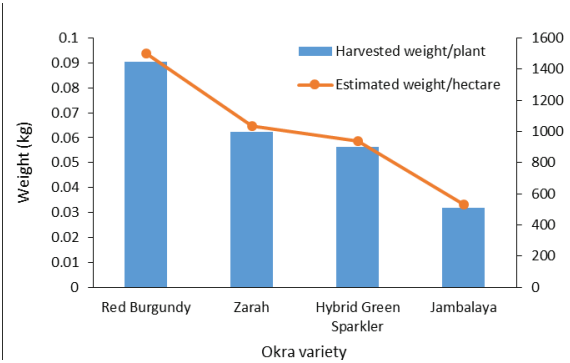

Figure 2. Harvested weight per plant and estimated weight per hectare of okra varieties.

Harvest weight per plant was greatest for Red Burgundy (0.0905 kg), followed by Zarah and Hybrid Green Sparkler. Jambalaya had the least harvest weight per plant compared to the other varieties (Figure 2). Estimated weight per hectare for Red Burgundy was 3-fold greater than Jambalaya. On the other hand, estimated weight per hectare for Zarah and Hybrid Green Sparkler were 2-fold greater than Jambalaya (Fig. 2).

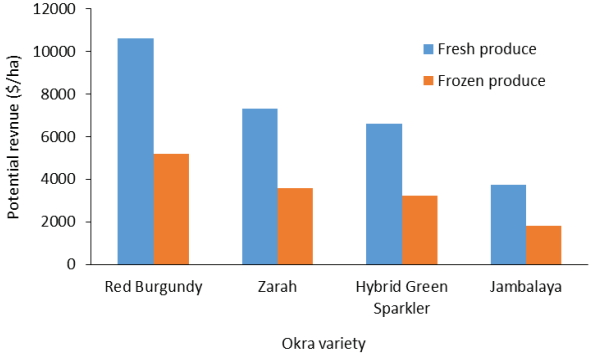

Fig. 3. Estimated potential revenue from fresh and frozen okra. Revenue was estimated based on four weeks of harvest and a planting density of 16, 600 plants/ha. Prices used per kg of fresh and frozen okra were $7.07 and $3.45 respectively.

From an economic perspective, revenue in dollars per hectare for fresh okra was greatest for Red Burgundy, followed by Zarah and Hybrid Green Sparkler (Figure 3). On the other hand, Jambalaya had the least revenue potential (Figure 3). Potential revenue from frozen okra followed a similar trend. Red Burgundy had the greatest revenue from frozen okra, followed by Zarah and Hybrid Green Sparkler (Figure 3). Jambalaya had the least revenue when frozen compared to the other okra varieties (Figure 3).

Conclusions

Red Burgundy was the highest yielding and most profitable variety in this study. Zarah and Hybrid Green Sparkler, the specialty varieties, produced yields comparable to Red Burgundy which is a popular variety. Although potential earnings from growing the varieties vary by variety, growing okra can increase the revenue of farmers steadily over a long period of time. This is due to the fact that okra can be harvested daily or every other day over a period of 2-3 months. Based on our findings, we accept the hypothesis that yield and revenue were different for the okra varieties evaluated.

Future studies will focus on understanding the nutrient requirements of okra under East Texas growing conditions and harvesting over the entire season since this current study examined yield data collected only over a four week period.

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