



AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
<http://ageconsearch.umn.edu>
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*



**Sociedad Caribeña de Cultivos Alimenticios
36 Memoria Anual**

**Caribbean Food Crops Society
36 Annual Meeting**

**Société Caraïbe des Plantes Alimentaires
36 Mémoire Annuel**

**Boca Chica, Santo Domingo, República Dominicana
27 de agosto al 1 de septiembre, 2000**

**Memoria Editada
por**

**Centro Para el Desarrollo Agropecuario y Forestal, Inc
(CEDAF)**

YIELD PERFORMANCE OF EGGPLANT CULTIVARS GROWN UNDER ORGANIC MANAGEMENT SYSTEM

M.C. Palada¹, S.M.A. Crossman², and A.M. Davis¹. ¹Agricultural Experiment Station and ²Cooperative Extension Service. University of the Virgin Islands. St. Croix, U.S. Virgin Islands 00850

ABSTRACT

An on-farm trial was conducted in the spring of 1998 to evaluate the yield performance two groups of eggplant (*Solanum melongena* L.) cultivars grown under organic management system. Seven hybrid cultivars (Black Beauty, Black Bell, Black Nite, Hybrid Beauty, Italian Pink Bicolor, Early Bird and Viserba) comprised one group. The other group consisted of open-pollinated, elongated types Philippine Long Purple, Pingtung Long, Trinidad Long and Dumaguete Long Purple. Seedlings were planted in three rows spaced 1.22 m apart. Plants were spaced 61 cm within rows. The trial was established using a randomized complete block design with three replications. An organic crop management system was adopted in growing and maintaining the crops. These consisted of using organic insect sprays, cow manure and grass straw mulch. All plots were drip irrigated to maintain soil moisture tension at 30 kPa. Data were collected on number of harvests, number of fruits, fruit weight and size. Incidence of insect pests and diseases were recorded by visual observations. Data from seven harvests showed no significant differences in the number of fruits among cultivars. Significant differences were observed in fruit weight for both groups. Fruit weight ranged from 212 g for Trinidad Long to 96 g for Pingtung Long. Weights of the hybrids ranged from 298 g for Black Beauty to 113 g for Early Bird. The top yielding hybrid cultivars were Black Nite (32.4 t.ha⁻¹), Black Beauty (28.8 t.ha⁻¹), Black Bell (29.5 t.ha⁻¹), Italian Pink Bicolor (26.1 t.ha⁻¹) and Hybrid Beauty (26.0 t.ha⁻¹). These cultivars are suitable for sustainable eggplant production in the Virgin Islands.

INTRODUCTION

Eggplant is thought to have originated in tropical India and is a staple vegetable in many tropical countries (Lawande and Chavan, 1998). In the United States, the South Atlantic States, New Jersey, and California grow considerable hectareage of eggplant for shipment, although the fruit is of minor importance in the U.S. It is of great importance in the warm areas of the Far East and is grown more extensively in India, China, and the Philippines (Thompson and Kelly, 1954). The world production of eggplant increased from 3.48 MT in 1969-71 to 8.68 MT in 1992 (FAO, 1992). The major producers of eggplant are China, India, Japan, and Turkey. In Central America and the Caribbean, eggplant is grown extensively in Mexico, Costa Rica, Guatemala, Jamaica, Haiti, the Dominican Republic and Grenada. In the Virgin Islands, eggplant ranks fourth as a major vegetable crop. The 1992 Census of Agriculture (U.S. Dept. of Commerce, 1995) reported a total production of 13,693 lbs (6.22 MT) harvested from 43 farms with a combined area of 14 acres (5.67 ha). The Virgin Islands import most of the eggplant from the Dominican Republic (Pearrow, 1992).

Eggplant belongs to the Solanaceae (or nightshade) family. There are three main botanical varieties under the species *melongena*. The round or egg-shaped cultivars are grouped under var. *esculentum*. The long slender types are included under var. *serpentinum*, and the dwarf plants are categorized under var. *depressum* (Salunke and Kaddam, 1998). The common eggplant, to which the large-fruited forms belong, is known under the name *S. melongena* var. *esculentum*. The plant is bushy and grows to a height of 60-120 cm; the leaves are large and arranged alternately on the stems. The flowers are large, violet-colored, and either solitary or in clusters of two or more. The serpentine or snake eggplants are placed under the variety *Serpentinum*. The fruits of this group are long and slender, 2.0 cm or less in diameter, and 30-40 cm long. The dwarf eggplants are known under the variety *depressum*, which produce small pear-shaped fruits that are purple in color. *Solanum macrocarpon* known as Gboma eggplant is important in West Africa, and Chinese scarlet eggplant, *S. integrifolium* are grown for food and ornamental uses (Rubatzky and Yamaguchi, 1996).

Eggplant is known to have some ayurvedic medicinal properties and is said to be good for diabetic patients. It has also been recommended as an excellent remedy for those suffering from liver complaints (Shukla and Naik, 1993). Eggplant is a popular and important fruit vegetable in the Virgin Islands. It is always used in local dishes and other culinary preparations. Common recipes include fried eggplant, stuffed eggplant, eggplant filling with rice and eggplant croquettes (Henry, 1994).

Although the climate of the Virgin Islands is favorable for year-round eggplant production growers are faced by a number of production constraints associated with crop management practices. The major constraints are high cost of production (labor and production inputs such as fertilizers and pesticides), limited water resources for irrigation and inefficient marketing system. The cost of chemical pesticides, fertilizers and irrigation constitutes a major expenditure in vegetable production. Reducing the use of these inputs would cut production cost and increase economic returns to vegetable growers. In addition, the environmental impact of toxic pesticides can be minimized if growers would use other options such as organic and cultural methods of producing vegetables. Sustainable crop management systems encourage efficient use of local resources, thereby reducing dependency on external and imported inputs.

Achieving a sustainable vegetable production system is possible by adapting a combination of sound crop management strategies including the use of cultivars adapted to low production and management inputs with high tolerance to pest and diseases, nutrient cycling and integrated pest management. To develop a sustainable and profitable vegetable production enterprise, growers must be able to meet market demands in terms of vegetable cultivar preferences, volume, quality and seasonal requirements. Currently, there is little information on sustainable crop management practices and cultivars for USVI vegetable growers. Information on new and improved cultivars adapted to sustainable crop management practices is lacking. There is a need for continuous screening of new vegetable varieties developed and released by seed companies and research institutions to provide growers with information on promising varieties. Most of these new varieties are grown under high management inputs and may not perform well under low-input systems of limited-resource growers.

Eggplant cultivar evaluation has been a component of the vegetable cultivar evaluation project at the Agricultural Experiment Station, University of the Virgin Islands. Although the project was initiated in 1980, only five cultivar evaluation trials were conducted for eggplant over a 20-year period. Results of these evaluation trials are summarized in several reports (Navarro, 1982; Ramcharan, 1981; Petersen, 1987; Palada, et al., 1993). The objectives of this study were to: 1) evaluate the performance and adaptability of eggplant cultivars under low-input/sustainable production systems; and 2) select superior cultivars in terms of yield stability, pest and disease tolerance and quality for commercial production and home gardening.

MATERIALS AND METHODS

The trial was located on farmer's field in Estate Glynn, St. Croix, Virgin Islands (Lat. 17°42'N, Long. 64°48'W). The soil is a Glynn gravelly loam (clayey, skeletal, mixed, superactive, isohyperthermic, typic argiustoll) as described by Lugo-Lopez, et al (1998). Average rainfall is 1015 mm per year. The field trial was planted on March 5, 1998 and harvested seven times on May 29, June 2, 10, 17, July 2 and August 6. The two groups of cultivars evaluated and their fruit characteristics are shown in Table 1. Seven cultivars were hybrid and the other four were open-pollinated. Most cultivars have oval fruit with dark purple color.

Table 1. Eggplant cultivars evaluated under organic management system on St. Croix, U.S. Virgin Islands.

Cultivar	Type ¹	Fruit Shape	Fruit Color
Beauty	H	Oval	Dark Purple
Black Beauty	H	Oval	Dark Purple
Black Bell	H	Oval	Dark Purple
Black Nite	H	Oval	Dark Purple
Dumaguete Long Purple	OP	Oblong	Light Purple
Early Bird	H	Oval	Dark Purple
Italian Pink Bicolor	H	Oval	Pink
Philippine Long Purple	OP	Oblong	Light Purple
Pingtung Long	OP	Elongated	Light Purple
Trinidad Long Purple	OP	Oblong	Dark Purple
Viserba	H	Oval	Dark Purple

¹H=Hybrid; OP=Open pollinated

The cultivars were planted in plots consisting of three rows 7.3 m long and spaced 1.2 m apart. Each plot measured 3.6 m x 7.3 m or 26.3 m². Plants were spaced 0.61 m withing rows. All plots were drip irrigated to maintain soil moisture tension at 20 kPa. The experiment was established using a randomized complete block design with three replications. The organic management system consisted of application of dehydrated cow manure (2-1-2), spraying of insecticidal soap (M-Pede), pepper sprays (Red Arrow) and bacterial spray (Dipel). Cow manure was applied at the rate of 26 kg/plot (10 t.ha⁻¹). All plots were applied with dry guinea grass (*Panicum maximum*) straw mulch at 15 cm thick. The straw mulch was spread over the whole plot area one week after planting.

Visual field observations were performed on the incidence of pests and disease during the early plant establishment, active vegetative growth and bloom stage. Plant height was measured during the first harvest. Data on number of fruits, fruit size, and fruit yield were taken at each harvest. All data were taken from a harvest sample of 10 plants in the middle row. Data were analyzed for statistical significance using the SAS program.

RESULTS AND DISCUSSION

Plant Height

The average plant height of cultivars is shown in Fig. 1. Plant height ranged from 33.7 cm for Early Bird to 80.9 cm for Italian Pink Bicolor. Early Bird is the shortest cultivar and the first to produce fruits. It matured in 74 days after planting. All other cultivars matured in 85 days after planting. It was also observed that taller cultivars have vigorous plants with many side branches than shorter cultivars. When it comes to manual harvesting, taller cultivars are much easier to harvest than shorter cultivars. Cultivars Italian Pink Bicolor, Black Nite, Black Bell and Beauty have a significant plant height advantage over the other hybrid cultivars. The open-pollinated cultivars are shorter than the hybrids with the exception of Trinidad Long which was 76 cm in height. The open pollinated group of cultivars ranged in height from 43 to 76 cm.

Number of Fruits, Fruit Weight and Total Fruit Yield

There were no significant differences in total number of fruits for any of the two groups. However, significant differences (P.05) were observed in the average fruit size. The heaviest hybrid fruits were harvested

from cultivars Black Beauty (298 g) which were significantly heavier than fruits from all of the other hybrid cultivars except Italian Pink Bicolor (Fig. 2). Cultivar Pingtung Long produced fruits with the least weight (94 g) of the open pollinated group. Trinidad Long Purple was superior to all other cultivars of this group (Fig. 3).

The **hybrid** cultivars differed significantly ($P.05$) in total fruit yield (Fig. 4). The five highest yielding cultivars were Black Nite (32.4 t.ha^{-1}), Black Bell (29.5 t.ha^{-1}), Black Beauty (28.8 t.ha^{-1}), Italian Pink Bicolor (26.1 t.ha^{-1}) and Beauty (26.0 t.ha^{-1}). These cultivars consistently produced higher yields in all harvests compared to the other cultivars (Fig. 5). Although cultivar Italian Pink Bicolor produced smaller number of fruits per plot, higher total fruit yield was attributed to its larger fruit size. Conversely, although cultivar Early Bird produced higher number of fruits per plot, low fruit yield was the result of smaller fruit size. Yields from the open-pollinated group ranged from 9 to 16.6 t.ha^{-1} and there were no significant differences observed.

The high yield of cultivars Black Bell and Black Beauty are consistent with those reported earlier by Ramcharan (1981), Petersen (1987) and Palada et al. (1993). Therefore, these cultivars are more likely to be stable in performance and adapted in the Virgin Islands under sustainable crop management practices. Their yield performance are consistently outstanding. Other promising cultivars are Black Nite, Beauty and Italian Pink Bicolor. These cultivars produced yields which are higher than Trinidad Long Purple, a common local eggplant grown by farmers.

Cultivar Response to Insect Pests and Diseases

Visual observations throughout the growing season indicated that some cultivars were susceptible to damage by insect pests and virus infection. Incidence mosaic virus was evident in open-pollinated cultivars such as Dumaguete Long Purple, Philippine Long Purple, Trinidad Long Purple and Pingtung Long. Hybrid cultivars Viserba and Beauty also showed signs of mosaic virus. There were no symptoms of other fungal or bacterial diseases in all cultivars. Insect damage due to mealy bugs and aphids was common in cultivars Philippine Long Purple, Black Nite, Black Beauty, Dumaguete Long Purple, Beauty and Trinidad Long Purple. Insect damage was minimal and did not seriously affect fruit yield. It appears that most cultivars are sensitive to insect damage regardless of whether cultivars are hybrid or open-pollinated.

SUMMARY AND CONCLUSIONS

This study has shown that eggplant cultivars differed in their yield performance when grown under sustainable crop management practices. Five of the hybrid cultivars produced high yields while the open-pollinated cultivars were generally low yielding. In terms of total fruit production, the outstanding cultivars were hybrids Black Nite, Black Bell, Black Beauty, Italian Pink Bicolor and Beauty all with a total fruit yield of over 25 t.ha^{-1} . These cultivars appear to be most adapted to production in the Virgin Islands under low-input sustainable crop management practices. Vegetable growers should select and plant these cultivars with minimum production inputs. The study also showed that eggplant can be grown successfully in the Virgin Islands without the use of chemical fertilizers and pesticides.

ACKNOWLEDGMENTS

This research was supported by Hatch grant from the U.S. Department of Agriculture. The authors are grateful to Paulino Perez, Research Assistant, Nelson Benitez, Agricultural Aide, Renee Boston, Research Assistant, Laurel Royer and Esterlyn Matura student assistants for their assistance in establishing the field trial, maintaining the trial plots and collecting samples and other data. Special appreciation is extended to Kirk Ajamu Benoit, Vegetable Grower who provided a portion of his farm for conducting the field trial.

LITERATURE CITED

- Food and Agriculture Organization. 1992. Production Yearbook. Rome, Italy.
- Henry, O. 1994. Native Recipes. Extension Bull. No. 1. Cooperative Extension Service, University of the Virgin Islands.
- Navarro, A.A. 1982. Summary of vegetable crops research: 1980-1981. V.I. Agric. Expt. Station Technical Bull. No. 4.
- Lawande, K.E. and J.K. Chavan. 1998. Eggplant (Brinjal). p. 225-244 In: D.K. Salunkhe and S.S. Kadam (eds.). Handbook of Vegetable Science and Technology: Production, composition, storage, and processing. Marcel Dekker, Inc., New York.
- Lugo-Lopez, M.A., F.H. Beinroth, C.L. Santiago and G.R. Branno. 1998. Updated Taxonomic Classification of the Soils of the U.S. Virgin Islands, 1997. Bulletin 257. University of Puerto Rico, College of Agricultural Sciences, Mayaguez, Puerto Rico and Agricultural Experiment Station, Rio Piedras, Puerto Rico.
- Palada, M.C., S.M.A. Crossman and C.D. Collingwood. 1993. Yield Performance of Selected Vegetable Varieties in the U.S. Virgin Islands, 1988-1992. Technical Bull. No. 5. Agric. Expt. Station, University of the Virgin Islands, St. Croix, U.S. Virgin Islands.
- Pearrow, J. 1992. U.S. Imports of Fruits and Vegetables Under Plant Quarantine Regulations, Fiscal Year 1989. Commodity Economics Division, Economic Research Service, U.S. Dept. of Agriculture. ERS Staff Report No. AGES 9209, Washington, D.C.
- Petersen, A.C. 1987. Yield results of vegetable variety evaluation trials in the U.S. Virgin Islands. V.I. Perspective Agric. Research Notes, Vol 2(1):16-18.
- Ramcharan, C. 1981. Virgin Islands tomato, pepper and eggplant variety trials in 1978-1979. V.I. Agric. Expt. Station. Technical Bull. No. 3.
- Rubatzky, V.E. and M. Yamaguchi. 1996. World Vegetables: Principles, production and nutritive values, 2nd Edition. Chapman and Hall, International Thomson Publishing, New York.
- Salunkhe, D.K. and S.S. Kadam. 1998. Handbook of Vegetable Science and Technology: Production, composition, storage, and processing. Marcel Dekker, Inc., New York.
- Shukla, V. and L.B. Naik. 1993. Agro-techniques of solanaceous vegetables, p. 365 In: K.L. Chadha and G. Kalloo (eds.). Advances in Horticulture, Vol. 5, Vegetable Crops, Part 1. Malhotra Pub. House, New Delhi.
- Thompson, H.C. and H.C. Kelly. 1957. Vegetable Crops, 5th Edition. McGraw Hill Book Co., Inc. New York.
- U.S. Dept. of Commerce. 1995. 1992 Census of Agriculture. Vol. 1 Geographic Area Series. Part 54, Virgin Islands of the United States. Economics and Statistics Administration, Bureau of Census, Washington, D.C.

Fig. 3 Mean Fruit Weight of OP cultivars (g)

