



GROWING ZUCCHINI VARIETIES ON GUAM

Cucurbita pepo

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Zucchini, also known as courgette, is an annual (grows for one season), warm-season vegetable, and is one of several varieties of summer squash (*Cucurbita pepo*) belonging to the Cucurbitaceae family. Summer squash had been originally cultivated over several thousand years by the indigenous people of Central and South America, and later introduced to Europe. The summer squash variety known as zucchini was likely developed in Italy (Shallcross, 2015). Most varieties of zucchini are usually cylindrical and green, but varieties vary from light-green, dark green, including yellow. Although many squash, pumpkin, cucumber, gourds, and other cucurbit species grow on vines, zucchini plants are non-vining bushes.



Fig 1. Cooked zucchini (stir-fry).

Zucchini has been grown on Guam sporadically at a very small-scale for over 25 years. Locally, it is a popular vegetable that can be consumed raw, but is usually served as a cooked vegetable (Fig 1). Zucchini is a low-calorie, nutritious vegetable that is high in Vitamins A and C, and rich in antioxidants including carotene and lutein. It is

also very low in Saturated Fat, Cholesterol, and Sodium (Rudrappa, 2018)). Fig. 2 shows basic nutrition facts of 1 serving (1 cup) of cooked, boiled zucchini as provided by the United States Department of Agriculture (USDA)

Nutrition Facts	
Serving Size 223 g	
Amount Per Serving	
Calories 38	Calories from Fat 2
% Daily Value*	
Total Fat 0g	0%
Saturated Fat 0g	0%
Trans Fat	
Cholesterol 0mg	0%
Sodium 4mg	0%
Total Carbohydrate 8g	3%
Dietary Fiber 3g	12%
Sugars 4g	
Protein 3g	
Vitamin A 8%	Vitamin C 14%
Calcium 4%	Iron 6%

*Percent Daily Values are based on a 2,000 calorie diet. Your daily values may be higher or lower depending on your calorie needs.

NutritionData.com

Fig 2. Nutrition facts of 1 serving size (1 cup, 223g) of cooked, boiled zucchini.

Growing zucchini

Zucchini can be transplanted as a seedling or direct-seeded in to the ground. Seeds usually germinate within one week from sowing. Zucchini are usually spaced 2-3ft. between plants and 4-5 ft. between rows (Tuquero et al, 2016).

For plant growth and production, zucchini grows best in warm climates at day temperatures of 65-75°F (18-24°C) (Smith and Williamson, 2017), but can grow well in Guam’s higher temperatures.

A general fertilizer recommendation for one growing season for zucchini is 1,000 lbs. of 10:12:10 ratio (N-P2O5-K2O) per acre, or approximately 2.29 lbs. of the same nutrient ratio for every 100 sq. ft. (Hemphill, 2010).

Zucchini grows best in fertile, well-drained soils. Examples of adequate soils for growing zucchini on Guam include Akina silty clay, Guam-Saipan complex, Guam-Yigo complex, Pulantat clay, and Togcha soils. The ideal soil pH for growing zucchini ranges from 6.0 to 7.5 (Hemphill, 2010).

Watering regularly will keep your plants producing fruits. Zucchini plants prefer moist, but not wet soils. Irrigation of zucchini should consist of moderate, frequent watering. During dry periods, ensure soils are kept moist and not saturated. During extended rainfall events, watering may not be necessary until soil is nearly dried up. Mulching around zucchini plants will conserve soil moisture.



Fig 3. Zucchini varieties growing in Guam Cobbly Clay Loam in Yigo Guam, December 28, 2017 – March 2, 2018.

Common pests and diseases

Zucchini, like most cucurbits is a host for a wide range of pests and diseases. Some common diseases that infect zucchini include Powdery Mildew (*Oidium spp.*) (fungus), Brown Spot (*Alternaria alternata*) (fungus), Bacterial Leaf Spot (*Xanthomonas campestris*) (bacterium), and Zucchini Yellow Mosaic (Zucchini yellow mosaic virus (ZYMV) (virus). Some common pests that infest zucchini include aphids (*Aphis gossypii*), cabbage looper (*Trichoplusia ni*), and cucumber/pumpkin beetle (*Aulacophora spp.*), and melon fly (*Bactrocera cucurbitae*). Registered pesticides can help control insect and disease infestations. Pests and diseases can also be controlled by cultural practices such as, crop rotation, weeding, and general field sanitation.

Plant care

It is always good practice to consistently monitor plants for pests and diseases. If a pest or disease is unknown, collect samples and submit to the University of Guam, Cooperative Extension & Outreach for correct identification and treatment recommendations. Weeding and mulching around plants will reduce weed competition and conserve soil moisture. It is also advisable to keep

records of all field activities. Proper record keeping will identify good practices and mistakes, along with identifying desired varieties of plants. This will also improve decision making for future crops.

Harvest

Depending on variety, zucchini is generally harvested within 55 days after germination. Zucchini are best harvested at 6 to 8 inches in length and no more than 3 inches in diameter (Shallcross, 2015), but can be harvested at smaller stages. Zucchini, when left on the plant, can grow a lot larger than recommended harvesting size, but may result in tough skin, large seeds and undesirable fibrous flesh.

Post-harvest handling

Immediately after harvesting and cleaning, zucchini is best stored at 41-50°F (510°C) at 95 percent relative humidity for up to two (2) weeks. Storage temperatures below 41°F may cause chilling injury resulting in decay of zucchini fruits (Suslow and Cantwell, 1997).

2018 Zucchini trial on Guam

A variety trial was conducted at the Western Pacific Tropical Research Center, Yigo Agricultural Experiment Station, College of Natural & Applied Sciences, University of Guam. On December 28, 2017, three varieties of zucchini were transplanted in Guam Cobbly Clay Loam soil, a commonly cultivated soil in northern Guam, after growing in plant trays for 5 days (Fig 3). The three varieties selected for the variety trial included



Fig 4. Eight Ball variety.



Fig 5. Tigress variety.



Fig 6. Partenon variety.

Eight Ball, Tigress, and Partenon (Figs 4, 5, and 6). First harvest was observed on January 27, 2018. Harvest data was collected for a 30-day period from February 2, 2018 to March 1, 2018. Zucchini fruits were measured for fresh weight and classified as marketable or unmarketable.

Results and Discussion

All varieties produced quality marketable fruits. Tigress was the highest yielding variety in weight for this trial as shown in Fig 7.

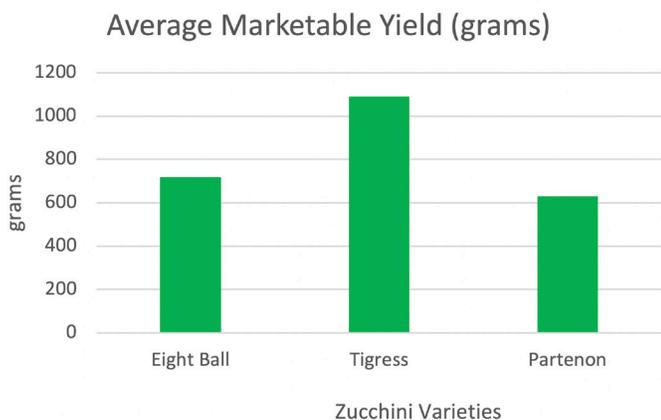


Fig 7. Average marketable yield of zucchini varieties grown in Yigo, Guam from February 2 to March 1, 2018.

Zucchini is a monoecious plant, which means that zucchini contains separate male and female flowers on the same plant. The male flower is required to pollinate the female flower, which develops into zucchini fruit when pollinated. The presence of beneficial insects is key for optimal pollination and fruit production for monoecious plants. In addition to zucchini being a monoecious plant, there are varieties of zucchini that have the ability to set fruit without pollination. This ability is known as ‘parthenocarpy.’ In a previous field study, it was found that Partenon and Tigress were found to be parthenocarpic (Reiners, 2013). This was apparent in this field trial, as

Partenon and Tigress significantly produced more fruit than Eight Ball. Fig. 8 depicts the total number of fruit harvested from each variety from this field trial.

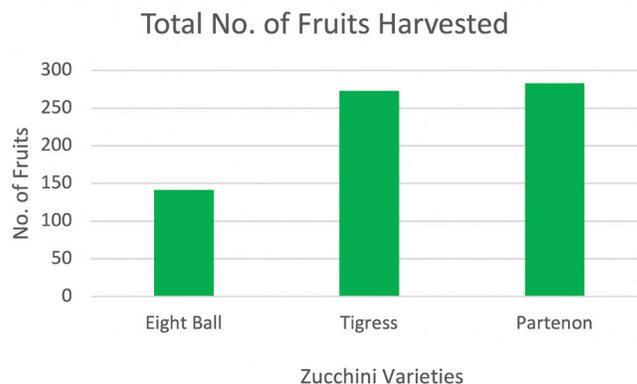


Fig 8. Total number of zucchini fruits harvested from February 2 - March 1, 2018.

An unidentified fruit rot contributed to most unmarketable fruits as shown in Fig 9. The cucumber beetle (*Aulocophora similis*) was a persistent pest as well as the melon aphid (*Aphis gossypii*). Organic pesticides containing active ingredient *Bacillus thuringiensis* subspecies *kurstaki* and Neem (*Azadirachta indica*) oil extract were applied weekly to control pest infestations and proved to be effective to control pest populations.



Fig 9. Unidentified fruit rot observed on zucchini variety Partenon.

Zucchini is very susceptible to the powdery mildew fungus (*Oidium spp.*), and can become a problem if not controlled in a timely fashion. Powdery mildew was first observed on the experimental field roughly one month after transplant on January 23, 2018. The fungus affects the plant by covering the leaves and stems in a white fungal blanket, which hinders photosynthetic activity. Fig 10 shows an example of a plant affected with powdery mildew.

A fungicide containing the active ingredient, copper hydroxide, was applied to control the powdery mildew fungus. Plants were still producing marketable fruit until the field was terminated on the second week of March due to an unknown virus spreading to all plants. The virus was likely Zucchini Yellow Mosaic Virus (ZYMV). Figures 11 and 12 shows virus-like symptoms on plant foliage and fruit.



Fig 10. Powdery mildew shown on zucchini variety Eight Ball.



Fig 11. Zucchini plant affected with virus infected symptoms.



Fig 12. Virus infected fruit of 'Tigriss' zucchini variety.

Summary

Like many warm season crops, growing zucchini successfully in respective localities highly depends on varieties. Zucchini is a warm season crop that is susceptible to fungal infestations. Timing of planting zucchini should be done in a time when fungal problems aren't too prevalent. One should consider planting parthenocarpic varieties to optimize fruit production should beneficial insect pollinator populations be low. Seek characteristics from seed sources that include resistance to powdery mildew fungus and zucchini yellow mosaic virus.

For support

Contact the College of Natural & Applied Sciences' Cooperative Extension & Outreach at 735-2080 for help or more information. Additional publications can be found on our website at: www.cnas-re.uog.edu under the Publications tab.

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Disclaimer

Mention of a company or organization is to provide an example and is not an endorsement or recommendation in preference to others that may also be suitable.

References

Hemphill, D. 2010. Oregon Vegetables. Squash, Zucchini and Summer. Department of Horticulture, Oregon State University. 4p.

Reiners, S. 2013. Producing Summer Squash Without Pollination – Ranking Varieties. Cornell Horticulture, Cornell University. 1p.

Rudrappa, U. 2018. Zucchini Nutrition Facts. Self Nutrition Data. Retrieved from <https://www.nutrition-and-you.com/zucchini.html>

Suslow, T. and Cantwell, M. 1997. Vegetables English. Squash (Soft Rind). Retrieved from http://postharvest.ucdavis.edu/Commodity_Resources/Fact_Sheets/Datastores/Vegetables_English/?uid=33&ds=799

Shallcross, L. 2015. Zucchini from A to Z. Chinese. FNH-00260. Cooperative Extension Service, University of Alaska Fairbanks. 16p.

Tuquero J., Bamba, J. Marutani, M., and Wall, P. 2016. Guam Crop Charts. Cooperative Extension & Outreach, Western Pacific Tropical Research Center, College of Natural and Applied Sciences, University of Guam. 12p.