



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.*

No endorsement of AgEcon Search or its fundraising activities by the author(s) of the following work or their employer(s) is intended or implied.

Selection of Greenhouse Zucchini Varieties and High-Quality, High-Yield and High-Efficiency Cultivation Techniques

Haijuan ZHANG¹, Guanghui FENG¹, Lifeng YANG², Bo GENG¹, Xiangying HOU¹, Dongwen SUN^{2*}

1. Zibo Digital Agriculture and Rural Development Center, Zibo 255000, China; 2. Shandong Agriculture and Engineering University, Zibo 255300, China

Abstract [**Objectives**] To select zucchini varieties suitable for cultivation in Zibo City and test its high-yield cultivation techniques. [**Methods**] Six zucchini varieties were introduced, and their commercial quality and yield were determined. [**Results**] The yield of Shengfeier, Xiuyu 170 and Xihulu 309 increased by 11.4%, 6.9% and 4.6%, respectively compared with S68 (control), and zucchini was straight, looked pleasing to the eye, and had strong disease resistance. [**Conclusions**] The zucchini varieties were selected and the high-quality, high-yield and high-efficiency cultivation techniques were integrated.

Key words Zucchini, Variety, High-quality, high-yield and high-efficiency, Cultivation techniques

1 Introduction

Zucchini (*Cucurbita pepo* L.), also known as Baigua, Fangua, American pumpkin and Eryuegua, is native to southern North America, with green color and straight shape, rich in vitamin C, soluble sugar, calcium and other nutrients, and has good taste and flavor. It is the main melon vegetable after cucumber, and occupies an important position in melon vegetables^[1–5]. Due to continuous cropping all the year round, soil-borne diseases of zucchini in Zibo City are serious, and the death rate is increasing year by year, which has brought huge losses to vegetable farmers. Therefore, from 2019 to 2020, we introduced six zucchini varieties for comparative experiments, and selected high-yield, high-quality and high-resistance varieties suitable for planting and popularization in Zibo City, and integrated relevant cultivation techniques.

2 Materials and methods

2.1 Test time The planting experiment was conducted in the experimental base of Nanrongjiazhuang Village, Huangcheng Town, Linzi District on November 20, 2021, and the plants were uprooted after their edible portions were harvested on May 30, 2022.

2.2 Test materials There are 7 zucchini varieties tested: Xihulu 309 (Beijing Academy of Agriculture and Forestry Sciences); Xihulu 336 (Beijing Academy of Agriculture and Forestry Sciences); Xiuyu 160 (Shandong Huasheng Agriculture Co., Ltd.); Xiuyu 170 (Shandong Huasheng Agriculture Co., Ltd.); Shengfeier (Beijing Academy of Agriculture and Forestry Sciences); Luyou (Beijing Academy of Agriculture and Forestry Sciences);

ences); S68 (CK) (Beijing Academy of Agriculture and Forestry Sciences).

2.3 Test methods The plot planting was adopted in the experiment, with a length of 8.9 m and a width of 1.55 m, and the planting area of each variety was 13.8 m². It was randomly arranged in blocks with 3 repetitions. In order to ensure sufficient light for zucchini in greenhouse, the plant spacing in the front part of the plot was 75 cm, the middle plant spacing was 80 cm, and the back part of the plot was 85 cm. Field management measures and pest control were carried out according to local cultivation habits.

2.4 Determination indicators and methods

2.4.1 Single fruit weight determination and method. Ten zucchini plants were selected from each zucchini variety plot, and the total weight and total number of zucchini fruits were recorded every time during harvest, and the average single fruit weight (g) of zucchini was calculated as follows:

Average single fruit weight (g) of zucchini = Total fruit weight/Total number of fruits.

2.4.2 Yield determination and method. The harvest date of each tested zucchini variety was recorded, and the yield was measured according to the plot. The total yield of zucchini in each experimental plot was recorded and finally converted into yield per hectare.

3 Results and analysis

The experiment showed that from the aspect of agronomic characters, the peel of Xihulu 309, Xihulu 336 and Shengfeier was pale green, while the peel of Xiuyu 160, Xiuyu 170, Luyou and S68 was glossy dark green (Table 1). According to local consumption habits, glossy dark green zucchini is favored by consumers. The single fruit weight of each treatment from high to low was in the order of Xihulu 336 (555.5 g) > Shengfeier (554.4 g) > Xiuyu 170 (553 g) > Xihulu 309 (551.9 g) > Luyou (550 g) >

Received: March 19, 2023 Accepted: May 21, 2023

Haijuan ZHANG, senior agronomist, research fields: promotion of new vegetable varieties and technologies.

* Corresponding author. Dongwen SUN, associate professor, research fields: promotion of vegetable production technology.

S68 (550 g) > Xiuyu 160 (547.9 g).

In terms of disease resistance, Shengfeier had the strongest disease resistance, followed by Xiuyu 170, Xihulu 309 and Xihulu 336. Xiuyu 160, Luyou and S68 had poor disease resistance.

In terms of yield increase, compared with S68 (control), the zucchini varieties with high yield included Luyou with the largest number of fruits (876), equivalent to the yield of 347.07 t/ha, which was 24.1% higher than that of the control; Shengfeier with the number of fruits reaching 780, equivalent to the yield of 311.59 t/ha, which was 11.4% higher than that of the control; Xiuyu 170 with the number of fruits reaching 746, equivalent to the yield of 299.06 t/ha, which was 6.9% higher than that of the control; Xihulu 309 with the number of fruits reaching 731, equivalent to the yield of 292.47 t/ha, which was 4.6% higher than

that of the control.

Although the yield of Luyou is the highest, its disease resistance is poor, its melon shape is common, its commodity nature is not good, and its economic benefit is not high; Shengfeier, Xiuyu 170 and Xihulu 309 have relatively good comprehensive characters and high yield, so they are suggested to be popularized varieties in the next year; Xiuyu 170 has green melon skin, straight melon shape and good commodity nature, so it is deeply loved by consumers and can be sold as a fine melon with good economic benefits; Shengfeier and Xihulu 309 have high yield and strong disease resistance, but the color of melon is pale green, and the commodity nature is slightly poor, so they can be sold as gradeless and uniformly-priced goods.

Table 1 Comparative test results of new zucchini varieties in light greenhouse

Variety	Commodity nature			Disease resistance	Yield		
	Melon peel color	Melon shape	Single melon weight//g		Number of fruits in plot	Plot yield kg/13.8 m ²	Yield//t/ha
Xihulu 309	Pale green	Long strip	551.9	Moderate resistance	731	403.4	292.47
Xihulu 336	Pale green	Long strip	555.5	Moderate resistance	623	346.1	249.33
Xiuyu 160	Glossy dark green	Long strip	547.9	Low resistance	480	263.0	190.71
Xiuyu 170	Glossy dark green	Long strip	553.0	Moderate resistance	746	412.5	299.06
Shengfeier	Pale green	Long strip	554.4	High resistance	780	432.5	311.57
Luyou	Glossy dark green	Long strip	550.0	Low resistance	876	481.8	347.07
S68(CK)	Glossy dark green	Long strip	550.0	Low resistance	706	388.3	279.66

4 High-quality, high-yield and high-efficiency cultivation techniques of greenhouse zucchini

4.1 Arrangement of crops for rotation The Autumn delayed zucchini seedlings are generally raised from September 1 to September 5; planting is conducted from October 5 to October 10; plants are uprooted after their edible portions have been harvested from March 15 to April 10 of the following year, with a growth period of about 160 – 180 d. The overwintering zucchini seedlings are raised from October 1 to October 10; planting is conducted from November 25 to December; plants are uprooted after their edible portions have been harvested on June 30 of the following year, with a growth period of about 210 d.

4.2 Variety selection Varieties in line with consumption habits, with good commodity nature, high yield, disease resistance, storage and transportation resistance were selected, including Shengfeier, Xiuyu 170, Xihulu 309 and other zucchini varieties.

4.3 Preparation before planting (i) 75 t/ha of fully decomposed organic fertilizer, 0.60 – 0.75 t/ha of bio-organic fertilizer and 0.75 t/ha of ternary compound fertilizer were applied. Deep ploughing and raking was carried out after fertilization. (ii) The width of the border was 90 – 100 cm, and the height of the border was 10 – 15 cm. Two drip irrigation pipes were laid on each border and it was covered with plastic film.

4.4 Planting Planting should be carried out on cloudy or sunny afternoons, and the planting density should be reasonably determined, with one row per border. In order to ensure adequate light for zucchini in greenhouse, the row spacing near the front part of greenhouse was 75 cm, the row spacing in the middle part was 80 cm, the row spacing in the back part was 85 cm, the plant spacing was about 60 cm, 15 000 – 16 500 plants/ha were grown, and the planting distance was 3 – 5 cm from drip irrigation pipe. It was thoroughly and deeply watered immediately after planting.

4.5 Field management after planting

4.5.1 Temperature management. After planting, high temperature and high humidity were maintained and recovering was promoted (28 – 35 °C in daytime, 11 – 15 °C at night, and no aeration if no higher than 30 °C). After recovering, it was necessary to promote roots and control seedlings to prevent excessive growth of plants (22 – 25 °C in daytime, aeration if higher than 25 °C, no aeration at about 20 °C, 10 – 15 °C at night). It could be reduced to 8 – 10 °C when uncovering in the morning. This was conducive to the early formation and blooming of female flowers, and could effectively control overgrowth. When the first melon began to expand, the temperature was raised appropriately (25 – 35 °C during the day, above 11 °C, reaching 12 – 17 °C at night).

4.5.2 Fertilizer and water management. When the first melon

began to expand (10 cm), it should be watered in time, chemical fertilizer could be applied during watering, and 225 – 300 kg/ha potassium dihydrogen phosphate could be applied. When the first melon was harvested universally and the second melon expanded, the second topdressing was carried out, and 300 – 375 kg/ha urea was applied. After that, topdressing was carried out every half month or so, or topdressing operation was separated from the previous one for a period of time.

4.5.3 Light. In the morning, after uncovering the straw mulch, the dust and broken grass on the film were wiped off with a mop. On cloudy days, it was still necessary to uncover the straw mulch and receive scattered light. The reflective curtain could be hung at the center, and the artificial light could be installed for supplementary lighting if conditions permit.

4.5.4 Pollination. Generally, zucchini can't bear fruit parthenogenetically. In winter and early spring, there are basically no pollinating insects in greenhouses, so artificial pollination must be carried out. At present, we most commonly use the flower-free technology, and it is recommended to use 4-Chlorophenoxyacetic acid for foliar spraying at 15:00 – 18:00 on sunny days. When spraying, only the front of leaves was sprayed, and the growing points and young melons should not be sprayed at close range. In case of severe weather, it is best to use 2,4-D for spraying. If it is rainy continuously, the spraying time can be extended appropriately.

4.5.5 Plant adjustment. Greenhouse zucchini has long growth period, large blades and many leaves, although most of them are dwarf varieties. However, there are many nodes, affecting ventilation and light transmission, and it is prone to diseases, so hanging vines should be carried out. In the process of hanging winding vines, the lower old leaves and diseased leaves were removed. Generally, a melon with about 2 leaves should be kept and pinching was conducted about 30 d before uprooting plants after their edible portions have been harvested.

4.6 Pest control There are many diseases and pests affecting the growth of zucchini, such as viral disease, powdery mildew, aphid, whitefly and vegetable leafminer.

4.6.1 Agricultural control measures. These measures include applying organic fertilizer, selecting varieties with strong disease resistance, reasonable crop rotation, strengthening field management, laying a good foundation for irrigation and drainage in the field, and ensuring smooth drainage.

4.6.2 Physical control measures. Silver-gray plastic film, black light lamp and yellow plastic board can be used to repel aphids and trap and kill pests.

4.6.3 Chemical control measures. (i) Powdery mildew: 20% triazolone (triadimefon) emulsifiable concentrate, 40% polysulfide suspension, or 2% antifungal aqueous solution can be used at the initial stage of onset. 40% – 50% sulfur suspending agent or 40% kresoxim-methyl suspending agent can be sprayed on the leaves at the initial stage of disease, once every 7 – 14 d, continuously for 3 – 4 times. (ii) Viral diseases: 20% moroxydine hydrochloride wettable powder, 2% ningnanmycin or 4% cytosinepeptide mycin can be applied at the initial stage of onset, once every 7 – 10 d, continuously preventing and controlling for 2 – 3 times. (iii) Downy mildew: After the onset of disease, 50% dimethomorph, 25% Azoxystrobin suspension, 20% thidiazole copper suspension and 68% metalaxyl mancozeb can be sprayed once every 5 – 7 d depending on the disease situation. (iv) Whitefly: 17% flupyradifurone (Sivanto® Prime), 22.4% spirotetramat (spirotetramat) (1 : 1 000 – 1 500 solution), 10% flonicamid (1 : 1 500 solution), 10% acetamiprid (1 : 1 250 solution) and 25 g/L bifenthrin (1 : 1 000 solution) can be used every 7 – 10 d. The above pesticides can be used alternately or mixed, and virus inhibitors can be added to the pesticides to treat the virus if necessary. (v) Vegetable leafminer: The commonly used pesticides are 20% imidacloprid EC (1 : 2 000), 10% imidacloprid wettable powder (1 : 1 000), 1.8% Abamectin EC (1 : 2 000), 48% chlorpyrifos (Lorsban) EC (1 : 800 – 1 000), pesticides such as cyromazine can also be used, and the above pesticides should be used alternately.

4.7 Timely harvest When the zucchini melons grow to 400 – 600 g (tender melons), they can be harvested.

References

- [1] LI SL, XU J, CHE XX, *et al.* Comparative experiment of new zucchini strains[J]. Shanxi Agricultural Sciences, 2017, 45(1): 13 – 16. (in Chinese).
- [2] XI XF, MA ZL, XU HX. Photosynthetic response of low temperature and low light to zucchini seedlings[J]. Gansu Agricultural Science and Technology, 2015(4): 31 – 33. (in Chinese).
- [3] YU JS, SUN YX. Preliminary report on introduction and observation of zucchini varieties in high altitude irrigation area of Tianzhu County[J]. Gansu Agricultural Science and Technology, 2014(6): 41 – 42. (in Chinese).
- [4] ZHANG SC, ZHANG HF. Introduction test results of 9 zucchini varieties in Honggu area[J]. Gansu Agricultural Science and Technology, 2013(1): 24 – 25. (in Chinese).
- [5] JIANG XM, TAN JJ. On vegetable cultivation[M]. Beijing: China Agriculture Press, 1980: 216 – 224. (in Chinese).