Comparison of fruit quality between “Shiranui” and “Jinlegan”

Shuai Zhong¹, Jinqiu Huang¹, Ya Fan¹, Hairong Wang¹, Xun Wang²*
¹College of Horticulture, Sichuan Agricultural University, Chengdu, Sichuan, 611130, China
²Istitute of Pomology and Olericulture, Sichuan Agricultural University, Chengdu, Sichuan, 611130, China
*Corresponding author’s e-mail: wx0104@sicau.edu.cn

Abstract: “Jinlegan” is a new bud mutation of “Shiranui”, and it has different qualities. In this experiment, their fruit weight, net fruit weight, tare weight, cross diameter, longitudinal diameter, navel height, single valve weight and skin thickness were analyzed, and the contents of soluble sugar, titratable acid, and edible rate in both hybrid citrus were determined. The results show that compared with “Shiranui”, “Jinlegan” enjoys lower titratable acid content, and more edible rate, net fruit weight, single valve weight. In conclusion, “Jinlegan” has unique flavor, commodity value and a broad market.

1. Introduction
“Shiranui” is a hybrid variety, bred by crossing between ‘Kiyomitangor’ and ‘Nakano No.3’ Ponkan’ [1], which ripens in February to March and produces almost seedless fruits. “Shiranui” is a late maturity citrus with excellent comprehensive qualities. The tree of “Shiranui” has advantages of high yield, strong adaptability, and convenient management, but the tree vigor is weak. The fruit of “Shiranui” is large and fruitful. In Zhang’s experiment, “Shiranui” is larger compared with some other mainly planted citrus in china, and the fruit weight of “Shiranui” is over 220 g [2]. The rind of “Shiranui” is medium thick, readily easy-peeling with the color of orange-yellow, and its collar is prominent at stalk part of the fruit. The flesh is tender and juicy, and the flavor is pleasant, aromatic like ‘Ponkan’ flavor and having high soluble solids, etc [3]. However, “Shiranui” has poor cold tolerance, and the fruit must survive the winter and wait for maturity on the tree, so the flowering and growth of the fruit have extremely high requirements for the temperature, sunshine, humidity, soil, wind, altitude, terrain and slope direction of the planting area [4].

Sichuan is the main production area of “Shiranui”, especially in Pujiang and Meishan [5]. “Jinlegan” is a new bud mutation of “Shiranui”. It has a similar appearance to “Shiranui” and a similar color to ‘Lemon’, although some of its qualities differ from the “Shiranui” greatly.

In this experiment, fruit weight, net fruit weight, tare weight, cross diameter, longitudinal diameter, navel height, single valve weight, skin thickness, titratable acid, soluble sugar, edible rate and the number of fruit petals of “Shiranui” and “Jinlegan” were measured to better find the differences of this two varieties, providing more information to the extension of “Jinlegan”.
2. Materials and methods

2.1 Fruit materials.
Three trees of each of “Shiranui” and “Jinlegan” were selected for the experiment from the orchard in Pujiang, Chengdu, Sichuan province. When both of the two varieties are mature, eight fruits were picked from each of the trees for uniformity, ordinary without decay and external injuries. Then the materials were sent to lab to measure the fruit weight, net fruit weight, tare weight, cross diameter, longitudinal diameter, navel height, single valve weight, skin thickness and number of fruit petals, using the net fruit weight divided by fruit weight as the edible rate. The rest materials were used to measure the soluble sugar and titratable acids determination. The average value of 8 values of each variety were taken as theirs measured indictors.

2.2 Soluble sugar determination.
0.15 g sample was weighed, boiled with distilled water for 20 min to extract soluble sugar, and determined by anthrone colorimetry with constant volume.

2.3 Titratable acids determination.
Titratable acids were determined by titration with 0.1 M NaOH in fresh sample.

3. Results
From the resultant table.1, some measured indictors of “Shiranui” and “Jinlegan” vary significantly. The cross diameter of “Jinlegan” has highly significant difference from “Shiranui” (P<0.01). The average cross diameter of “Jinlegan” is 87.36 mm, 7.96 mm more than “Shiranui”. The number of fruit petals of “Jinlegan” is significantly different from “Shiranui” (P<0.05), and its average number of fruit petals is three more than “Shiranui”. But the fruit weight, net fruit weight, longitudinal diameter, navel height, single valve weight, skin thickness of “Jinlegan” have no significant difference compared with “Shiranui”. But some qualities of the two varieties is different. The fruit weight of “Jinlegan” is 33.45 g higher than “Shiranui”, and its net fruit weight is 52.86 g higher than “Shiranui”, and the tare weight of ‘Jinlegan’ is 19.4 g higher than “Shiranui”, showing the “Jinlegan” has higher edible value than “Shiranui”. The longitudinal diameter, navel height, single valve weight, skin thickness of “Jinlegan” and “Shiranui” do not vary significantly.

Table 1. Some indictors of “Jinlegan” and “Shiranui”.

| Fruit weight (g) | Net fruit weight (g) | Tare weight (g) | Cross diameter (mm) | Longitudinal diameter (mm) | Navel height (mm) | Single valve weight (g) | Skin thickness (mm) | Number of fruit petals |
|------------------|----------------------|-----------------|---------------------|---------------------------|------------------|------------------------|---------------------|-----------------------|
| “Jinlegan”       | 257.03±              | 211.63±         | 45.41±              | 87.36±                    | 70.12±           | 75.40±                 | 10.17±              | 11.00±                |
| “Shiranui”       | 223.58±              | 158.77±         | 64.81±              | 79.40±                    | 78.46±           | 86.40±                 | 10.67±              | 11.00±                |

From the table.2, the titratable acid of “Shiranui” is significantly higher than “Jinlegan” (P<0.01), and the average titratable acid of ‘Jinlegan’ is 0.81 %, 0.08 % less than “Shiranui”. And the soluble sugar of “Jinlegan” and “Shiranui” is not significant. Soluble sugar of “Jinlegan” is 12.28 g/L, less than “Shiranui” of 12.63 g/L. Titratable acid of “Jinlegan” is 0.81 %, less than “Shiranui” of 0.89 %, showing that the flavor of “Jinlegan” is more sweeter than “Shiranui”. The difference of edible rate of “Jinlegan” and “Shiranui” is not significant. But the edible rate of “Jinlegan” is 11.32 % higher compared with “Shiranui”, reflecting that the “Jinlegan” has more edible part.
Table 2. other indicators of “Jinlegan” and “Shiranui”.

|                | Titratable acid (%) | Soluble sugar (g/L) | Edible rate (%) |
|----------------|----------------------|---------------------|----------------|
| “Jinlegan”     | 0.81±0.02            | 12.28±0.70          | 82.33±7.06     |
| “Shiranui”     | 0.89±0.02**          | 12.63±0.89          | 71.01±5.12     |

4. Conclusions
The cross diameter of “Jinlegan” is highly significant from “Shiranui”, the “Jinlegan” has longer cross diameter. The longitudinal diameter, navel height, Skin thickness of “Shiranui” is longer compared with “Jinlegan”, showing that the different appearance of ‘Jinlegan’ and “Shiranui”.

The titratable acid of “Jinlegan” is highly significant from “Shiranui”. “Jinlegan” has lower content of titratable acid. The content of soluble sugar of “Shiranui” is higher compared with “Jinlegan”, reflecting the unique flavor and nutritional value of this two varieties.

The edible rate of “Jinlegan” is 11.32 % higher than and “Shiranui”. The number of fruit petals is significant difference from “Shiranui”, average number of fruit petals is three more than “Shiranui”. The fruit weight, net fruit weight, single valve weight of “Jinlegan” is higher than “Shiranui”. Tare weight of “Jinlegan” is lower than “Shiranui”, showing higher edible value of “Jinlegan”.

Through comprehensive evaluation, the differences between “Jinlegan” and “Shiranui” are not only their colors, but also other indicators below. “Jinlegan” have high eatable value, a special favor compared with “Shiranui”, which is a totally different variety from “Shiranui”, having a unique commercial value. The determination of the indictors of “Jinlegan” has a guiding effect on its commercialization. However, to realize the successful cultivation of “Jinlegan” in different areas, further scientific research should be made in combination with different climatic characteristics, soil conditions and cultivation types in different areas.

The cultivation area of hybrid orange has reached 6667 hm² in Sichuan, where the proportion of “Shiranui” cover 60 % of all areas[7]. The future of this new bud mutation of “Shiranui”- “Jinlegan”, is promising.

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