

Study on Germplasm Resources of Peach Cultivars

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Abstract [Objectives] To study the germplasm resources of excellent peach cultivars. [Methods] Five peach cultivars were introduced, including ‘Jinxiu’ peach, ‘Jinxiang’ peach, ‘Chunxiao’ peach, ‘Hujingmilu’ peach and ‘018 nectarine’ peach. Then, these five cultivars were used to study the biological characteristics of peach trees, namely, as phenology, fruit quality, heat resistance, cold resistance and other resistance. [Results] Five cultivars of peach plants grew fast and robust, among which ‘018 nectarine’ had very crisp fruit, ‘Jinxiu’, ‘Jinxiang’, ‘Chunxiao’ and ‘Hujingmilu’ had very sweet fruit; the peach trees of these five cultivars have good water resistance, heat resistance and cold resistance. [Conclusions] The results of this study can not only provide a reference for the introduction of peach trees, but also provide a practical basis for the large-scale planting of peach trees.

Key words Peach trees, Cultivars, Fruit, Stress resistance

1 Introduction

Peach, a deciduous shrub or small arbor belonging to *Amygdalus* of *Prunus* L. in Rosaceae family, is an important fruit tree in China. Peach trees are widely distributed in China, including Shandong, Shaanxi, Inner Mongolia, Shanghai, Zhejiang and Nanning. Peach trees first bloom and then grow leaves, have many beautiful flowers, fresh and delicious fruits and high nutritional value, so they are excellent tree species for viewing flowers and fruits.

In recent years, there are many researches on peach trees at home and abroad, including researches on biotechnology such as cultivation techniques, flowering regulation and fruit yield^[1–4]; there are also some reports on breeding^[5–7]; there are also some researches focusing on diseases and insect pests of peach trees^[8–9]. The results of this study can not only provide a reference for the introduction of peach trees, but also provide a practical basis for the large-scale planting of peach trees.

2 Materials and methods

2.1 Overview of the experimental site We selected the peach tree area in Shanghai Chenshan Botanical Garden as the experimental site. It is located on the east side of Chenshan Botanical Garden in Songjiang District, Shanghai, with an annual average temperature of 15–16 °C; the soil fertility is medium, the soil is clay, and the soil is slightly alkaline.

2.2 Selection and collection of materials Peach trees planted in the field were selected as experimental materials, and various peach tree resources were purchased and collected. The introduction area is mainly Shanghai, including Sheshan Zhongyi Taoyuan Specialized Cooperative.

2.3 Experimental design and methods A total of 5 groups were set up in the experiment, one group for each peach tree culti-

var, and ‘Jinxiu’ peach was taken as the control. When planting, the peach trees of 5 cultivars were randomly arranged without repeated treatment, with ridge width of 200 cm, ditch width of 50 cm, plant spacing of 250 cm.

Through the field observations in 2019–2022, various methods such as photographic records and measuring tapes were used to judge the phenological records, cold resistance, heat resistance, diameter at breast height (DBH), and height of peach trees. The DBH, height and other traits of peach trees were measured by measuring tape.

3 Results and analysis

3.1 Phenological records of peach trees As shown in Table 1, five cultivars of peach trees, ‘Jinxiu’ peach tree, ‘Jinxiang’ peach tree, ‘Chunxiao’ peach tree, ‘Hujingmilu’ peach tree and ‘018 nectarine’ peach tree were observed in this study, and the flowering period of ‘018 nectarine’ peach tree was the earliest. It began to bloom on March 10, and the peak flowering period began on March 18, which can last for 2–3 weeks; the flowering period of ‘Jinxiu’ peach, ‘Jinxiang’ peach, ‘Chunxiao’ peach and ‘Hujingmilu’ peach was close to each other, and the peak flowering period began from March 20 to March 22, and ended around April 15. The peak flowering period lasted for 2 weeks.

In terms of fruit maturity, ‘018 nectarine’ peach belongs to nectarine, which matured the earliest and began to mature at the end of June; ‘Chunxiao’ peach trees and ‘Hujingmilu’ peach trees belong to honey peaches, which began to mature in the first ten days of July; ‘Jinxiu’ peach trees and ‘Jinxiang’ peach trees belong to yellow peach, which began to mature in the first ten days of August. In terms of defoliation time, these five cultivars of peach trees began to defoliate in late November, and most of the leaves would fall within 1–2 weeks, which belong to the typical characteristics of deciduous fruit trees.

3.2 Traits of peach cultivars As shown in Table 2, for five cultivars of peach trees, through observing ‘Jinxiu’ peach tree,

‘Jinxiang’ peach tree, ‘Chunxiao’ peach tree, ‘Hujingmilu’ peach tree and ‘018 nectarine’ tree, we found that the height of ‘018 nectarine’ peach tree was the highest. The height was 220 cm, the crown width was 240 cm, and the diameter of the tree body was 10 cm. The height of the other four cultivars of peach trees was 165–175 cm, the crown width was 270–300 cm, and the stem diameter was 11–14 cm. In terms of plant type, they were all common smiling faces. In terms of external color of fruit, the pericarp of ‘Jinxiu’ peach and ‘Jinxiang’ peach was yellow, ‘Chunxiao’ peach and ‘Hujingmilu’ peach were pink, and the fruit of ‘018 nectarine’ peach was fuchsia. In terms of pulp color, the pericarp of ‘Jinxiu’ peach and ‘Jinxiang’ peach was

yellow, the pulp of ‘Chunxiao’ peach and ‘Hujingmilu’ peach was milky white, and the pulp of ‘018 nectarine’ peach was yellow. In terms of pulp quality, these five cultivars of peaches were very crisp, while the fruits of ‘Jinxiu’ peach tree, ‘Jinxiang’ peach tree, ‘Chunxiao’ peach tree and ‘Hujingmilu’ peach tree were very sweet, while the fruits of ‘018 nectarine’ peach tree were crisp and sweet. In terms of single fruit weight, the weight of ‘Jinxiang’ peach and ‘Hujingmilu’ peach was slightly smaller, with a single fruit weight of 220 and 200 g, respectively; the single fruit weight of ‘Jinxiu’ was 280 g, the single fruit weight of ‘Chunxiao’ was 250 g, and the single fruit weight of ‘018 nectarine’ was 290 g.

Table 1 Phenological records of peach tree cultivars

Cultivar	Germination stage	Full bloom stage	Fruit ripening stage	Deciduous stage
‘Jinxiu’	March 17	March 20	Early August	Late November
‘Jinxiang’	March 16	March 21	Early August	Late November
‘Chunxiao’	March 17	March 20	Early July	Late November
‘Hujingmilu’	March 18	March 22	Middle July	Late November
‘018 nectarine’	March 10	March 18	Late June	Late November

Table 2 Traits of peach cultivars

Cultivar	Height//cm	Stem thickness//cm	Fruit surface color	Pulp taste	Single fruit weight//g
‘Jinxiu’	175	11	Yellow	Sweet	280
‘Jinxiang’	165	12	Yellow	Very sweet	220
‘Chunxiao’	175	14	Pink	Sweet	250
‘Hujingmilu’	170	14	Pink	Sweet	200
‘018 nectarine’	220	10	Fuchsia	Sweet	290

3.3 Adaptability of peach tree cultivars As shown in Table 3, we observed that ‘Jinxiu’ peach tree, ‘Jinxiang’ peach tree, ‘Chunxiao’ peach tree, ‘Hujingmilu’ peach tree and ‘018 nectarine’ peach tree had good adaptability for planting in Shanghai area, with strong growth potential, fast plant growth and robustness. In terms of heat resistance, the highest temperature in the summer of 2019–2022 in Shanghai reached 41 °C, but there was no obvious death of plants, indicating that the heat resistance was good. The low temperature weather occurred in the winter of 2019–2022 in Shanghai, with a low temperature of −3 °C to −5 °C, lasting for 3 d, and the lowest temperature was −9 °C, but these five cultivars of peach trees did not suffer from freezing injury, indicating that they had good cold resistance. Shanghai has a rainy season from June to July every year. During this period, the precipitation is large. In the case of digging drainage ditches, these five cultivars of peach trees have good water resistance and no root rot.

Table 3 Adaptability of peach tree cultivars

Cultivars	Growth potential	Heat resistance//°C	Cold resistance	Water tolerance
‘Jinxiu’	Excellent	41	Strong	Strong
‘Jinxiang’	Excellent	41	Strong	Strong
‘Chunxiao’	Excellent	41	Strong	Strong
‘Hujingmilu’	Excellent	41	Strong	Strong
‘018 nectarine’	Excellent	41	Strong	Strong

4 Discussion

There are many factors affecting the biological characteristics of peach trees, which are closely related to the level of maintenance. For example, there are many diseases and insect pests in peach trees, such as *Tetranychus cinnbarinus*, *Taphrina deformans*, gummosis, and so on. Besides, after the defoliation of peach trees in winter, organic fertilizer should be applied once in December, and topdressing should be applied in spring and summer, and compound fertilizer is generally chosen for topdressing. In addition, during the high temperature period from July to August, whether it can be watered in time also has a greater impact on the quantity and quality of peach fruit. Furthermore, whether peach trees are pruned or not after defoliation also has a significant impact on fruit yield in the second year.

These five cultivars of peach trees are high-yielding, in addition to maintenance is an important factor, the surrounding planting environment is also an important factor. Because of the obvious effect of artificial protection in the botanical garden, there are many small animals in the garden, such as birds and squirrels. A row of cedar trees, including *Taxodium distichum*, *Metasequoia glyptostroboides* and *Taxodium ascendens*, are planted next to the peach tree planting area. There are a large number of squirrels and various birds on the trees. When the peach trees are mature, they will be eaten by these small animals. Even if the fruit is bagged or covered with bird-proof nets, there will still be some loss of fruit.

References

- [1] YANG Y. Discussion on efficient cultivation and related management techniques of peach[J]. Contemporary Horticulture, 2017(4): 23. (in Chinese).
- [2] XIONG R, CHEN JY, WANG Y. Study on the flowering-time regulation of outdoor ornamental peaches [J]. Northern Horticulture, 2012(8): 75–77. (in Chinese).
- [3] ZHAO CP, WANG QX, HAN YM, *et al.* Effects of tree shape on the quality of leaf and fruit and the yield in peach[J]. Journal of Northwest A&F University (Natural Science Edition), 2010, 38(6): 160–164, 170. (in Chinese).
- [4] XIAO L, CHEN HJ, DI B, *et al.* The changes in canopy parameters and the effect of yield and quality by two kinds of peach tree shape[J]. Northern Horticulture, 2012(17): 20–23. (in Chinese).
- [5] ZHU GR, WANG LR, CHEN CW, *et al.* A new flat peach cultivar

- ‘Zhongpan 17’ [J]. Journal of Fruit Science, 2020, 37(3): 445–448. (in Chinese).
- [6] WANG ZY, LIU GJ, CHANG RF, *et al.* Breeding of a new late-ripening peach cultivar ‘Qiulian’ [J]. Northern Horticulture, 2020(3): 178–180. (in Chinese).
- [7] YE ZHENG W, SU MS, DU JH, *et al.* A new late ripening yellow peach cultivar ‘Jinshuo’ [J]. Journal of Fruit Science, 2020, 37(3): 441–444. (in Chinese).
- [8] WANG YH, YANG JG, ZHANG JL, *et al.* Experiment and demonstration of green control technology of peach diseases and insect pests in Pinggu, Beijing [J]. China Plant Protection, 2012(8): 20–23. (in Chinese).
- [9] NIU YH, ZHANG T, ZHANG CY, *et al.* Discussion on green control integrated techniques against peach pests [J]. Shaanxi Journal of Agricultural Sciences, 2019, 65(8): 90–92. (in Chinese).

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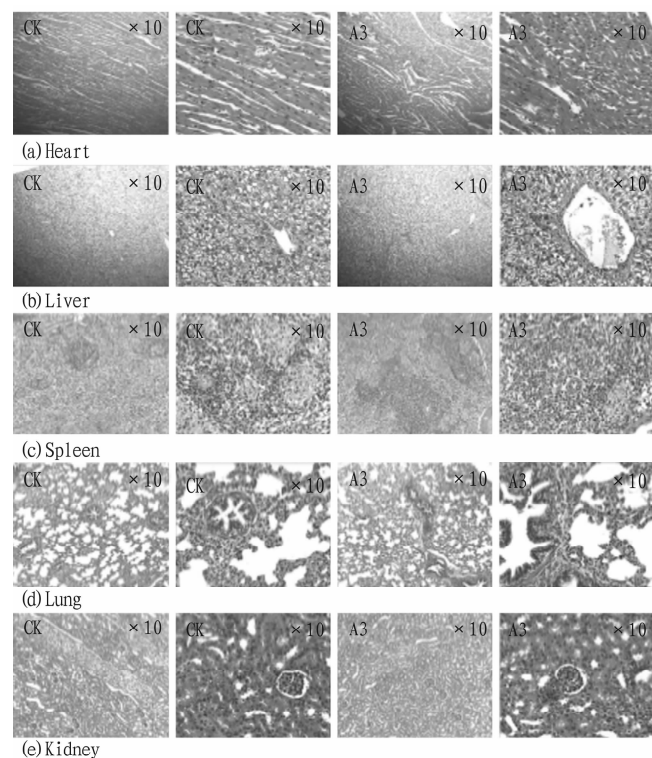


Fig.1 Tissue section

4 Conclusions

In summary, the body characteristics of mice were not abnor-

mal compared with the control group when the purified supernatant of Bt fermentation was administered at the doses of 0.2, 0.6 and 1.0 mL/kg. The results of blood routine and blood biochemical analysis showed that there was no significant difference between the two groups. After the administration, mice were dissected and tissue sections were made, and no pathological changes were observed through 10 times and 40 times microscope. The results showed that the purified supernatant of Bt fermentation had high biological safety.

References

- [1] HUANG HM, ZENG YT, WANG L. Research progress of *Bacillus thuringiensis* and its parasporal crystal insecticide[J]. Guangdong Chemical Industry, 2021, 48(10): 86–87. (in Chinese).
- [2] CHENG GY. Detection and application of water-soluble active substance in fermentation broth of *Bacillus thuringiensis* [D]. Guilin: Guilin University of Technology, 2019. (in Chinese).
- [3] ZHAO KJ, XING YN, HAN LL, *et al.* Optimization of fermentation conditions for *Bacillus thuringiensis* strain Bt20 [J]. Journal of Northeast Agricultural University, 2014, 45(7): 45–53. (in Chinese).
- [4] WANG HR, LIU YW. Research progress in fermentation of Bt biopesticide [J]. Journal of Anhui Agricultural Sciences, 2010, 38(19): 10116–10117. (in Chinese).
- [5] CHEN ZE, WU JX, ZHANG ZG, *et al.* Ten years’ research progress on submerged fermentation of *Bacillus thuringiensis* in China (1990–2000) [J]. Chinese Journal of Biological Control, 2002(1): 33–35. (in Chinese).
- [6] HU F, XU TT, SU XIAN Y, *et al.* Control efficacy of *Bacillus thuringiensis* tiny microgranules on maize lepidopteran pests [J]. Chinese Journal of Biological Control, 2023, 39(1): 46–53. (in Chinese).