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Study on Growth Characteristics of Young Feijoa Trees in Different Propagation Methods

Meng Zhang, Dan Wang, Shao-Xiong Ren and Li-Zhang Fan
College of Life Science and Engineering, Southwest University of Science and Technology, Mianyang, 621010 Sichuan, China

Abstract: In this experiment, *Feijoa sellowiana* Berg. was grown with the multiplication from seeds, grafting, cutting and layering, its germination period, growth of shoot and seedling information after 2 years were studied. The results showed that the growth characteristics of young feijoa trees obviously influenced by four propagation methods. The germination period, length of shoot and seedling information after 2 years of seeds and grafting were superior to that of cutting and layering. In production practice, seeds and grafting should be chosen according to productive purpose.

Key words: Feijoa (*Feijoa sellowiana* Berg.), propagation methods, young trees, germination period, growth of shoot, seedling rate

INTRODUCTION

Feijoa sellowiana is a subtropical species belonging to the Myrtaceae family. It is native to South Brazil with a secondary dispersion in Uruguay. The fresh fruit is enjoyed for its characteristic flavour and aroma which are similar to pineapple. For this reason, it is also called pineapple guava. As a newly rising species for its edible fruits, ornamental and medicinal properties, feijoa shows great potential in foods (Kolesnik *et al*., 1991), drug (Nakashima, 2001) and cosmetics (Hardy and Michael, 1970). Wang *et al*. (2007) in Southwest University of Science and Technology (SWUST) introduced a small number of fruit seedlings from New Zealand in 2004. She considers that feijoa have great potential for the development of ornamental trees and edible fruits because it retains its fine qualities in Sichuan climatic conditions. It is urgent to speed up the rate of reproduction in order to meet production demand. Feijoas are propagated from seed, layering, cutting and grafting. Propagation from seed produces very heterogeneous plants. Consequently, this method is used only in the production of rootstock and in small domestic gardens. Compared with other fruit trees, vegetative propagation of feijoa is more difficulty. The callus induction is very difficulty by flower organs of feijoa and sterilization of the explant and callus induction of feijoa is also difficulty. Zhang *et al*. (2009) find it is difficulty to propagate by cutting. In this experiment, *Feijoa sellowiana* Berg. was grown with the multiplication from seeds, grafting, cutting and layering, its germination period, growth of shoot and seedling information after 2 years were studied in order to choose the right method to feijoa's propagation.

MATERIALS AND METHODS

Experiment site: Experiment site is in the Southwest University Agricultural Experiment Station (Mianyang, Sichuan province) with the annual average temperature of 16.3°C, January average temperature 5.2°C, July average temperature 26°C, annual average rainfall of 963.2 mm, frost-free period 272 days. The soil is made up of loam and organic matter content 1.5%. The site flat, good drainage and irrigation conditions and all young feijoa trees have the same fertilizer and water management. Young feijoa trees in different propagation methods.

Seedling plant: Sowing seeds in October 2007, transplanting in February 2008.

Cutting seedlings: Cutting with 1 year old semi-hard wood from 3 years old seedling plant in June 2007, transplanting in February 2008.

Grafted seedlings: Grafting by ventral-graft in October 2007, grafted rootstock is 1 year old seedling plant and the scion is 1 year old semi-hard wood from 3 years old seedling plant, transplanting in February 2008.

Corresponding Author: Meng Zhang, College of Life Science and Engineering, Southwest University of Science and Technology, Mianyang, 621010 Sichuan, China

Layering seedlings: Layering with 1 year old hard wood from 3 years old seedling plant in June 2007, transplanting in February 2008.

Experimental design and statistical analysis: To compare the growth characteristics of seedling plant, cutting seedlings, grafted seedlings and layering seedlings, the experiment was conducted with 3 replications in a single factor random block design and 10 young trees uniform growth per replication. The germination period, growth of shoot, seedling height, caliper and seedling rate of different propagation methods of feijoa young trees from 2008-2009 were continuously observed and recorded. The data on the vegetative characteritic were subjected to analysis of variance and the significant differences between means were determined by using the Least Significant Difference (LSD) test at the 5% level. The seedling rate data were arcsine transformed and the transformed data were statistically analyzed.

RESULTS AND DISCUSSION

Germination period of different propagation methods of feijoa: As shown in Table 1 after continuously observation the growth of feijoa from 2008-2009, seedling is the first to sprout then grafted seedlings, layering plants and cuttings. The time of bud sprouting is related to the temperature in early spring between different years. However, the time of bud sprouting at the same year is closely related to the maturity of branch, the higher the maturity of the branch, the later the time of bud sprouting. The time of bud sprouting influences the growth potential current year, the earlier of bud sprouting, the stronger of the growth potential and the bigger the growth of shoots.

Growth of shoot of different propagation methods of feijoa: It can be shown in Table 2 that significant differences in growth of shoot might be resulted in by different propagation methods of feijoa. The seedling had the largest growth of shoot, the total growth in 2 years was 101.5 cm and the annual average growth was 50.75 cm. The cuttings had the least growth of shoot, the total growth in 2 years was 56.3 cm and the annual average growth was 28.15 cm especially in 2008, the growth of shoot was 15.8 cm.

The total growth of grafted seedlings in 2 years was 93.5 cm and the annual average growth was 46.75 cm, little difference was obtained with seedling. The growth of layering plants was between the cuttings and grafted seedlings, the total growth of layering plant in 2 years was 71.1 cm and the annual average growth was 35.55 cm (Table 3).

Table 1: Germination period of different propagation methods of feijoa seedling

	Particular year	
Propagation methods	Month day year	Month day year
Seedling	3-30-2008	3-25-2009
Cuttings	4-6-2008	3-30-2009
Grafted seedlings	4-2-2008	3-26-2009
Layering plants	4-4-2008	3-28-2009

Table 2: Growth of shoot of different propagation methods of feijoa seedling

	Growth of shoot cm^{-1}		
Propagation methods	2008	2009	Growth in 2a
Seedling	35.8	65.7	101.5
Cuttings	15.8	40.5	56.3
Grafted seedlings	33.5	60.0	93.5
Layering plants	25.6	45.5	71.1

Table 3: Seedling information of different propagation methods of feijoa seedling after 2 years

Propagation methods	Seedling height m^{-1}	Caliper cm^{-1}	Seedling rate/%
Seedling	1.67^{a}	1.32^{a}	100^{a}
Cuttings	0.90^{c}	0.80^{c}	63^{c}
Grafted seedlings	1.55^{ab}	1.12^{ab}	90^{b}
Layering plants	1.08^{b}	0.95^{b}	76^{c}

Data following different small letters in the same column present significant difference at 0.05 level

Seedling information different propagation methods of feijoa: Details of seedling information of different propagation methods of feijoa seedling after 2 years are shown in Table 1. The seedling and caliper in seedling were the largest that difference with grafted seedlings was not significant but that among cuttings and layering plants significant. The seedling and caliper in cuttings were the worst. Seedling rate in seedling were the largest, reached 100% which had significant differences with other propagation methods. Seedling rate in cuttings and layering plants were 63 and 76%, respectively there were no significant different between two propagation methods. Seedling information of different propagation methods had great difference and closely related to the development of roots.

The seedling and grafted seedlings had many good fibrous roots which can increase the surface contact between the soil and the fibrous roots. With little adventitious roots in cuttings and layering plants, the root systems are much inferior in quality to the seedling and grafted seedlings. The root systems of the seedling and the grafted seedlings showed stronger capacity of nutrients and water absorbed from soil so, the seedling and the grafted seedlings had the higher photosynthesis intensity, water use efficiency than that of the cuttings and layering plants.

CONCLUSION

The growth characteristics of young feijoa trees obviously influenced by four propagation methods. The germination period, length of shoot and seedling information after 2 years of seeds and grafting were superior to that of cutting and layering. In production practice, seeds and grafting should be chosen according to productive purpose.

The full light mist and hormone treatment can stimulate the semi-hard wood rooting but the stability of rooting rate and root system were very poor. Many other factors play a role in cutting including cutting's collected time, length, location, hormone density, substrate and variety.

Culture medium and plant growth regulator have a great effect on the rooting of softwood cutting of feijoa and reproduction methods and maturity also have a great effect on cutting. In practice, cutting should not be popular to productive purpose.

Layering method had high rooting rate but low coefficient of propagation, stem suffered and poor toot system limited mass production of its seedlings.

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