



(RESEARCH ARTICLE)



## Rooting and development parameters of softwood cuttings of kiwifruit plant in different planting schemes

Obidjon Odinamakhmadovich Sattorov \*

Tashkent State Agrarian University, Tashkent, Uzbekistan.

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### Abstract

This article reveals the results of experiments conducted to study the influence of the planting scheme on the viability of the varieties of kiwifruit plant introduced to our republic in their reproduction from softwood cuttings. The experiments were conducted on a special substrate in a microclimate-controlled facility. Hayward variety of the kiwifruit plant served as the object of study. Softwood cuttings of kiwifruit varieties were studied by planting in eight different schemes. The results of the study showed that the rooting of kiwifruit varieties from softwood cuttings was higher as the distance between them decreased. However, in terms of seedling yield per unit area, the planting schemes 10×20 and 15×15 cm were recommended in the production.

**Keywords:** Kiwifruit; Variety; Softwood cutting; Planting scheme; Rooting; Growth

### 1. Introduction

Although kiwifruit or sweet actinidia (*Actinidia deliciosa* Ch.) is a new fruit plant that has only recently begun to be grown on an industrial basis, it has become very popular in many countries around the world today [1, 2, 3].

According to K. V. Klemeshova [4], sweet species of actinidia - *Actinidia deliciosa* Chevalier - has really become very common in recent years. All varieties of this species are called "kiwi" (kiwifruit) by a common name. All varieties of the genus sweet actinidia - *Actinidia deliciosa* are moist plants, which are very demanding to relative humidity and precipitation. This is directly related to the climatic characteristics of the center of origin of this plant - Central and Western China.

The reason of such popularity of sweet actinidia is that it is extremely rich in vitamins and has excellent taste. The richness of actinidia fruits in vitamins A, B, C, P, PP vitamins, β-carotene and minerals has been reported and emphasized in the research and scientific sources of many scientists [1, 5, 6, 7, 8].

The following data show that sweet actinidia is so popular today: by 1989, per capita consumption of sweet or Chinese actinidia (*Actinidia chinensis* Planch) was 2,8 kg in New Zealand, 583 g in Australia, 236 g in Germany, 211 g in Belgium and Italy, 178 g in Switzerland and 147 g in Japan [9].

In recent years, the demand for this delicious fruit is growing in Uzbekistan too. It should be noted that this demand is met only through imports. Therefore, the cultivation of kiwifruit plant in our country is one of crucial tasks.

\* Corresponding author: Obidjon Odinamakhmadovich Sattorov  
Tashkent State Agrarian University, Tashkent, Uzbekistan.

## 2. Material and methods

The study was conducted at Tashkent State Agrarian University in 2018-2021. The Hayward variety of kiwifruit was used as the object of the study. The experiment was carried out on an artificial substrate and in the facility with an automated device that creates an artificial mist, which provides favorable conditions of humidity and temperature inside the facility.

For the experiment, cuttings of 8–10 cm long were prepared from the shoots of mother plants of introduced kiwi varieties. To prepare the cuttings, the newly formed shoots during the growing season were cut in the morning. Prepared cuttings were treated by remaining them in a solution of 50 mg/l water concentration of indolyl acid for 12 hours before planting. Then the treated cuttings were rinsed with clean water before planting. The cuttings were planted in the last ten days of May in a different scheme according to the research program.

Experiments were conducted according to the methods presented in the sources developed by Buriev Kh.Ch. et al., "Methods of calculations and phenological observations in experiments with fruit and berry plants" [10], by F.Ya. Polikarpova, V.V Pilyugina "Methods of production of planting material by softwood grafting" [11].

## 3. Results

According to scientists, many factors (planting scheme, time, growth substances and their concentration, etc.) affect the rooting of fruit plants in their reproduction from softwood cuttings. Among these factors, the scheme of planting softwood cuttings is also important. Because excessive thickness of planted cuttings leads to the rot of cuttings due to increased humidity and shading, on the contrary, increasing the distance among the planted cuttings reduces the amount of seedlings per unit area.

Experiments on propagating the kiwifruit plant from softwood cuttings in different planting schemes have shown that the rooting of softwood cuttings varied according to the variants. At the same time, as the planting scheme expanded, the rooting rate of cuttings increased. As a rule, the highest rooting rate was recorded in the variant planted in the scheme 15×25 cm. In this variant, the amount of rooted cuttings reached 90, 6% of the total planted cuttings. The lowest rooting rate was observed in the scheme 10×5 cm. In this experimental variant, the rooting of softwood cuttings of kiwifruit plant did not exceed 79, 3%.

It should be noted that in the experimental variants, the difference on rooting rate was not so high, but thin planted cuttings showed an advantage in terms of development parameters of the root system. In this case, the best developed root system was noted in the cuttings of varieties planted in the scheme 10×15 ... 25 and 15×15 ... 25 cm (Fig. 1).



**Figure 1** Development of the root system in softwood cuttings of the Hayward variety of kiwi in different planting schemes (as in September 1): 1-10×5; 2-10×10; 3-10×15; 4-10×20; 5-10×25; 6-15×15; 7-15×20; 8-15×25

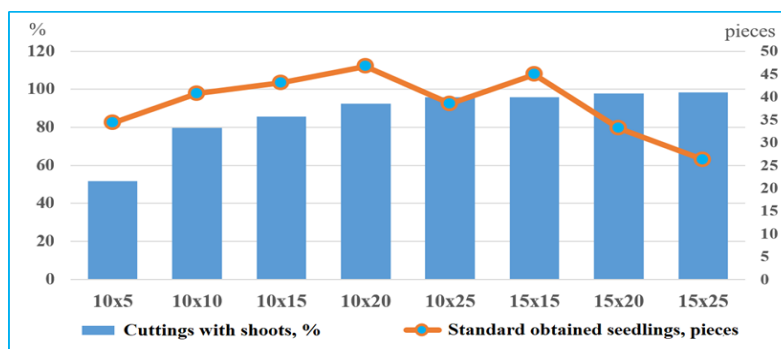
The planting scheme also had a significant effect on the development parameters of the topsoil parts of the softwood cuttings. In this case, the highest rate of shoot formation in the planted cuttings was recorded in the variant planted in the scheme 15×25 cm. In this variant, the amount of shoot-forming cuttings was about 98,3% from the total planted softwood cuttings. As the planting scheme thickened, the shoot formation decreased in direct proportion. As a rule, the least rate of the growth of cuttings were recorded in the scheme 10×5 cm. In this experimental variant, the amount of shoot-forming cuttings did not exceed 51,6% of the total planted softwood cuttings. The remaining variants were found to be in ascending order between these two variants.

The number of leaves in plants grown from softwood cuttings also varied depending on the formation of the shoots. The advantage in this biometric parameter was also noted in the variant planted in the scheme 15×25 cm. The lowest rate on leaf formation in rooted cuttings was noted in the variant in which the cuttings were planted in a 10×5 cm scheme. In terms of number of leaves, the remaining variants were in the ascending sequence between these two variants (Table).

**Table 1** Influence of the planting scheme on the development parameters of plants of the Hayward variety of kiwi grown from softwood cuttings

Experimental variants, cm	Rooting, %	Size of root system, cm <sup>3</sup>	Shoot-forming cuttings, %	Number of leaves, pcs
10×5	79.3	2.1	51.6	6.3
10×10 – Control	81.7	4.3	79.8	8.3
10×15	85.8	5.1	85.7	9.6
10×20	86.7	5.9	92.3	11.7
10×25	88.9	6.5	95.8	15.7
15×15	89.5	6.9	95.9	16.8
15×20	89.6	7.0	97.8	18.7
15×25	90.6	7.1	98.3	19.1

It should be noted that although the regeneration in plants is high when the planting scheme allows thinly planting, it is important to choose the optimal variant in terms of the amount of ready seedling output per unit area. Calculations showed that the yield of standard seedlings exceeding 80 cm in length of the main branch was the highest in the planting schemes of 10×20 cm and 15×15 cm compared to the total grown plants (46 and 44 pieces/m<sup>2</sup>, respectively). In the densely planted variants, although the number of plants that have taken root and grown is large, most of them (75-80%) have been left for cultivation next year. Because their height did not even reach 50 cm. On the contrary, in the thinly planted variants, although about 95–98% of the plants grew strongly, producing shoots, the amount of seedling yield was also lower due to the fact that few cuttings were planted per unit area (Fig. 2).



**Figure 2** Influence of the planting scheme on the yield of seedling of Hayward variety of kiwi plant in the propagation from softwood cuttings

#### 4. Conclusion

The rooting of softwood cuttings of Hayward variety of kiwifruit plant is higher as the spacing distance between seedlings decreases. However, in terms of seedling output per unit area, the planting schemes 10x20 and 15x15 cm are recommended in the production. In these planting schemes, standard sized seedlings up to 46 and 44 pieces, respectively, per unit area (m<sup>2</sup>) can be obtained.

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#### Compliance with ethical standards

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