

# The Age of Citrus Cultivars Affects Rooting, Growth and Development of Cuttings

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## ABSTRACT

The article presents the results of research conducted to study the effect of the age of citrus varieties on the rooting, growth and development of cuttings. The article also provides valuable information on determining the phenophases of rhizogenesis in cuttings of citrus plants of different ages.

**KEYWORDS:** citrus plants, cultivars, cuttings, roots, shoots.

## Introduction

Many authors have noted the relationship between the rooting of green cuttings and the development of the root system in fruit plants [3, 4].

The process of the formation of additional roots in the green cuttings of citrus plants is mainly due to plastic substances accumulated earlier in the cuttings themselves, the amount of these substances depends to a certain extent on the length of the cutting [1].

Citrus plants can be propagated by various vegetative methods: lignified, semi-lignified, from green cuttings, bud or cutting grafting, by grafting [5,6,7].

## Materials and Methods

The experiment was conducted in 2014-2016 at the central experimental farm of the scientific research institute of horticulture, viticulture and winemaking named after Academician M. Mirzaev.

Grafting of citrus plants was carried out according to the generally accepted methodological guide developed at the Timiryazev Agricultural Academy. Cuttings were cut from lignified (control), green, semi-lignified 10-14-year-old mother bushes in the greenhouse combine "Limonariya" of Kibray district, Tashkent region and placed in polyethylene bags at the cutting site.

The fog generator was used from 8:00 a.m. to 8:00 p.m., with a spray time of 15-25 seconds and an interval of 3.5 to 15 minutes (depending on weather conditions). Hydrothermal conditions of cuttings rooting medium were controlled by KEP-12U device and manually.

The following types and varieties of citrus plants were used as research objects: "Meyer", "Tashkent", "Yubileyniy" varieties of lemon, "Gamlin" variety of orange, "Unshiu" variety of mandarin and "Duncan" variety of grapefruit were selected. Grafting was done on the third ten days of May.

Each experimental variant was planted in 100 plots (25 per plot) in four replicates. An additional 30 plots were planted in each experimental variant for phenological observations.

Every three days after the cuttings of citrus plants were planted, phenological observations were made on their rooting and the formation of callus, primary and total rooting of cuttings, as well as the beginning of

growth of branches were recorded.

The data obtained from the experiment on propagation of citrus plants through green cuttings were processed by the method of dispersion analysis recommended by B.A. Dospekhov [2].

### Results and Discussion

One of the most common methods is to propagate lemon seedlings from green or semi-wooden cuttings. For this, 8-10 cm long cuttings with 3-4 eyes are prepared from its branches formed last year.

Taking into account the above, it was determined that the age of the cultivars is important in vegetative propagation of well-developed citrus seedlings. Cuttings were treated with a 0.05% solution of indoleacetic acid for 12 hours before planting.

The results of the study can be seen from table 1 that in the propagation of citrus plants, there was a significant change in the growth and development of cuttings made from this year's green, semi-wooded or previous year's wooded varieties. In all varieties of lemon, the development of green shoots was observed to be accelerated. This indicates that they belong to the light rooting group. Orange, tangerine and grapefruit cuttings from citrus plants showed very slow rooting even when propagated in different variants. Complex rooting of cuttings from citrus plants such as orange, tangerine and grapefruit has been observed in many studies.

The development process of the root part of the rooted cuttings of different ages was also observed.

Thus, it should be noted that when propagating citrus plants from cuttings, the younger the varieties, the faster rooting and development in them. But when preparing a pen, it is necessary to take into account that the varieties are not in a herbaceous state and that the buds are ready to wake up.

**Table 1 Determination of phenophases of rhizogenesis in cuttings of different ages of citrus plants**

Type and variety	Rooting phases of cuttings, day				Rooting of cuttings, %			Average in 3 years, %
	Callus formation	Root formation	Complete rooting	Bud growth	2014	2015	2016	
Wooden cuttings (control)								
Lemon "Meyer"	19-20	24-25	32-34	22-23	64,0	58,0	67,0	63,0
Lemon "Tashkent"	19-20	24-25	32-34	22-23	69,0	60,0	68,0	65,6
Lemon "Yubileyniy"	29-30	37-38	42-43	25-26	66,0	56,0	60,0	60,6
Orange "Gamlin"	30-32	35-40	45-50	23-24	12,0	8,0	17,0	12,0
Mandarin "Unshiu"	32-34	35-36	42-44	23-24	10,0	7,0	12,0	9,6
Grapefruit "Duncan"	23-24	30-35	44-46	25-26	10,0	7,0	11,0	9,3
Green cuttings								
Lemon "Meyer"	9-10	17-18	22-23	20-21	94,0	88,0	97,0	93,0
Lemon "Tashkent"	9-10	17-18	22-23	21-22	99,0	90,0	98,0	95,6
Lemon "Yubileyniy"	9-10	17-18	22-23	21-22	96,0	86,0	90,0	90,6
Orange "Gamlin"	13-17	23-24	35-36	29-30	42,0	20,0	37,0	33,0
Mandarin "Unshiu"	22-24	30-35	42-44	45-50	30,0	10,0	12,0	17,3
Grapefruit "Duncan"	23-24	30-35	44-46	45-50	20,0	10,0	11,0	13,6
Semi-wooden pens								
Lemon "Meyer"	14-15	19-20	23-24	23-24	98,0	90,0	95,0	94,3
Lemon "Tashkent"	14-15	19-20	23-24	23-24	98,0	92,0	96,0	95,3

Lemon "Yubileyniy"	14-15	19-20	23-24	23-24	96,0	90,0	90,0	92,0
Orange "Gamlin"	16-17	30-31	38-39	39-40	40,0	23,0	27,0	30,0
Mandarin "Unshiu"	22-24	35-37	43-44	45-50	32,0	12,0	12,0	18,6
Grapefruit "Duncan"	23-24	35-38	44-46	45-50	20,0	11,0	11,0	14,0

In this case, callus formation occurs in lemon cuttings in 9-10 days, in oranges in 13-17 days; in mandarin and grapefruit in 22-24 days, in lemon in 17-18 days, in orange in 23-24 days, in mandarin and grapefruit in 30-35 days, in lemon in 20-21 days, in orange in 35-36, in mandarin and grapefruit in 42- in 46 days and the growth of buds was observed in lemons in 20-22 days, in oranges in 29-30 days, in tangerines and grapefruits in 45-50 days. Similarly, their rate of rooting was on average 90-95.6% in lemon, 33% in orange, 13.6-17.3% in mandarin and grapefruit.

It was observed that when citrus plants were prepared from semi-wooded and wooded cuttings, their rhizogenesis period was delayed by 1.5-2.0 times, and the rooting process was also reduced by two, and in some cases by three times.

We observed that not all citrus green cuttings show the same growth and development under artificial fog conditions. It was found that they can be divided into light, medium and complex rooting groups according to their biological origin. Difficult rooting of orange, tangerine and grapefruit cuttings may be due to their relatively high sugar content.

### Conclusions

Based on the results of studies on the passage of phenophases of rhizogenesis in cuttings of citrus plants of different ages, it can be concluded as follows:

in vegetative reproduction of citrus plants, it is easy, convenient and effective to prepare cuttings from green varieties formed in the spring of this year;

When propagating new types and varieties of citrus plants from green cuttings, they can be divided into three main groups according to their rooting and development, these are:

- light-rooted species (lemon);
- medium rooting species (orange);
- complex root species (tangerine, grapefruit).

From the green cuttings of lemon plants, it is possible to grow lemon seedlings that can meet the standard requirements within six months under the conditions of an artificial fog generator. Orange, tangerine and grapefruit seedlings grown from green cuttings need to be cared for in the nursery for another year in order to meet the standard requirements.

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