

## Efficiency of Conducting Greenoperations When Growing Lemon in a Tranch Greenhouse

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**Abstract:** The scientific article provides experimental material devoted to the study of the microclimate in a trench culture for growing lemon.

Experiments have found that when growing lemon in a trench unheated greenhouse, the optimal temperature of 19.3-33.5 °C is observed during May-October months, the humidity of 62-85% remains in January-April, October-December, that is, during seven months without external influence of physical factors. In a trench culture, lemon in the annual development cycle undergoes four waves of shoot growth: the first wave of shoot growth in the crown occurs from the beginning to the end of May, the second - from the end of June to the second decade of July, the third - during August, and the fourth - from the first half of September to the end of October.

In order to target the excess growth of shoots in the crown of trees and more efficient use of organic plastic substances by plants for laying generative buds in the first, second and third waves of growth, the pinching of green shoots must be carried out over the eighth leaf, and in the fourth wave of growth over the fourth leaf.

**Keywords:** lemon, annual cycle, temperature, humidity, growth, shoot, leaf, pinch, plastic substances, crowns.

### Introduction

A long and hot growing season on the territory of Uzbekistan ensures the ripening and high quality of lemon fruits, but relatively severe winters with frosts down to -25 -30°C, causing the death of citrus plants, determine the need to cultivate lemon in the protected soil: in trenches and greenhouses of various designs (1, 2, 3, 4).

Trench culture is based on the use of heat given off by the ground through the soil and trenches during the

cold season, and additional heating is usually used in greenhouses. In trenches, in the conditions of insufficient illumination and low air temperature in winter months, the intensity of physiological processes is significantly weakened, and the plants are in a state of growth dormancy. In greenhouses, lemons are kept throughout the year in the conditions of sufficient lighting and temperature conditions to ensure the normal growth and development of plants. On the contrary, in summer period, it is necessary to take measures to lower the air temperature in the greenhouse and trench by ventilation, spraying, etc. (5, 6).

Growing lemon in trench and greenhouse conditions requires conducting of a number of studies, aimed at improving the technology of growing lemon in trenches and greenhouses.

**Research methodology.** The study was carried out in 2019-2020 in the conditions of "Eco Agro product" farm, locating in Kibray district of Tashkent region.

As an object of research, five-year-old plants of Meyer lemon variety zoned in Uzbekistan were used. In each variant, five lemon trees were used as experimental ones. The experiment was repeated three times.

The experiment was carried out according to the following scheme:

Variant 1 - pinching the shoots of the current year over the 4th leaf.

Variant 2 - pinching the shoots of the current year over the 8th leaf.

Variant 3 - pinching the shoots of the current year over the 12th leaf.

**Research results.** The pinching of shoots of the current year, on the recommendation of foreign

scientists, is carried out in the crown of plants in the second and third age periods of life - growth and fruiting, fruiting and growth. This technique is used for the effective redistribution of organic plastic substances for laying generative buds, fruit-bearing branches in the crown and reducing the volume of pruning during crown formation, as well as ripening of shoots. Methodical implementation of the green operation consists in removing the upper part with 2-3 leaves from the shoots of the current year that have reached a height of 15-20 cm.

In the practical citrus growing of the republic, the use of lemon shoots pinching is still poorly studied. In particular, there are no scientific recommendations for carrying out this operation on lemon bushes grown in a trench culture - in the presence of how many leaves on a developing shoot, the frequency of pinching and the dates of their implementation in the connection with shoots growth waves in the annual development cycle.

Phenological observations on lemon in the trench greenhouse during its passing through the growing season in the annual cycle show that the first growth wave occurs in late March - early April and continues until the end of May with a total period of 45-50 days. When growing lemon in heated greenhouses, the first wave of shoot growth occurs in the first half of February and ends in mid-April. That is, it starts for 45 days earlier than in a trench greenhouse and lasts 75-80 days.

The second period of growth of lemon shoots in trench conditions begins at the end of June, in the greenhouse - at the beginning of June and ends under both growing conditions at about the same time, July 16-24. We explain the simultaneity of the beginning and completion of this growth wave of shoots by the approximately equivalent obtainment by plants of the sum of effective temperatures during this period of growing season.

The third period of growth of lemon shoots when grown in a trench greenhouse falls on the beginning of August and ends in late August - early September, and in the usual ground one for 6-10 days later.

The fourth period of shoot growth in trench culture begins in the first half of September, without a dormant period between the third and fourth waves of shoot growth. In a ground greenhouse this wave begins at the beginning of October, that is, it drops behind the trench culture by 15-20 days. Earlier flow of this wave of growth of lemon shoots in trenches in comparison with the ground greenhouse, we explain by the better warming of the soil and air in these greenhouses.

As the experimental data, given in Tables 1 and 2, show, that a lemon plant grown in a trench culture, as well as in a ground one heated in winter, undergoes four waves of shoot growth in the annual development cycle. However, only the shoots of the current year of the first, second and third growth waves complete the stage of full ripening. The shoots of the fourth wave of growth remain unripe, so they must be pinched without fail. In winter period, plants of the trench culture are in a state of forced dormancy. In plants grown in ground-based heated greenhouses, a deep and long period of dormancy is not observed and they undergo a small fifth wave of shoot growth at the end of December-January months.

Our observations have established that the shoots of the current year formed on lemon bushes can be distinguished into the following groups:

1. One growth, consisting of only one increment - spring, summer or autumn;
2. Two growths with 2 increments - spring and summer, or summer and autumn;
3. Three growths, consisting of 3 increments - spring, summer and autumn;
4. Four growths having 4 increments - spring, summer, 2 autumns;
5. Five growths with increments - spring, summer, 2 autumns and winter.

Two growth branches can be formed not only from spring and summer increments, but also from 2 autumn increments or one spring and one autumn. Three growth branches can consist of the 1st, 2nd, 3rd

increments and the 2nd, 3rd, 4th increments, and also the 1st, 3rd and 4th increments.

All of these groups of shoots, as well as their individual parts, differ from each other, since each group of shoots and even individual of them develop under various external factors (moisture of soil and air, illumination, distance from the trunk, etc.).

Groups of shoots formed in a lemon bush during the annual growing cycle can be: one growth; two

growths; three growths; four growths and five growths.

In order to target the excess growth of annual shoots in the lemon crown and more efficient use of organic plastic substances, spent by plants on the excess growth of these shoots in four growth periods, we studied the pinching of green shoots above the 4.8th and the 12th leaves from the base of the shoots (Table 1).

Table 1 Influence of the pinching force of lemon shoots on the dynamics of their growth when grown in ground greenhouses, 2019-2020

Pinching variants	Dates of growth waves and dormancy passing							
	the first		the second		the third		the fourth	
	start	end	start	end	start	end	start	end
Over the 4 <sup>th</sup> leaf - control	9.02	19.04	9.06	24.07	10.07	8.09	8.10	19.11
Over the 8 <sup>th</sup> leaf	5.02	4.04	2.06	16.07	6.08	7.09	6.10	24.11
Over the 12 <sup>th</sup> leaf	3.02	13.04	2.06	19.07	7.08	9.09	5.10	26.11

The conducted experiment showed that in all experimental variants of shoots pinching, the best conditions were provided in the variant of pinching the green annual shoots above the eighth leaf. In this case, the growth of shoots during the first wave of growth ends as early as April 4. In the variants of pinching over the 12th and the 4th leaves, the growth of shoots was limited on April 13 and 19, that is, later by 9 and 15 days. During the second and third growth waves, this shoot pinching variant also provided optimal conditions for limiting shoot growth. In the fourth wave of shoot growth, pinching over the fourth leaf turned out to be the most effective. Thus, we can state a positive fact of the effect of green shoots pinching during all periods of growth waves, which allows plants to rationally use plastic substances for laying generative buds and the formation of lateral fruit-bearing branches, determining the productivity of plants in the next annual cycle.

Table 2 shows the experimental data characterizing the duration of the periods of lemon bushes growth and dormancy in connection with the variants for pinching annual shoots when grown in ground greenhouses.

The growth phase of shoots in the first period of the annual growing cycle, regardless of the force of pinching, lasted 67-68 days. In the second and third waves of shoot growth, the duration of this phase significantly decreased and was 45-50 and 26-33 days according to the variants of shoot transplantation, that is, the duration of the phase by the first growing season decreased for 1.3 and 2.6 times. The duration of the fourth wave of shoot growth in comparison with the three previous ones had an intermediate position and amounted to 38-51 days.

The duration of the dormancy phase, as well as the growing season, was maximum in the first and fourth periods of the shoots growth waves and amounted to 43-46 and 74-87 days, respectively. In the second and third periods, this physiological indicator was 16-19 and 30-34 days, that is, its duration to the first and fourth waves of shoot growth decreased more than for 2.4 times.

These experimental figures indicate that when growing lemon in a greenhouse, the photosynthetic activity of the bushes leaves and the reactions of the respiratory processes proceed in equivalent values (Table 2).

Table 2 The effect of the pinching force on the duration of the growth and dormancy phases of lemon shoots in the annual development cycle when grown in a greenhouse, 2019-2020

Pinching variants	Dates of growth waves and resting passing								Average for the year, days	
	1		2		3		4			
	growth	rest	growth	rest	growth	rest	growth	rest	growth	rest
Over the 4 <sup>th</sup> leaf - control	68	46	50	16	26	34	38	87	182	183
Over the 8 <sup>th</sup> leaf	67	40	45	18	31	30	46	88	189	176
Over the 12 <sup>th</sup> leaf	68	43	47	19	33	30	51	74	199	176
<b>SAD<sub>05</sub></b>	1,0	2,0	1,0	1,0	2,0	1,0	2,0	2,0	3,0	1,0

**Conclusions**

1. When growing lemon in a trench culture in the annual development cycle, four waves of shoot growth are observed: the first wave of shoot growth in the crown occurs from the beginning to the end of May, the second - from the end of June to the second decade of July, the third - during August, the fourth - from the first half of September to the end of October.
2. In order to target the excess growth of shoots in the crown of trees and more efficient use of organic plastic substances by plants for laying generative buds in the first, second and third waves of growth, the pinching of green shoots should be carried out over the eighth leaf, and in the fourth wave of growth over the fourth leaf.

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