ISSN: 2350-0328

International Journal of Advanced Research in Science, Engineering and Technology

Vol. 9, Issue 10 , October 2022

Semi-Cylindrical Deepening Helolimonary

Maxamov Xo‘jaxmat Tavashovich

Associate professor, department of technological education, Karshi State University

ABSTRACT: The article describes the cold tolerance parameters of the lemon tree, the construction and geometrical parameters of the semi-cylindrical sunken heliolimonarium, as well as the structure and operation of the underground heat accumulator used in the construction.

KEY WORDS: air collector, frame, structural arc, heat accumulator, air transmitter-collector, ventilator, heater.

I. INTRODUCTION

Various medicines, mineral salts and organic acids are very important for the human body. Citrus plants contain a lot of these essential substances. Lemon is one of the most useful fruits. Establishing and expanding lemon cultivation in our Republic is one of the most important tasks in solving food issues.

In the climatic conditions of Uzbekistan, lemons are grown in specially protected greenhouses. Because it is a subtropical plant and is resistant to cold. Growing lemons requires heating greenhouses with organic fuels, which leads to high consumption of organic fuels. To reduce fuel consumption, it is more effective to use solar-heated lemonades.

The climatic conditions of Central Asia create opportunities for growing lemons in large quantities. Energy consumption for growing lemons in soil-protected devices is 40-50% of the cost of the finished product.

The climatic conditions of our republic have opportunities for large-scale use of solar energy for heating lemon groves. Effective use of solar energy for heating solar panels is one of the effective ways to save natural fuels and reduce product costs.

II. LITERATURE SURVEY

The lemon tree is resistant to cold and needs to be protected during the cold periods of the year. By dividing the lemon tree into parts, its critical cold tolerance temperature can be explained as follows:

1. -1.5-2.5 ^{0}C in the fruit.
2. In leaves and buds - up to 3 -4 ^{0}C.
3. In one and two-year varieties - up to 5 – 6 ^{0}C.
4. In the main varieties - up to 7 – 8 ^{0}C.
5. Full frostbite - up to 8 – 10 ^{0}C.

The lemon tree begins to grow when the temperature of the air and soil is + 9 ^{0}C. For it to begin full growth, the optimal temperature should be + 16 + 18 ^{0}C. When the air temperature is above + 10 ^{0}C, the vegetation period of lemon is 200 - 220 days. Lemon is very demanding on soil and air moisture during flowering and budding. For a lemon tree, it is desirable for the soil moisture to be around 60 %.

It is known from experiments that the possibility of growing citrus plants in open fields mainly requires air temperature to be from minimum - 6 – 12 ^{0}C to maximum + 30 + 35 ^{0}C, vegetation period is 180 - 220 days and relative air humidity is 60 – 80 %.

III. METHODOLOGY

In order to effectively grow lemons in soil-protected facilities, we will try to combine a simple film heliogreenhouse [1,2] with a trenched lemonarium [3,4]. Based on the results of optimizing the geometric parameters of the devices, taking into account the overall dimensions of the lemon tree, the structure of the solar lemonarium with a underground heat accumulation system [5] and a trench-type cylindrical surface, covered with a two-layer film, was developed.

In Figure 1 below, width L = 6 m; length L = 30 m; diameter of the cylindrical surface to be covered with a film D = 6.3; height of trench with deepened soil h = 0.8 m; horizontal width of the deepened trench surface L = 3.5 m; and the width of the sloped surface in the trench soil is L = 1.48 m.

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 9, Issue 10 , October 2022

The frame of the construction arch (1) is made of steel pipe with a diameter of 0.018 m or rolled steel of size (25x25x3). The frame is covered with two layers of polyethylene film with an interval of 0.04...0.06 m. The outer cover arcs are installed every meter, and the inner cover arcs are installed every two meters.

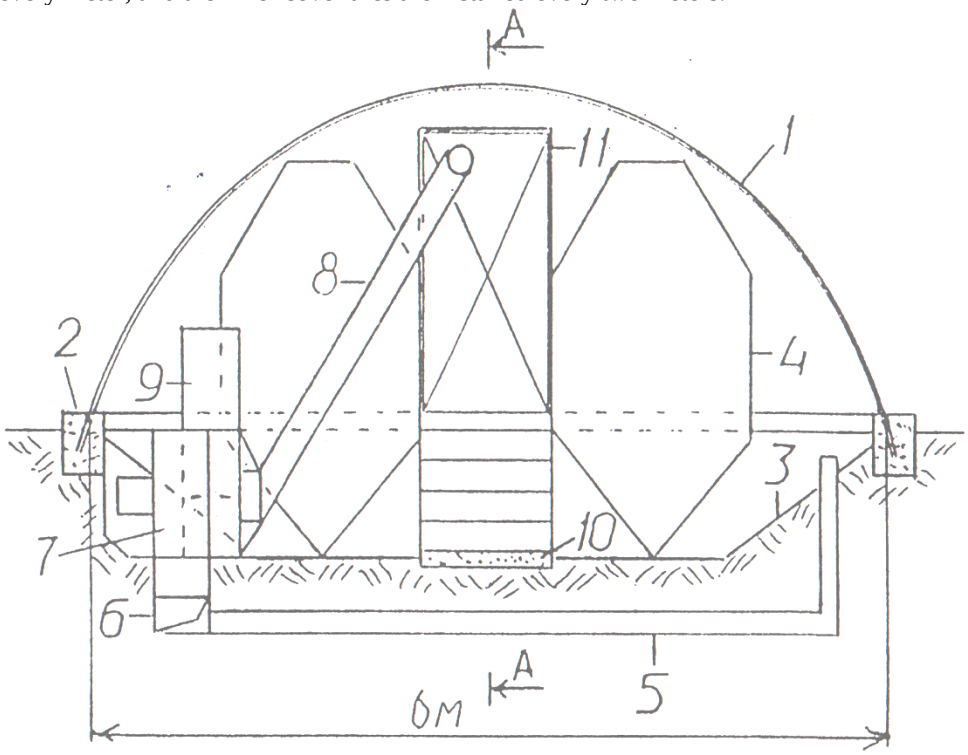

Figure 1. Scheme of heliolimonary: 1-frame for two-layer film coating, 2-foundation, 3-trench soil layer, 4-lemon plant outline, 5-heat accumulation channel, 6-collector-air collector, 7-fan with heater, 8-air collector, 9-electrosheet, 10-Lane, 11-door.

The frame is fixed to the foundation (2) with a cross section of 0.3...0.4 m. Circumferential diameter of lemon bushes D=1.5 m. Lemon seedlings are planted in two rows along the length of the lemon garden, one every 2.3 meters. The width of the corridor to pass between the lemon trees along the length of the limonarium is L= 1 m (10). The distance between the lemon trees in the horizontal position is 0.8 m. This location of the lemon tree makes it possible to provide convenient agrotechnical services.

The heat accumulation system consists of a heat accumulation channel (5), air transmitter-collector (6), ventilator (7), air collector (8). Pipes made of ceramic, metal, concrete and other materials with an inner diameter of 0.11...0.13 m and a length of 4.5 m can be used as a heat accumulation channel. Pipes are laid at a depth of 0.4...0.5 m with an interval of 1.12 m. The end of the pipe on the north side is connected to the air transmitter-collector (6), and the other end is attached to the pipe with a length of 1.2...1.5 m, which takes the air into the device on the south side. The cross-section of the middle part of the air-transmitter-collector (the place of connection with the fan) is 0.2x0.4 m, and the finished parts are made of concrete with dimensions of 0.2x1 m.

Heliolimonary will be built for the southern latitude. The amount of solar radiation falling on the heliolimonary during the winter months will be more compared to other types of greenhouses built according to the location of the east-west meridian. On open days of winter, the air temperature inside the heliolimonarium exceeds 20...25 ^{0}C and a fan (7) is added. The hot air above the limonarium comes to the heat accumulator channels (5) through the air collector (8) and the air transfer-collector (6). Hot air transfers part of the heat to the channel walls, cools and returns to the lemonarium. In this process, the temperature rise in the greenhouse is prevented and heat accumulation is carried out in the soil around the channels. At night, when the air temperature in the greenhouse drops to 11...15 ^{0}C, air circulation begins, as in the daytime. Cold air heats up in the ducts and passes to the greenhouse, providing the greenhouse with the required

ISSN: 2350-0328
International Journal of Advanced Research in Science, Engineering and Technology
Vol. 9, Issue 10 , October 2022

temperature. The process of spending the accumulated heat to maintain the required temperature in the greenhouse is carried out.

On chronically cloudy and low-temperature days (indoor air temperature below +11 ^{0}C), there is a lack of heat for greenhouses. In such cases, the fan heater (7) is activated. KVB, KVPP, SED-300 and other types of water heaters are used in the selected design. Heaters can be connected to autonomous water heating units running on natural gas or to central heating systems. When using autonomous water heating units, the unit can be installed outside the greenhouse or inside the greenhouse. AGV, KS, KM and other types of water heating units can be used. The units should be installed near the ventilator and electric sheet. Dudburun is placed at the level of the foundation. The air-heater system is low-power and operated automatically using simple technical tools.

A drip irrigation system is used for watering lemon trees. Drip irrigation provides such opportunities as water saving, the ability to dose water from the center, and the ease of feeding the tree with minerals.

IV. EXPERIMENTAL RESULTS

The deepened heliolimonarium differs in that it has 13...26 % better radiation regime and 4...18 % less heat loss compared to the traditional heliolimonarium of semi-cylindrical type.

The average daily air temperature in the sunken heliolimonarium is higher by 1.2...5.9 ^{0}C compared to the traditional heliolimonarium of the semi-cylindrical type.

The average daily air temperature in a heliolimonary with a heat accumulator is 2.3...4.2 ^{0}C higher than in a conventional type heliolimonary, 4.3...7.4 ^{0}C lower during the day and 1.5...2 at night. It differs in that it is higher than 7 ^{0}C. At the same time, it has the ability to ensure that the air temperature in the heliolimonarium is normal.

V. CONCLUSION

The annual economic savings for sunken type heliolimonaries are as follows:

1. In conditional fuel - 1909.06 kg s.yo./year or 10.6 kg s.yo./(m^2 year);
2. In natural gas - 2216 m^3/year or 12.3 m^3 /(m^2 year).

REFERENCES

1. Niyazov Sh.K. Studyof heat regimes of film greenhouses with solar and non-ferrous subsoil heating. Author's abstract. Diss... cand.tech.nauk. – Ashgabat.: 1981. -26 p.

2. Kim V.D. Radiation and thermal regimes in solar film inclined greenhouses with subsoil heat accumulators. Diss... Cand.Tech.Sc. – T.: 1988. -20 c.

3. Pervushina P.A. Cultivation of lemons in the conditions of Uzbekistan. –T.: Uzbekistan. 1980. -40 c.

4. Nuriddinov B., Khairiddinov B., kim M. Limonchilikda куёш energiyasidan foydalanish. "T.: Fan. 1993. -55 б.

5. Mahamov Kh.T., Khayriddinov B.E., Kim V.D. Heliolimonarium of in-depth type with a heat accumulator. Solar engineering. 2001. №1. 33-36 c.