THERMAL PHYSICAL CHARACTERISTICS OF SOLAR GREENHOUSES, STRUCTURE, OPERATION MODES AND THEIR ANALYSIS OF EXISTING HEAT ACCUMULATOR SOLAR GREENHOUSES

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Abstract: This article covers the physical characteristics of solar greenhouses and geothermal water heating and light rays. The photosynthesis processes and general equations that occur in the cultivation of plants in solar greenhouses are shown. Any effect of light on substances and plants such as tomatoes and cucumbers, including its physiological effects, is related to absorption, and the structure, operation modes and analysis of existing heat accumulator solar greenhouses have been studied.

Key words: Solar energy, greenhouse, geothermal water, photosynthesis, energy, reaction, plant, intensity, light filter, light flow, accumulation, air.

It is known that in the winter season, heating of greenhouses with existing geothermal water and the effect of visible light rays on the thermal physical and photosynthesis process using solar energy have been studied. The process of photosynthesis, which is very unique, is of great importance in the occurrence of biological evolution on the earth's surface. Photosynthesis is the process by which photosynthetic bacteria absorb chlorophyll and other photosynthetic pigments from simple compounds (carbon dioxide and water) at the expense of light energy, which is necessary for both itself and other organisms. is to create substances.

In this process, plants absorb carbon dioxide from the air, and absorb water from the soil through the roots, forming carbohydrates, proteins and other complex substances from their bodies. These substances are necessary substances for the human body and health. Photosynthesis is one of the important biological processes, which was first studied by the English scientist J. Priestley, the Dutch scientist J. Ingenhaus, the Swedish scientist J. Senebe, and N. Saussure. In 1886, the Russian scientist K. A. Timiryazov determined that sunlight energy participates in the process of photosynthetic changes through chlorophyll in plants.

K.A. Timiryazov's words, there is no process on the surface of the earth as interesting as the process that takes place when sunlight falls on a plant leaf. Later, the Russian scientist A.P. Vinogradov, M.V. Tates and American scientist E. Rubens found that the source of oxygen released during photosynthesis is not carbon dioxide gas, but water.

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Thus, the general scheme of the photosynthesis process in various organisms is as follows: $DH_2 + A \xrightarrow{yorug'lik} AH_2 + D$

Here DH_2-donor, A-acceptor, AH_2--product of photosynthesis.

In addition to the fact that the intensity of photosynthesis depends on the intensity of light, tall green plants are characterized by a high efficiency of photosynthesis and the presence of chloroplasts in the cell structure (up to 20-100 chloroplasts are found in one cell of a green leaf). The chloroplast is surrounded by a two-layer membrane, and its interior is made of thylakoid.

Thylakoids contain protein, fat, chlorophyll, carotenoid-carrying components and enzymes. In plants, photosynthesis consists of the process of oxidation and reduction, and the oxidation of water and the reduction of carbon dioxide occur with the help of a quantum of light energy. In the process of photosynthesis, the quantum energy of light absorbed by chlorophyll is collected into a state of chemical energy in the compound ATF (andinosine, triphosphate), and this process is called photophosphorylation and takes place in the dark.

In 1905, the English scientist F. Blackman determined that photosynthesis consists of the reactions of fast light and slow dark. Carbon dioxide absorbed in photosynthesis is converted into other substances, proteins and organic acids in plant cells. Their amount depends on light intensity, plant type and climatic conditions (soil moisture, amount of mineral nutrients and temperature). In order to increase plant productivity, it is necessary to increase the coefficient of sunlight utilization of the plant. Plant seeds should be planted in such a way that there should be enough carbon dioxide, water and nutrients in the soil for each plant. Plant selection is also important in creating new varieties that can quickly absorb carbon dioxide and effectively use the organic matter.

According to estimates, land and water plants on the globe produce about 450 billion tons of organic matter every year through photosynthesis. Photosynthesis creates organic matter, cleans the atmosphere of carbon dioxide and enriches it with oxygen.

In this way, photosynthesis creates the necessary conditions for the existence of life on our planet. Although the photosynthesis activity of green plants is very large (all over the Earth), a very small part of the sunlight energy absorbed by the plant is used directly for photosynthesis. Such a share usually does not exceed 2,82-3,2% in tomato and cucumber plants grown in solar greenhouses. A moderate temperature is very important for the photosynthesis process to take place at a normal level. Even if the temperature is high or low, photosynthesis is bad. The organic mass of plants is accumulated in the process of photosynthesis, therefore, one of the effective ways to increase the productivity of plants such as tomatoes and cucumbers grown in solar greenhouses is to increase the intensity of photosynthesis, that is, to increase the coefficient of solar energy use for photosynthesis.

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Photosynthesis of plants consists of the process of oxidation and reduction, oxidation of water and reduction of carbon dioxide occurs with the help of quantum of light energy. General equation of photosynthesis process

$$6CO_2+6H_2O = C_2H_{12}O_6+ 6H_2$$

The importance of the spectral composition of light for the process of photosynthesis depends on the total absorption of the leaf surface, the location of the leaf in relation to the direction of sunlight, its ability to reflect and the thickness of the leaf. All these internal complex factors take place under different laws in different plants under the inf0luence of light. All terrestrial and underwater living organisms that carry out photosynthesis on the surface of the Earth absorb 3 quadrillion megajoules of solar energy every year, which is 10 times more energy than the energy used by humans. The maximum efficiency of photosynthesis (FIK) is 15-20%.

The maximum efficiency of photosynthesis (FIK) is 30%. In agricultural practice, this amount is 0,8-2% in fields.

Russian FA Academician I.S. In Shatilov's opinion, it is possible to increase FIK even more if the agrotechnics of plant care are chosen correctly. This means that plants grown in solar greenhouses can collect 5-6 times more photosynthetic energy. To increase the photosynthesis process, extend the period of active activity of the leaves, keep the amount of CO_2 gas in the greenhouse at the required level, improve root nutrition, improve moisture and soil aeration, and apply advanced scientific and technical achievements and use nano and innovative technologies to FIK 15 % can be increased. For humans, animals and plants, light is a necessary factor of life, because its lack or absence disrupts the normal functioning of the organism, lack of light is not covered by any other effects such as heating, nutrition and the like. can't wait.

Any effect of light on matter and plants, such as tomatoes and cucumbers, including its physiological effects, is related to its absorption. The use of light filters, glass plates, and gelatin films mixed with certain dyes is based on selective absorption. A light filter transmits a specific part of the spectrum (the part that corresponds to the color of the light filter) and absorbs all other parts.

Theoretical recommendations on efficient use of solar radiation in greenhouses heated with geothermal water have been developed. Solar radiation is the main energy source of the earth, consisting of visible light and ultraviolet and infrared rays invisible to the human eye. All organic and inorganic processes that take place in the surface layer of the earth and in the atmosphere are the basis of phenomena. The solar radiation falling on the Earth's surface consists of the stream of parallel rays falling directly and the radiation stream whose intensity has decreased as a result of the absorption and absorption of gas molecules, dust particles in water droplets and dust in the atmosphere.

The intensity of the solar radiation flux (I) is quantitatively equal to the energy of light that falls on a unit surface perpendicular to the direction of the radiation flux in a unit of time. The solar constant (I0) is the amount of radiation flux that passes through a medium with no atmosphere or a completely transparent one. The numerical value of the solar constant is equal to the energy of light falling on a surface of 1 sm^2 perpendicular to the direction of radiation above the earth's atmosphere per unit of time (1 minute), its average value is equal to 10 =1,95 kal/sm^2 minute. creates 1 355 000 lyuks illumination above its atmosphere. Due to changes in solar activity and annual changes in the distance between the earth and the sun, this value can change up to 5%.

When sunlight passes through the atmosphere, it is mainly absorbed by water vapor molecules, carbon dioxide gas and other particles, and the degree of absorption depends on the wavelength of the radiation spectrum, especially the absorption intensity of the middle part of the spectrum is stronger. The vibration frequency of the infrared spectrum corresponds to the vibration frequency of the molecules that make up the compounds in the atmosphere. This situation causes the effect of solar energy to decrease.

Above the atmosphere, the solar radiation flux falling on the horizontal surface can be determined as follows, taking into account that the solar radiation flux falls on the CB surface above the atmosphere, compared to the horizontal surface AB.

$$\mathrm{I} = \frac{\mathrm{I_0}}{\mathrm{R}^2}\sinh_0 \qquad \mathrm{I} = \frac{I_0}{R^2}cos\vartheta$$

Here R is the distance between the sun and the earth, $h_0 =$ height of the sun relative to the horizon, sinh_0= sinφ sinδ + cosδ cosα.

Structure, operation modes and their analysis of existing heat accumulator solar greenhouses. One of the heliodevices using accumulated solar energy is heliogreenhouses. In due time, various methods of using heat accumulators and device projects were proposed for solar greenhouses. The first thermal storage heaters heated by solar energy were developed in Almaty in the 1940s by the elderly solar technician V.N. Bukhman. The crop area of this helio-greenhouse is inside the trench, and solar energy is accumulated in the soil of this trench and in the soil pile on the north side.

In 1955-1956, B.V. Petrov built several solar greenhouses of this type in Crimea. The angle of deviation of the clear surface of these helio-greenhouses from the horizon is 45^0, the depth of the trench is 1,5 m, and it is intended for growing strawberries, tomatoes, and citrus plants.

In order to accumulate solar energy, it is moved to the north side of the greenhouse with a depth of 1,5 m. Metal pipes were laid in the middle of the soil pile, from the lower part of the greenhouse to the upper part.

The hot air of the day passes from the top of the greenhouse into the channel, cools down by giving heat to the soil around the tube, and exits through the hole at the bottom. At night, the temperature of the air is in the opposite direction, that is, it warms up through the pipe and goes into the greenhouse. The disadvantage of these helio-

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greenhouses is that the greenhouse reduces the light regime for plants deepened in the cultivated area and in some cases leads to an increase in groundwater.

In 1956-1958, H.I. Gavrilov saw the keying option of solar energy storage in the soil and put it into operation. Its main electrocalorifier system is.

There are two heating units on both sides of the greenhouse, and the units are connected to each other through air distribution channels. The channels consist of 100 m long asbestos cement pipes, the distance between them is 0,75 m, and they are placed at a depth of 0,35 m. With the help of fans in the first heating unit, the hot air inside the greenhouse is taken and driven into the pipes under the ground, and with the help of the fan of the second heating unit, it goes back to the greenhouse.

In this case, the heat accumulator works as follows: hot air passing through the pipes heats the pipes. In turn, heat is transferred from the heated pipe to the surrounding soil through heat conduction. As a result, the soil around the pipe heats up and energy accumulates in it.

If the channels are closed, the air movement through the pipes stops, circulation is carried out only through the internal air in the greenhouse, that is, the air is heated in the heating units and driven into the greenhouse.

In the 1960s and 1970s, M.D. Kim developed two types of solar greenhouses with underground heat accumulators in the heliopolygon of Karshi State University. The first experimental option consists of a rocky battery, oriented to the south. The surface of the useful part occupied by the battery of the solar greenhouse is 3,7m·7m=26m^2.

The area intended for production is 3,7 m·65 m=240m^2. The heat accumulator consists of a chamber measuring 0,3·1·6,5m, divided into three sections and filled with limestone. In the accumulator, the hot air from the greenhouse passes through the upper channel into the chamber and cools down through the lower opening to the greenhouse. At night, the air moves in the opposite direction. Cold air passes through the bottom hole into the chamber. Due to the insufficient amount of accumulative substance in the chamber, its accumulative capacity is low, and the main part of the heat accumulates in the soil of the greenhouse, construction elements, walls and plants. A water battery was also tested in the solar greenhouse. For this, a tank with a volume of 0,25·1·2 m was made, water was poured into it and the water tank was placed at a height of 1 m in front of the greenhouse wall. While the water battery worked, the stone battery did not. According to the experiments, it was found that the water battery collects more energy than the hard stone battery, and the amplitude of the air temperature is reduced [2-4].

By T.A Sodikov, earthen racks are placed as an earthen accumulator on the north side for the use of earthen batteries in solar greenhouses.

Total accumulative soil volume V=F·h·n=13m^2·0,25m·5=17m^2

is equal, where F is the surface of each accumulative layer; h-soil thickness; n is the number of layers. However, it will be difficult to build and use such soil and water accumulator solar greenhouses on large working areas.

In the following years, the scientists of the scientific production association "Kuyosh" of the Academy of Sciences of Turkmenistan R.B. Bayramov, A.E. Ribakov and A. Mazilev conducted tests for the production of water and soil accumulator structures for one-slope solar greenhouses. The transparent surfaces of these greenhouses are oriented in such a way that they provide the maximum amount of solar energy in winter and early spring. Under the influence of solar energy passed into the greenhouse, the temperature of the air rises and circulates by natural convection.

As a result of hot air passing through the moist soil layers located on the north side of the greenhouse, it accumulates during the day, and at night this accumulated heat ensures the normal air temperature inside the helio-greenhouses. The optimal dimensions of the structure were determined through experiments to ensure maximum energy transferred to and accumulated in the solar greenhouse built in the conditions of Turkmenistan. But there are problems in building and using such solar greenhouses with thermal accumulators on a large scale.

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