RESEARCH GEOTHERMAL GREENHOUSES

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The estimation of the thermal area of experimental geo-heleotermalnoyi greenhouses to determine the optimal height suspension trays of seedlings. Tested effectiveness of the proposed design greenhouses in spring.

Greenhouse, trays with plants, thermal space.

Modern greenhouses for industrial production of vegetables in the winter use mainly gas heating to maintain the required temperature. Abnormally low winter temperature, duration of heating season, which marked the winter of 2011-2012, a significant increase in natural gas prices should cause a cost increase early greenhouse production. Greenhouses without additional heating acquire relevance, although compared give products later. The article [1] describes the experimental design of the greenhouse, which was established for production testing of the proposed technical solutions for the use of low-grade geothermal energy and solar radiation. The cost of building greenhouses remains high volume and use it as efficiently as possible is desirable. Enlarge acreage can use if suspension boxes where you can put small plants such as strawberries, radishes and more. However, it is unknown at what height should be placed such suspension design.

Purpose - to test the effectiveness of proposed solutions and thermal field research greenhouses used are suspended trays of plants.

Materials and methods of research. To determine the thermal greenhouse space we have conducted experimental studies during 21-22 March 2012. Hothouse geographically located in the southern suburbs of the city. Kyiv. Measurements performed with a digital pyrometer UNI-T (model UT301A). Within one measurement allowed temperature fluctuations ranging up to 0.2 ° C. Temperature readings were shooting from a metal pipe with a diameter of 50 mm, a height of 3m,

painted with oil paint yellow. The pipe was placed in the middle of the greenhouse and deepened by 0.2 m in the soil.

Results.

With the experience of building a greenhouse can be noted that the most technologically sophisticated and costly production was the arch and fixed to the frame insulated basement. Arches made of rectangular steel Ruby 40 × 20 × 2 rate of loss of snow and suspension of heavy trays of plants in the basement depth of 0.8 m was due to the desire to prevent freezing of the soil in the greenhouse in winter. That increasing greenhouse height of 1.5 - 2 meters will not cause a significant rise in the facility, and the volume and therefore a place to put false stalls will increase significantly. This method will and economic impact and reduce the area for the construction of greenhouses. An additional advantage is the ability to reduce shading foreign objects with solid building.

When creating a greenhouse sought to extend the season for growing vegetables and berries without permanent artificial heating. Start-governmental agricultural works appropriate conduct when the soil temperature is not below 5 0C. When checking it was found that in 2012, due to the design greenhouses for the beginning of the season can be considered the beginning of March. During this period the temperature outside at night was less than - 2 ° C and the day did not exceed 8 0C. The first week after transplanting landing at night covered with plastic wrap.

Temperature of air and soil in the greenhouse, in cold conditions the spring of 2012, allowed to sow the first plants in the 1st week of March, when the average temperature in the greenhouse did not fall below 5 °. Sudden changes in temperature day and night prompted widespread cooling air and the soil surface, so the landing at night covered with plastic wrap. As of April 1 was obtained crop of green onions, and on 15 April - radishes, spinach, lettuce, and tomato seedlings, May 15 - cucumbers, June 2 - tomatoes (Figure 3). Of course, the conclusions concerning the first year of operation of such a greenhouse, and a number of elements (selection of crops, varieties, timing of seeding and planting, etc.) needs to be improved. It is possible to obtain earlier products, the additional heating at night. For your last held power for

greenhouses electrical wiring, and in the future it will be possible to connect an electric convector.

The design of structures closest to the so-called greenhouse thermos, which are widely advertised in the media and Internet. Yes indicates that even at a temperature of -30 ^{0}C, the temperature in them is not reduced below than 3 ^{0}C [2, 3, 4]. In this case, using a relatively low-power heating a greenhouse can be used throughout the year, which significantly improves its economic profitability. For 2 and 3 February 2012 were conducted measurements of temperature at a height of 1.5 meters above the ground on the north side of the greenhouses inside and outside the greenhouse. Time for measurement was selected due to the fact that 2 February was cloudy, with a minimum temperature -29 ^{0}C, and the next day, due to an anticyclone, the temperature increased to 10 ^{0}C in dense clouds.

As can be seen from the data in clear weather, temperatures could reach 2 ^{0}C, but the difference was not 30 but only 15 ^{0}C. Even with sunny weather temperature is above 0 endured about one hour. Polycarbonate inner surface was covered with frost layer thickness of 1 mm. That is described in [2, 3] effectiveness greenhouses in winter is hardly the case. Given the fact that fresh vegetables have a maximum value limit is winter at this time is impossible heated gels. The economic feasibility of artificial heating in winter should be investigated separately.

Conclusions

1. The temperature field of the proposed greenhouses start from a height of 0.5 m above ground is uniform, which allows the use of suspended trays for plants.

2. Increase the height of the greenhouse will significantly expand the amount of space to accommodate stalls without a large material costs. This service trays should be maximally automated.

3. The design of geo-enabled heleotermalnoyi greenhouse without artificial heating, get the first stable yields in mid-April.

4. Using the proposed greenhouses for growing vegetables in winter without artificial heating is not possible.