

SHADING NETS TESTING

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Introduction

Vegetable growing within plastic-covered greenhouses constitutes a fundamental condition for innovative crops during sabbatical years. Likewise, the method developed in order to reduce the use of pest-control chemicals requires the use of anti-viral plastic roofing (UV radiation-absorbent). In this type of structures, temperature easily reaches around 50°C, which does not allow an adequate growing neither of leafy or stalked vegetables nor of most of the other crops.

Shading constitutes a cooling means, but also presents a negative aspect: it damages the plants as a consequence of its reduction of the photosynthetic activity. Certain crops, such as lettuce, are extremely sensitive to shade and react almost immediately to it, thus reducing the agricultural yield.

In the test described in this paper, several shading nets have been tested. Some of them filter a given wavelength (color) while others merely diffuse the light they receive. The end of the present study has been to compare the influence they exert on the crops and their yield.

Methods & Materials

The test was carried out in certain Kfar Darom farms that possess experimental open-ended tunnels measuring 6 m wide by 10 m long. A roofing of infrared plates covered all the tunnels. Their sides were covered with mesh 50 nets or screens. On their roofs, the shading nets were placed over the plastic layers in accordance with the treatment required. The Polysack Company of the Nir Ytzhak Kibbutz supplied all the nets tested, with a shading grade of 30%.

Treatments

1. Control. No shading net covering
2. Pearl color net. White net that diffuses the receiving light
3. Red color net
4. Blue color net
5. Aluminum color net (ALUMINET)

The tests were carried out 4 times at completely random dates, each time in a different gallery. Two types of lettuce were planted in each gallery: Noga in the Northern section and Iceberg in the Southern one.

The plots were disinfected by solar radiation during one month.

Planting: 24/08/00. Regular treatment used in the farms.

The temperature measurement was performed by means of thermometers, registering the maximum and minimum temperatures once a day at a fixed hour.

The crop growth measurement was carried out twice during the season, the first time on August 31, 2000, eight days after planting, and the second on September 13, 2000, two weeks later.

Sunlight radiation was made on 5/9/00 at noon, in a totally clear day, when radiation out of the galleries was 1856 microeinsteins.

The crop was harvested on September 26, 2000. From the harvest of each variety, 10 contiguous lettuce heads from a typical section were collected and weighed. These 10 lettuce plants occupied approximately 1.1 m.

Analysis and Results

The results of the test are presented graphically in the next pages.

The pearl and red nets gave excellent results in all the measured parameters, at least compared to the control crop. The yield of the Noga variety treated with these nets was outstanding, even in comparison with the blue net. The pearl shading net also showed an unequivocal advantage over the system that used the Aluminet shade.

Temperatures and radiation levels did not differ much between the different types of nets except for the Aluminet shading net, which resulted in a higher heat generation than the rest, notwithstanding the fact that the radiation through this net was lower (although not significantly).

The conclusion arrived at is that, as expected, the relevant factor is more the composition of the radiation than its absolute quantity.

The nets remained in place during the whole summer, and a lot of dust accumulated on them. Even at the time of the first verification the radiation received within the structures had been reduced to half the normal. The differences would have probably been more marked with the nets free of dust.

The relationship between radiation and agricultural yield indicates the optimal sunlight level to be within the range of 30% to 40%. Although the experimental data are not sufficient to fundament a theory on shading, the farmers' experience indicates the optimal shade level to be in the range of 20% to 30%. Even within this optimal shade level both the direct radiation level (by means of pearl net) and the one obtained with the selective photosynthetic radiation (red-colored net) have contributed to improve the yield.

The temperature differences were bigger than those indicated in the graph. Due to the limitations of the thermometers it wasn't possible to register temperatures higher than 50°C, but it was evident that the temperatures within the test galleries went beyond those 50°C practically every day.

Leafy or stalked lettuce plants are sensitive to shade even during the Israeli summer, which is characterized by a strong solar radiation. For this reason, this was the crop selected for this study independently of its economic importance for the Gush Katif region. There are other crops less sensitive to radiation, but there is not a single crop that doesn't react to radiation, unless they suffer from the damage produced by the excess of heat caused by a strong solar radiation. Taking into account the fact that the extraordinary treatments did not boost heat, it can be undoubtedly affirmed, and even recommend the use of the nets that gave the best results for other crops.

Conclusions

1. Shading nets are extremely positive for all the leafy crops under plastic roofing during the summer season.
2. The pearl and red colored nets have given the most positive results.
3. These results are valid for lettuce crops. With some of the crops the relationship between the different treatments could be different, but the general trend is probably the same. Therefore, we can recommend the application of the results of this experiment and to testing of the shading screens with other crops.

