

Light diffusion improv

Wageningen UR Greenhouse Horticulture discovered that diffused light improves the growth of fruit and several pot plants in moderate climates.

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Creating and using diffused light in greenhouses has become common in countries that are situated closer to the equator. Growers use special plastic films, which diffuse light, to increase production processes and avoid burning the crop. Diffusing light means light that is scattered in all directions and is equally distributed over an area. Research carried out by Wageningen UR Greenhouse Horticulture, was the first to investigate the potentials and mechanisms behind diffused light in horticultural crops. They pointed out that countries with similar climate to the Netherlands, could also make use of this method. Diffusing light on plants in greenhouses was first tried and tested on cucumber and several pot plants.

Research had been done on the effect of diffused light in forest eco-systems. It was discovered that plants growing under diffused light conditions, are able to use that diffused light more efficiently due to several internal mechanisms within the plant leaves. Wageningen UR Greenhouse Horticulture then started to research how crops in greenhouses would be affected and whether they would see comparable results as in the forest eco-systems and other crops. Studies with crop models displayed promising results. Practical experiments followed and cucumber crops in the Netherlands were put to the test with the first greenhouse trial to be carried out. The crops were cultivated under direct and diffused light, using clear diffuse covering material.



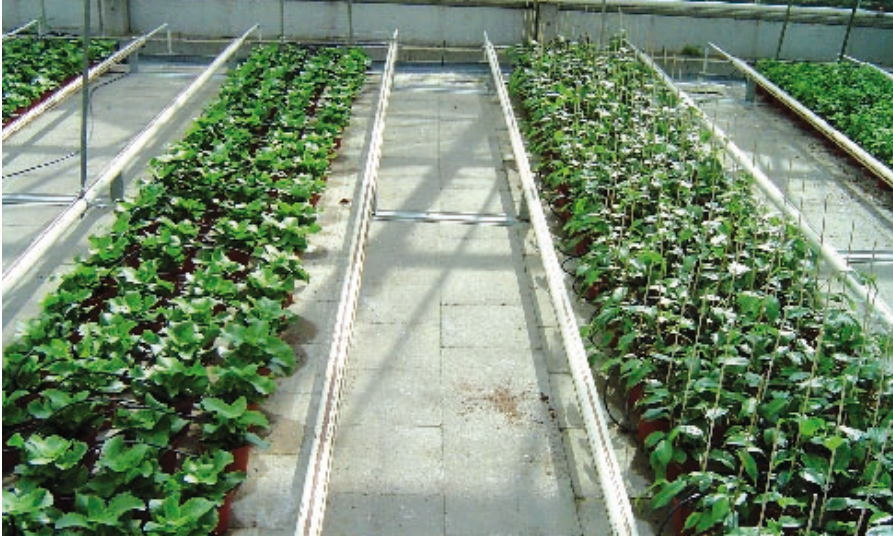
Creating diffused light in a greenhouse with a special covering

More fruits

Crop yield was improved when exposed to diffused light. Compared to direct light, the number of fruits increased to 7,8% and the fruit weight fared 4,8% higher. The material used to diffuse the light also

reduced the light by about 4%, this means that results could have been better if there had been no light reduction. Diffused light penetrated deeper into the canopy and the middle leaves intercepted more light, which caused an increase in photosynthesis, leading to higher fruit production.

es growth



With a covering that does not diffuse light, shadows appear which can lead to non-uniformity of the crop



Diffused light can accelerate production of certain crops

During the experiments there was no indication that lower positioned leaves played a significant role in the production process. In fact, the lower leaves turned yellow, proving that less photosynthesis took place. Only the middle leaf layer was more active and showed a higher contribu-

tion to the photosynthetic process.

The researchers concluded that diffused light proved beneficial to the production of the cucumber plants, especially during periods of high irradiation and a relatively large amount of direct light.

Faster growth up until November

Motivated by the results of the greenhouse cucumber trial, Wageningen UR

Greenhouse Horticulture started a similar experiment with pot plants. Species used were chrysanthemum, kalanchoe, schefflera and ficus. This trial also showed an improvement in crop growth due to the diffused light. The relative growth rate proved to be higher. Heavier chrysanthemum plants consisting of more and larger leaves were produced in a shorter time and the production process was accelerated.

The same results were found with schefflera plants, where crop leaf temperatures were found to be lower due to diffused light. However, kalanchoe and ficus only grew faster at the start of the experiment in autumn, but towards the darker winter period (in November), the diffuse covering material had no longer proved beneficial. The positive effect of diffused light did not compensate for the 4% reduction in light transmission. Crop growth did not accelerate due to this reduction in light level.

Evidently, the research indicates that there is a need in temperate climates for better greenhouse covering materials. This involves materials that scatter light without reducing it, thereby increasing production levels. Diffuse covering material is not as necessary during the winter months because clouds scatter the sunlight during this period. Diffuse covers are most beneficial in a moderate climate - during spring, summer and autumn, when there is more direct sunlight. n

The research on the effects of diffused light on cucumbers and pot plants was financed by the Dutch Ministry of Agriculture, Nature and Food Safety and the Dutch Product Board of Horticulture. More information can be obtained by Silke Hemming (silke.hemming@wur.nl) and Tom Dueck (tom.dueck@wur.nl), Wageningen UR Greenhouse Horticulture.