

# Utilization of New Light Selective Materials to Control the Ratio of Red and Far-Red Light in Plant Production

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## INTRODUCTION

It is generally known that a plant grows to a small size when the plant is grown under light that has a high red to far-red ratio in the spectrum. Mitsui Chemical Inc. utilized this phenomenon to development new types of covering materials for plant-height-growth regulation. For growth inhibition the film and panel material types have a high capacity to absorb light in the red spectral range present in the sun's radiation. We have tested those panel and film materials on ornamental and vegetable crops. In this report we report the potential of utilizing this material in plant production.

## MATERIALS AND METHODS

In our research we used a growth chamber with panel-type cover materials (YBM1, R: FR=2.43; YBM6, R: FR=2.43, Mitsui Chemical Inc.) for the ornamental-plant-growth studies and film-type cover materials (YXE-4#75E, R: FR=1.44, Mitsui Chemical Inc.) for the plastic-tunnel culture of some leafy vegetable crop seedlings grown in plug trays.

## RESULTS AND DISCUSSION

**Ornamental Plants.** Plant heights of poinsettia, geranium, petunia, morning glory, and pansy were lower under high R : FR ratio conditions. The effects of high R : FR ratio light condition on plant heights were especially high in poinsettia and geranium plants, and their plant forms appeared to be very compact. In the dwarf-type cultivars of same species the light treatment had little effect. The plant height of petunia resumed normal elongation after the light treatment ended. The light treatment also altered the number of the days to flowering. In poinsettia the flowering day come about 10 to 15 days earlier; on the other hand, flowering of petunia was delayed under the same conditions.

**Vegetable Crops Seedlings.** Cabbage, Chinese cabbage, and lettuce seedlings were grown in plug tray under a high R : FR ratio light condition. The plant height of cabbage and Chinese cabbage was small under the light treatment. On the other hand, lettuce plant height was higher with stem growth of the lettuce enhanced by the light treatment. It was thought that the low light intensity under the film might have caused a more succulent growth of the lettuce stems. In those crops, the root fresh weight was lower and the T/R ratio became higher under high R : FR ratio condition.

It was clear that the light-selective materials could inhibit the plant height of some ornamental and vegetable crops. But the response difference among plant species and cultivars, and effects on the other factors like number of days to flowering have not been completely evaluated. Before applying these materials in commercial cropping systems, it is necessary to study the plant growth response to R : FR light conditions more thoroughly.