New Functional Photo-selective Sheets: N.S. Blue and N.S. Red©

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In Japan, day length is longer than 12 h during the summer season, and shorter than 12 h during winter season. There are larger differences in high latitudes. This seasonal alteration of day length is accompanied by the ratio of the three spectral regions of sunlight that are effective for photosynthesis. The ratio of red light reaches the maximum at the winter solstice day and reaches the minimum at the summer solstice day. On the other hand, the ratio of blue light reaches the maximum at the summer solstice day. The ratio of green light is unchanged throughout the year. So, the red/blue ratio exhibits a characteristic pattern throughout the year (Fig. 1) (Tohyama et al., 2001).

We presumed that plant morphogenesis is affected by the seasonal change of the red/blue ratio and manufactured two types of new functional photo-selective sheets. The name of one type is N.S. Blue reduces the ratio, and the other is N.S. Red that enhances the ratio. Many different types of plants were covered with these sheets under natural climatic conditions. Generally speaking, the effects on plant growth are the following:

N.S. Blue

- Stimulated flowering in short-day plants and vegetative growth in many kinds of plants including long-day plants during summer season.

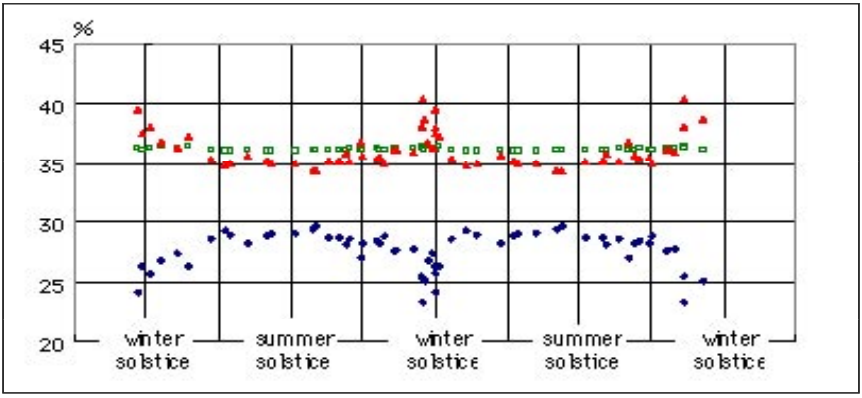

Figure 1. Seasonal alteration of the ratio of 3 solar-rays (◆ blue, □ green, ▲ red) at Tokyo.

- Advanced flowering in azalea (evergreen shrub) *Rhodendron* in spring, but delayed it in camellia (*Camellia*) in autumn. On the other hand, had no affect on flowering in apple (deciduous tree) in spring.
- Advanced maturation in grape (*Vitis*), but delayed in persimmon (*Diospyros*) and orange.

N.S. Red

- Advanced flowering in long-day plants and thickened growth in onion.
- Delayed maturation in persimmon and orange, but had no affect in grape.

LITERATURE CITED

Tohyama, T., Y. Ishii, Y. Kamuro, and **K. Okabe.** 2001. Seasonal light quality for plant growth. Regulation of Plant Growth and Development. 36:202-207.

Designing a Brand-New Agriculture: Producing Consistent Quality Vegetable Seedlings©

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Yamaguchi-Engei Co. Ltd. was established in 1996 and our main product line, vegetable seedlings, is increased by market requirements. Last year, Yamaguchi-Eengei established a new company, named BERG-EARTH. This company's main purpose is to find new markets and to develop new products.

Currently, these two companies are developing together — trying to develop a stable product system of quality vegetable seedlings. Current production systems for vegetable seedlings have many production problems including: difficult to propagation cultivars, expensive human labor, it can be affected by weather and season, it is affected by disease and insect pests, and physical impediment. Because of the many problems associated with current production systems, we have tried to introduce new technology at every production step to improve the total production system and develop a stable production system.

OUR NEW PROCEDURE INCLUDES THE FOLLOWING

Process 1. Seeding to grafting stage: Closed sapling production system (Fig. 1).
Process 2. Grafting stage: Using grafting robot.
Process 3. Grafting to shipment stage: Open style seedling production system (Fig. 2).

Process 1. By introducing the closed seedling production system we can grow a seedling plant under controlled environmental conditions (such as temperature, humidity, wind velocity, and gas concentration); under such conditions, it becomes possible to grow a quality and uniform seedlings.

Process 2. The grafting robot that can do grafting work correctly and quickly will substitute for the grafting work performed currently by hand which results in high production cost.