

A simple method for cooling down the soil in bench culture of strawberry

IN GREENHOUSES, keeping plants up on benches saves farmers from having to work while bending over. When plants are grown in this way, however, the high temperature of the soil often disturbs the growth of the plants. Therefore, a simple method for cooling down the soil has been developed, making use of the latent heat of evaporating water.

Adaptability of the technology

This technology has proved effective in the bench culture of strawberry. Benches were constructed out of a framework of pipes and polyethylene film to hold the soil. In this simple form of bench, the temperature of the soil often gets too high which interferes with plant growth. This cooling technology is most effective for a simple bench of this kind. It may also be used for crops other than strawberry.

The technology

The system should be constructed as shown in Fig. 1 and Fig. 2.

- ❑ Iron pipes and polyethylene film are used for the construction of the bench. Both the pipes and the plastic must be strong enough to support an appropriate amount of soil (Fig.1).
- ❑ Unwoven cloth 0.3 mm thick is attached to the underside of the polyethylene film. The cloth is kept wet with water supplied from a water channel (See Fig.1).
- ❑ An open water channel is set to run the length of the bench (Fig.1).
- ❑ A tube is attached to the end of the bench to drain the water dripping from the cloth (Fig.2).

Advantages of the technology

This technology has three advantages compared to the coling systems generally used in Japan.

- ❑ This cooling system cools down the soil more evenly than the traditional method of running water in pipes. It is, therefore, more favorable to the growth of the roots and tops than the traditional method (Fig.1 and Fig. 3).
- ❑ It accelerates the formation of flower-buds and prolongs the harvest season of strawberries (Fig. 4).
- ❑ Less water is consumed in comparison with the traditional method of piped groundwater.

Precautions when trying the technology

- ❑ The material used to contain the soil must be able to conduct heat. This is because the soil is cooled down by the conducted latent heat of water, evaporating from the unwoven cloth attached to the material.
- ❑ In Japan, the unwoven cloth used for this technique is around 0.3 mm thick. However, the optimum thickness depends on the evaporation rate, which in turn depends on climatic conditions. If the cloth is too thick, too much water may drain away. If the cloth is too thin, on the other hand, it cannot hold enough water to meet the evaporative demand.
- ❑ The system used to supply water to the unwoven cloth must be separate from the system for irrigation water.

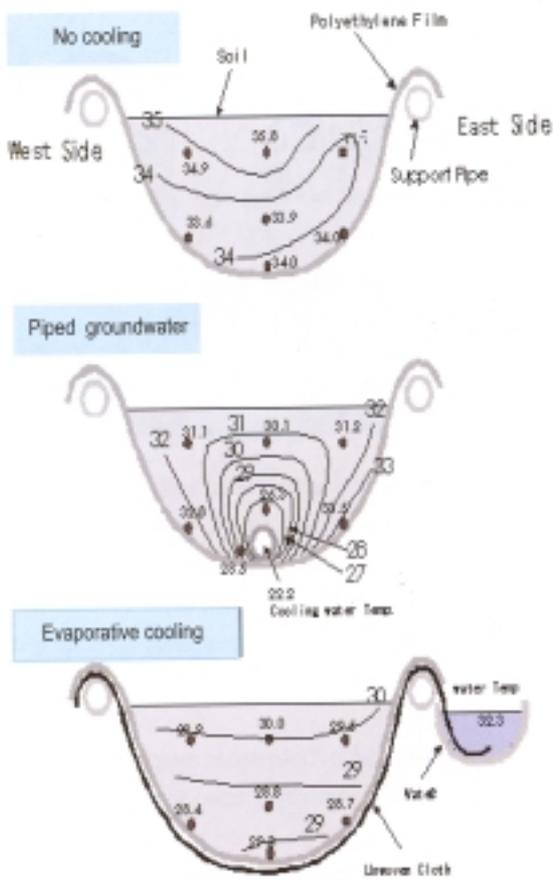


Fig.1. An example of temperature distribution in the soil from two different cooling systems (°C)

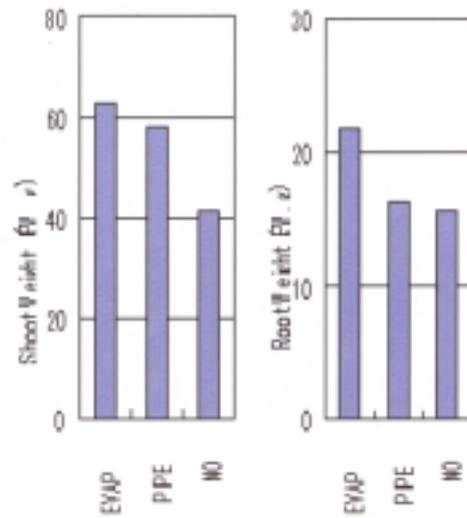


Fig. 3. Effect of soil cooling on growth of strawberry (cv. *Toyonaka*) EVAP: Evaporative Cooling, PIPE: Piped Groundwater, NO: No Cooling

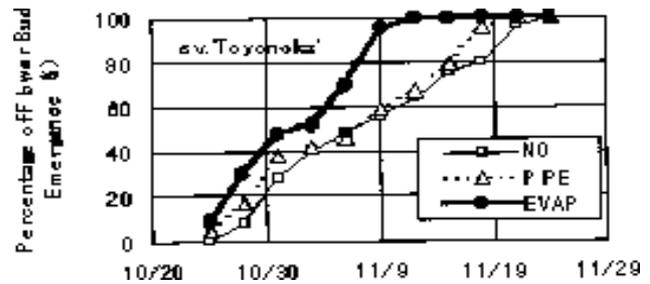


Fig.4. Effect of soil cooling on flower bud emergence of strawberry (cv. *Toyonaka*). The legend is the same as in Fig.3



Fig. 2. Evaporative cooling system