Hardening Transplants

Curtis E. Swift, Ph.D., Colorado State University

Introduction:

The transplanting process can be a shock to rapidly growing seedlings especially when set out into the cold windy garden in the spring. This is especially true for transplants started in the greenhouse, cold frame, hotbed or home. These young seedlings can be made somewhat resistant to heat, cold temperatures, drying and whipping winds, certain types of insect injury, injury from blowing sand and soil particles and low soil moisture by a process termed "hardening".

The term "hardening" refers to any treatment that results in a firming or hardening of plant tissue. Such a treatment reduces the growth rate, thickens the cuticle and waxy layers, reduces the percentage of freezable water in the plant and often results in a pink color in stems, leaf veins and petioles. Such plants often have smaller and darker green leaves than nonhardened plants. Hardening results in an increased level of carbohydrates in the plant permitting a more rapid root development than occurs in nonhardened plants.

Cool-season flower and vegetable plants can develop hardiness allowing them to withstand subfreezing temperatures. Unhardened cabbage seedlings have been reported to be damaged by temperatures of -2 degrees C (28 degrees F) while hardened cabbage will tolerate temperatures as low as -6 degrees C (22 degrees F).

Warm-season types of plants even when hardened, will not withstand temperatures much below freezing. If transplanted to the garden or field prior to the average last killing spring frost, such plants should be provided protection by hot caps or other such devices.

Method:

Any of the following can be used to harden transplants. A combination of all these techniques at one time is more effective.

1. Gradually reduce water - water lightly at less frequent intervals but do not allow the plants to wilt severely.

2. Expose plants to lower temperature than is reported as optimal for their growth. If biennials are exposed to cold for an extended period, they may bolt in lieu of developing properly. **Note:** Placing the plants outside during the day to encourage hardening and then bringing the plants back into the warm house during the night often reverses the hardening process. Plants could be placed in a cold frame or other area that does not freeze during the night hours without lose of the hardening process.

3. Do not fertilize, particularly with nitrogen immediately before or during the hardening process. A starter solution or liquid fertilizer could however be applied to the hardened transplants one or two days prior to transplanting into the garden or at the time of transplanting.

4. Gradually expose the plants to more sunlight. This results in the development of a thicker cuticle layer thereby reducing water loss.

Precautions:

Hardening is not necessary for all transplants. Splittstoesser recommends that with the exception of tomatoes, plants that are susceptible to frost should not be hardened. Overly hardened plants while withstanding unfavorable outside conditions are slow to get started and may never overcome the stress placed on the plant during the hardening process. Lorenz and Maynard recommend that plants be hardened for no longer than seven to ten days before planting to the garden site.

 **References Used:**

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