Effects of Low Temperature and Age of Plant on Flowering in *Lolium perenne* L.\(^1\)

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Exposure to winter conditions of low temperatures and short days greatly hastens the emergence of the inflorescence of many temperate grasses when they are subsequently exposed to long days and warm temperatures. Species and strains vary from those with no cold or short-day requirement for flowering to those in which such are obligatory. Between these extremes, the flowering response is proportional to length of exposure to these pre-induction conditions. Research on "seed chilling" has been conducted for more than a century, but the importance of the short-day component of winter conditions has been realized only in recent years. Although efforts to elucidate the mechanisms of vernalization have not been very rewarding, charting the effects of various pre-induction treatments has enabled the plant scientist to control life cycles of many species (2).

The authors encountered difficulties in obtaining expected results by chilling germinated seeds in preliminary experiments with those strains of perennial ryegrass known to have high pre-induction cold requirements as mature plants. The present experiments were conducted to determine if the stage of seedling development or age of plant influenced subsequent floral response to low temperatures. A further objective was to compare effects of natural vernalizing conditions with those of constant low temperature and artificial lights.

**MATERIALS AND METHODS**

All experiments were conducted with a single strain of perennial ryegrass originating from a certified seed lot produced in Oregon. One hundred plants were selected and screened by the root fluorescence test to eliminate any showing annual characteristics. After vegetatively subdividing each plant into 9 equal segments, the resulting 900 plants were established in an isolated nursery in the field to permit random pollination. Natural photoperiods were extended to 18 hours by artificial light to facilitate intercrossing of plants differing in natural time of anthesis. Seed used in these experiments was a composite from this planting.

The initial experiment was designed to compare (1) germinating seeds vernalized in complete darkness at 35° F. ± 3°, (2) seedlings grown at greenhouse temperature; for 4 weeks and 10-hour photoperiods before transferring to 35° F. ± 3°, and 10 hours light daily, and (3) seedlings grown as in (2) above but transferred out-of-doors after 4 weeks for exposure to natural winter conditions. The 4-week-old seedlings were in the 3- to 4-leaf stage when exposed to the natural or artificial pre-induction conditions.

Seed vernalization treatments were conducted in petri dishes by permitting 48 hours of germination in the dark at room temperature before transferring to low temperature. Dishes were wrapped in aluminum foil to exclude light, but were opened briefly each week in diffuse light to permit air exchange. Water was added as needed to keep the filter paper saturated.