Effect of the E1 Allele on Reproductive Development In *Glycine Max*.

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INTRODUCTION

The control of flowering time is one of the most important properties governing geographic distribution of crop plants. Previous studies have shown that a series of genes known as the e-gene series is responsible for control of flowering time in soybean. The control of flowering time may have important economic benefits. Among the E genes, the E1 gene has been found to have the greatest impact on time to flowering.

The time from vegetative development to flowering can be broken down into four phases: a photoperiod-insensitive pre-inductive phase, a photoperiod-sensitive inductive phase, a photoperiod-sensitive floral development phase and a photoperiod-insensitive floral development phase (Fig. 1).

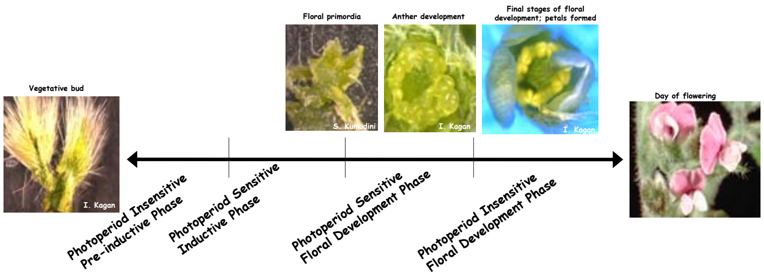

Fig. 1. Phases of floral development; from vegetative development to flowering

OBJECTIVE

To determine the role of photoperiod and E1 alleles on flowering. Specifically their role in time to floral bud induction and rate of floral bud development to anthesis.

MATERIALS AND METHODS

Experiment 1: Reciprocal transfer experiment

Two near isogenic lines (NIL) that differ for the allele at the E1 locus (Table 1) were grown in controlled environment growth chambers (Fig. 2) set to either short (12 h) or long day (20 h) conditions. Periodically plants were moved from the short day (SD) to long day (LD) chamber and vice versa, in a reciprocal transfer design. Both photoperiod treatments received 1000 μmol m^{-2} s^{-1} of photosynthetically active photon flux for a total of 12 hours. One photoperiod treatment did not receive any additional light (SD), while the other received an additional 8 hours of incandescent light (LD). Time to first flower was noted for all treatments.

Experiment 2: floral bud induction

Two NILs that differ for the allele at the E1 locus (Table 1) were grown in one of two controlled environment chambers, set to either SD or LD. Plants were sampled daily and axillary tissue were dissected and examined microscopically for evidence of floral bud primorida. (Fig 1)

RESULTS

The data from the reciprocal transfer experiment suggests that both NILs, even those with recessive alleles are sensitive to photoperiod.

The photoperiod sensitive, inductive phase begins at or shortly after emergence (day 3 or 4) in both NILs. (Fig 3)

The photoperiod sensitive inductive phase appears to run from emergence to 15 days after planting.

From the second experiment, it was found that the first floral primorida were observed 18 days after planting in both NILs grown under SD conditions

The E1 dominant allele delayed the induction of the floral primordia under long day conditions.

Table 1. Name, background and gene composition of the E-gene NILs tested.

Near Isogenic Line (Harosoy)	Gene composition
OT89-5	e1 e2 e3 e4 e5 E7
OT93-26	E1 e2 e3 e4 e5 E7

Fig. 2. Controlled environment chambers

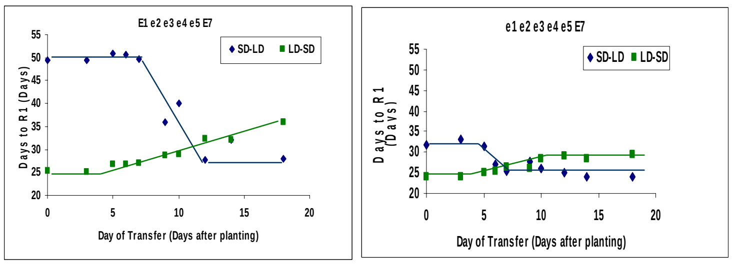

Fig. 3. Impact of photoperiod and the E1 allele on time to flowering

SUMMARY

The E1 alleles condition flowering in a photoperiod-mediated response. There is evidence that the photoperiod-sensitive inductive phase is longer in those NILs with a dominant E1 allele when grown under LD growing conditions. Therefore, later flowering in soybean genotypes carrying the dominant E1 allele can be said to be either partly or completely due to delayed induction of floral primordia.

The impact of these alleles on photoperiod-sensitive floral development phase is yet to be determined.