

TEMPERATURE AND DAYLENGTH EFFECTS ON THE TIME OF FLOWERING OF EARLY AND LATE MATURING BEANS (*Phaseolus vulgaris* L.) II. INHERITANCE STUDIES

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ABSTRACT

Early and late maturation of beans, indicates photoperiod insensitive and sensitive génotypes respectively. Since this response is strongly influenced by temperature is called the photoperiod-temperature response.

This study evaluated the effects of four photoperiod-temperature combinations on the six diallel crosses among two early-maturing (70-85 days) and two late-maturing (90-105 days) dry bean selections.

The late lines were 'Great Northern Nebraska-1 Selection 27' (photoperiod sensitive) and a Cornell cultivar (Line 37) 'Redkote' (sensitive). The two early lines were 'Line 40' from the cross 'Charlottetown' (insensitive) x 'Redkote', and 'Line 41' from the cross 'Redkote' x 'Michelite-62' (insensitive).

Seeds of parents, F_1 , F_2 and F_3 , were planted in growth chambers with 9 and 16 hours daylength in combination with 24°- 18°C and 33°- 27°C day-night temperatures. Irradiance was 2.95 mw/cm² in the spectral region of 400 to 725 nm. Relative humidity was 60-70%.

The number of days from planting to the first flower was analyzed. For each treatment estimates were made of: 1) components of genetic variance (additive V_a and dominant deviations V_d); 2) number of genes (two methods); and 3 broad and narrow sense heritability (BSH, NSH).

Additive effects were more important under high temperature. Dominant deviations were more important under low temperature, except for the F_2 under short days.

Both BSH and NSH varied widely, their relative values changed with environment. NSH estimates were low, while BSH means for all crosses were higher under long days.

Late flowering was dominant in lines 27 and 37 except for short days with high temperatures. Transgressive segregation was present in 'Line 37'.

'Line 27' demonstrated high specific combining ability when crossed with lines 40 and 41. This suggests different alleles for these two lines, which can be explained by their different origins.

Monogenic action was indicated, except for cross '37 x 41' which was digenic. The chi square test (χ^2), indicated the presence of two genes in most crosses.

The results of 'Line 37' could be explained by: a) two gene pairs completely dominant for earliness with epistasis when homozygous recessive (ratio 9:3:4), b) as above but with both recessive homozygous gene pairs epistatic, (ratio 9:7).

The response of crosses between sensitive and with insensitive lines under short days (9 to 12) suggested a one gene difference.

Long days and high temperature caused large variation in flowering among sensitive progenies.