

## Seed Size and Cell Number in Soybean

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High yields of soybean, above 50 bushels per acre, can be achieved consistently from year to year in Massachusetts. From earlier years we have reported yields measured from research studies that exceed 80 bushels per acre. In an attempt to understand year to year variation in seed yield, we have conducted a number of field studies to identify how varying light conditions might influence as much as a 25 to 30% change in weight per seed. Such variations have been observed under normal (ambient) light conditions between years.

In studies we have light enriched plants, by installing wire mesh fences to hold back neighboring rows from a central sample row thus preventing canopy closure, and shaded plants by installing shade cloth, with 50% light reduction, above the soybean plants. Light enrichment or shading prior to flowering resulted in the greatest changes in seed yield, mostly these resulted because of equally large changes in pod number per plant. Light treatments applied in early pod fill, after the end of flowering, also affected yield, but to a lesser extent. Pod retention and changes in seed size were factors that contributed the most to changes in seed yield at this time.

Exposing soybean plants to shading or extra light during the early pod fill period simulated seasonal variations in seed size. Shading decreased weight per seed, while light enrichment increased weight per seed. These results suggested that seed size can partly compensate for decreased (lower light because of prolonged clouding) or increased light availability (lack of daytime clouds), thereby helping to explain some of the seasonal variation in seed yield.

Changes in seed size either occur because there are more cells per seed, or larger cells, or perhaps both may change. Thus, in 1995 we conducted a study applying shade or light enrichment during pod filling, and showed that changes in seed size (Fig. 1) were related to cell number in soybean cotyledons (Fig. 2).

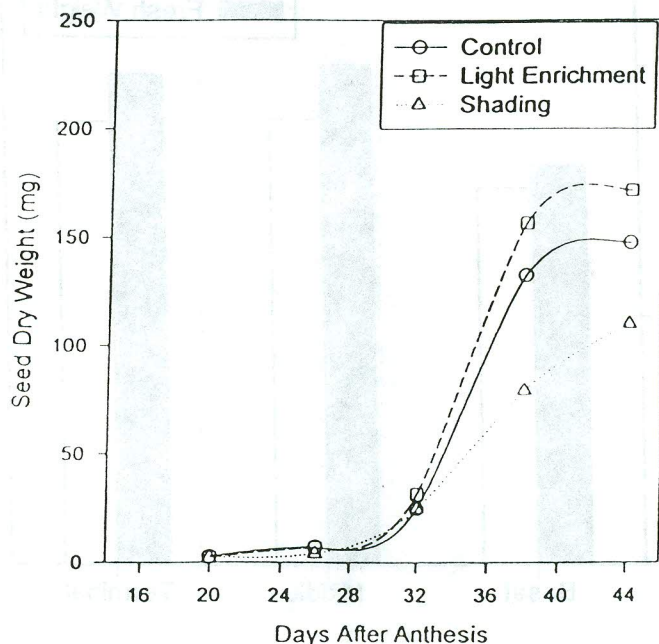


Figure 1. Change in seed size with variation in canopy light condition.

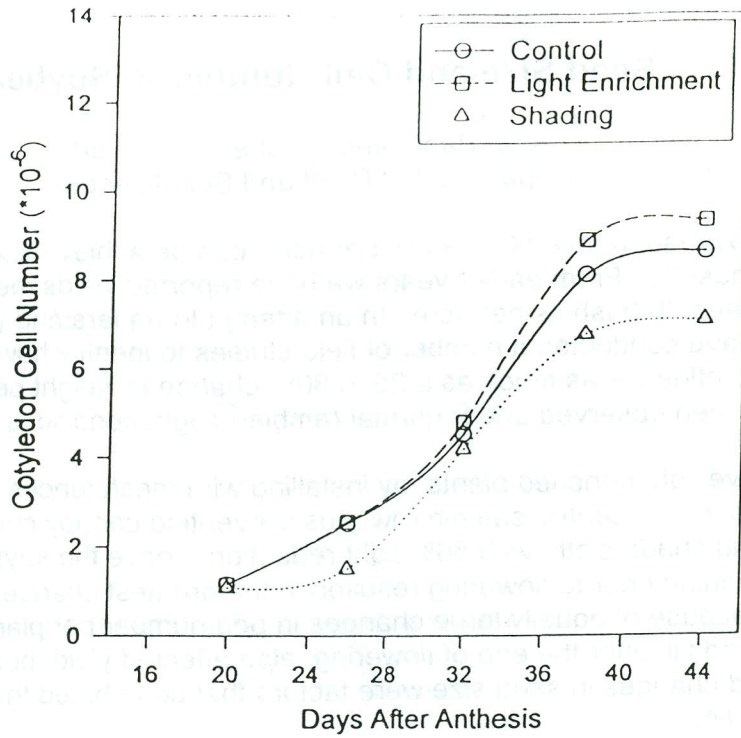


Figure 2. Cotyledon cell number with varying light.

In earlier studies we had shown that the basal seed in a soybean pod was always significantly smaller than the middle or terminal seed. In the 1995 study we showed this difference was also related to a difference in cell number per cotyledon (Fig. 3).

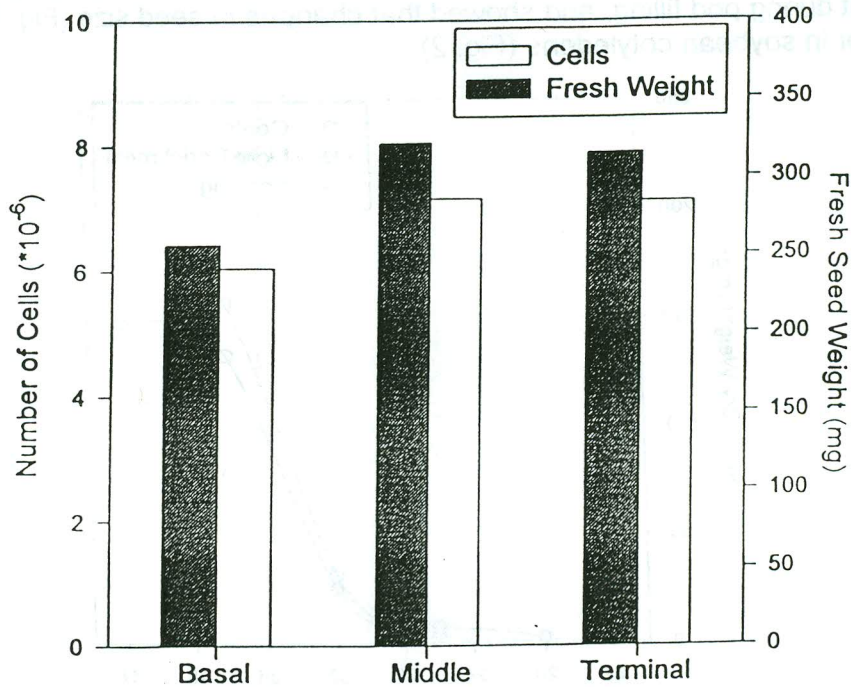


Figure 3. Relationship between seed weight and cotyledon cell number.