INFLUENCE OF LIGHT ENRICHMENT ON YIELD DEVELOPMENT IN SOYBEAN

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The objective of this experiment was to study the effects of increased light interception on the overall yield and distribution by examining the yield components of two soybean varieties. Total seed yield pod number, seed number per pod and average seed size were investigated, both on a per plant basis and on a nodal basis.

Two varieties were used: Altona - a maturity group 00 soybean with an approximate maturity of 95 days, and Evans - a maturity group 0 soybean with an approximate maturity of 110 days. Both were sown on May 18, 1982 at the University of Massachusetts Agriculture Experiment Station farm in South Deerfield in 50 cm row spacing and at a density of 60 plants per m^2. The soil is a Typic Udifluvent, Hadley silt loam. Normal cultural practices were followed. Fertilizer rate was 100 kg of K_2O and P_2O_5 per hectare, the pH was 6.5 and the beans were inoculated with a granular, peat-based soil applied inoculum. Weeds were controlled with alachlor and linuron (Lasso/Lorox). Each plot was 7.5 meters long by 3.5 meters wide, and the experiment was replicated six times.

Increased light was made available to the center row of the 5 row plots by the installation of 3 feet tall wire mesh fences at a 45^o angle sloping away from the center row. Fence installation was on June 28 and at the onset of flowering of the Altona variety. This was approximately 3 days prior to the flowering of Evans. The reason for fence placement was to decrease light competition on the center sample row while leaving root competition as unchanged as possible. We called these plots with fences, the light enriched (LE) plots.

Total yield per plant showed both varietal and treatment responses (Table 1).

Table 1. Final harvest yield data for Altona and Evans soybean, 1982.

	Altona		Evans	
	Control	Light Enriched	Control	Light Enriched
Yield per plant	7.7g	8.9	7.9	12.9*
Pods per plant	20.4	21.9	25.9	36.2*
Seeds per pod	2.23	2.33	2.36	2.33
Seed size (mg/seed)	168	176*	134	154*

* Significant at $P \leq 0.05$

Evans outyielded Altona and the LE plots outyielded the control plots. Evans held a yield advantage over Altona of 3% in the control plots and 45% in the LE plots. Within varieties the increase in yield per plant from control to LE plots was 16% for Altona and 63% for Evans. This follows what has been found in other experiments involving both varieties. Evans is a more plastic plant - better able to respond to environmental changes, such as density and row width changes, and this characteristic was observed in this experiment as well.

The component most responsible for the increased yield was pod number per plant. This component also exhibited varietal and treatment effects. Evans produced 27% more pods per plant than Altona in control plots, and 65% more pods per plant in LE plots. The LE treatment effect was an increase of 7% for Altona and 40% for Evans.

Average seed number per pod showed no significant differences either by variety or by LE treatment. Similar results have been found in all our research with these varieties that this component changes very little regardless of environmental manipulation. Seed size, the average weight of an individual seed, showed both varietal and treatment effects. The increase in seed size contributed to the increase in yield of the LE plants, but to a lesser degree than did pod number per plant.

Figures 1 to 4 represent results on a node by node basis. Figure 1 shows most pods were produced on nodes 1-7. For Altona this was control 86% and LE 88%. For Evans this was 70% for the control and LE plots. Branch pods

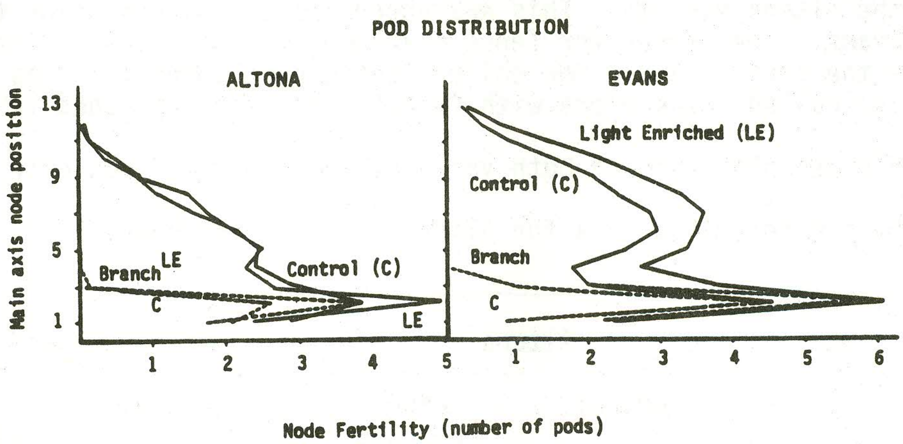

Figure 1. Number of pods per node for Altona and Evans soybean.

contributed greatly to this trend, accounting for nearly 100% of the total pods produced at the lower nodes in the Evans variety. It was observed that Evans was the more profusely branching variety with large numbers of pods occurring on branches. Also, Evans had a large number of main axis pods concentrated on nodes 4-7. Figure 1 also shows the difference in response between Altona and

Evans to the LE treatment. Whereas Altona showed little or no difference in pod number per node at the same main axis node positions, Evans exhibited a very uniform response over all positions.

Average seed number per pod showed little variation on a total plant basis, either between varieties or treatments. Figure 2 shows the lack of variation in seed number per pod occurred across all node positions.

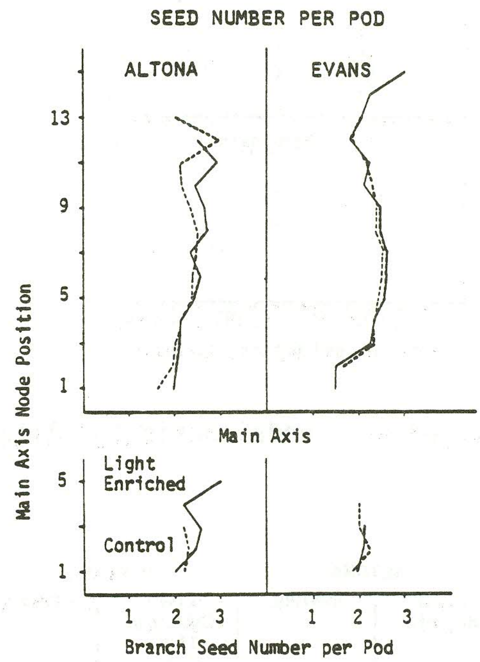

Figure 2. Mean number of seeds per pod on a nodal basis for Altona and Evans.

Irregularities at extreme node positions are due to the small number of pods at these node positions. Also, seed number per pod was not statistically different, whether pods were from the main stem or branches.

Both Altona, the larger seeded soybean variety, and Evans showed an increase in seed size with light enrichment. Figure 3 shows seed size was reasonably constant across all nodes, independent of node position for both LE and control plants, and secondly, that the increase in seed size for LE plants occurred across most nodes for Altona and all nodes for Evans. Figure 4 shows the average seed size of seeds from 1, 2, 3 and 4 seeded pods by variety and treatment on a nodal basis. The numbers 1, 2, 3 and 4 correspond to 1-seeded, 2-seeded, 3-seeded and 4-seeded pods respectively. Seed size was independent of the number of seeds per pod for all node positions.

These results suggest that soybean seed yield responses occur similarly across all nodes to an improvement in environment during pod set and seed fill.

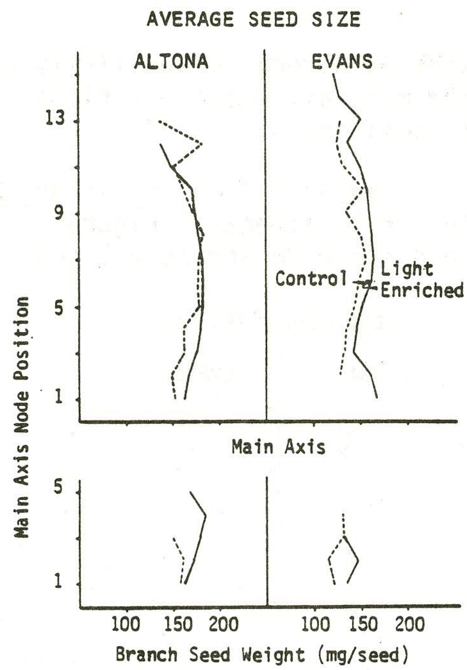

Figure 3. Mean weight per seed on a nodal basis for Altona and Evans soybeans.

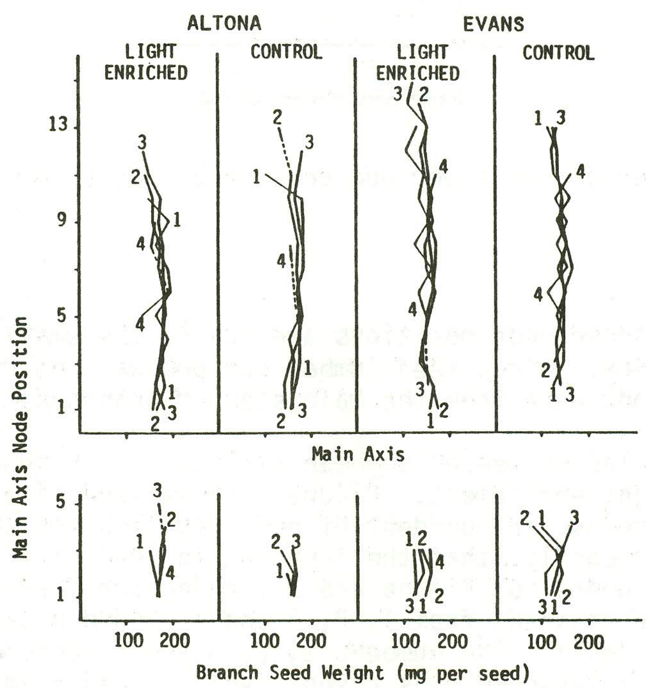

Figure 4. Mean weight per seed, based on umber of seeds per pod, on a nodal basis for Altona and Evans soybeans. 1, 2, 3, 4 indicate 1, 2, 3 and 4-seeded pods respectively.