STARCH AS A REGULATOR OF SOURCE-SINK RELATIONSHIPS IN SOYBEAN

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Plants tend to adjust to environmental fluctuations by increasing or decreasing yields depending on the situation. Plant physiologists believe this is because plants have the ability to maintain a certain source-sink balance. Observations support the hypothesis that sink demand has a direct effect on the source photosynthetic rate. In this study it was hypothesized that starch in the leaf acted as a possible regulator of the photosynthetic rate.

An indeterminant soybean variety was grown under greenhouse conditions. Fifteen weeks after seeding, plants were treated to create three source-sink ratios; sink-limited, normal and source limited by depodding and defoliation. Two weeks after adjusting the ratios leaves were harvested. The amount of starch was measured in a whole cell homogenate sample and nonaqueously isolated chloroplast sample.

The amount of starch in chloroplasts, the number of starch granules per chloroplast and their size in the sink-limited treatment were significantly higher than source-limited and noraml treatments. These results seem to support the hypothesis that starch might act as a regulator for the adjustment of the source photosynthetic rate. When 3 phosphoglycerate (3PGA) is produced in excess of what is needed in the cytosol for sucrose synthesis, more 3PGA will remain in the chloroplast and starch production increases. This starch could lower the photosynthetic rate so that production of 3PGA is reduced.

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