INTERNAL CO_2 CHANGE IN RESPONSE TO REDUCED PHOTOSYNTHETIC AVAILABILITY

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Photosynthesis provides the substrate for growth and maintenance of plant organs. Terminating photosynthetic transport to roots via stem girdling reduces soil CO_2 flux (a proxy for belowground respiration) and internal CO_2 concentration at the base of tress (a proxy for root respiration). However, it remains unclear how reductions in photosynthate availability, as opposed to complete termination, influence root respiration. We reduced photosynthate to roots by approximately one-half by girdling one of two-stems to determine if root respiration could be maintained with reduced substrate. We terminated the supply of photosynthate to another set by completely girdling their stems. The partial reduction of photosynthate transport did not influence internal CO_2 concentration for at least a week. Complete termination of photosynthate transport decreased internal CO_2 concentration within days. Trees with terminated photosynthetic transport had the greatest percent difference in internal CO_2 concentration when compared to the untreated group. The trees with simply reduced photosynthate, thus far have not shown a great difference in comparison to control. Though it appears that root respiratory demands can be satisfied by one-half photosynthate production, it remains uncertain if this can be maintained for longer periods of time. Additionally, it is unclear how other major sinks for photosynthate (e.g. aboveground growth) may be influenced. Belowground respiratory demands may be a higher priority than growth. Trees could also have stored carbon within a large root system, which can buffer root metabolism when new substrate is unavailable. Future research should determine the full extent photosynthetic transport reduction has on metabolic rates.

Emily in the field.