Tracking Carbon From Photosynthesis To Latex With ^{13}C Field Labeling Experiment.

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Abstract

The carbon (C) content of dry latex is about 80%. Then, the rubber trees must mobilize huge amount of C to regenerate the latex exported at each tapping. Does the latex C come directly from the primary sources, the leaves where C is assimilated through photosynthesis, or from reserve pools as wood starch, or both? Knowing the actual C sources and knowing the pathways towards latex is necessary to manage the tapping systems.

Stable isotopes and especially ^{13}C are widely used in plant science as tracers. We realized a field labeling of full crowns of 3y-old tapped rubber trees with $^{13}CO_2$ to trace the carbon from its assimilation in the leaves to the tree sinks and particularly to latex. Such experiment has never been done so far on rubber trees. Three trees (RRIT 408) were labelled in June and three other in October, using a specifically designed chamber. We sampled leaves, phloem, wood and latex to analyze their ^{13}C content and determine the dynamics of carbon allocation from leaves to latex. Latex is being sampled during one year.

The first results showed that ^{13}C was recovered later in latex than in phloem, indicating that most the latex C does not come directly from recent assimilation. The dynamics showing a peak of ^{13}C in latex 10-15 days after labelling in June are consistent with the hypothesis that newly assimilated C is mixed in a pool of older carbon (reserves) before being used to regenerate latex. However, the dynamics in October showed an earlier (6-8 days after labelling) and much higher peak. This showed that when the regeneration metabolism was well established the transfer of recent assimilates into latex was faster. In both cases ^{13}C was still recovered in significant amount more than 40 days after labelling, demonstrating the contribution of reserves.

The dynamics of ^{13}C recovery in soluble compounds (sugars and quebrachitol) in the phloem and in the latex C-serum will provide further information on their transport and use in laticifer cells. The first trends indicated that the mean residence time (MRT) of soluble sugars did not vary (36-45 h in June and October), whereas the dynamics of quebrachitol were different, indicating possible different sources of C for this compound believed to play a key role in osmotic regulation.