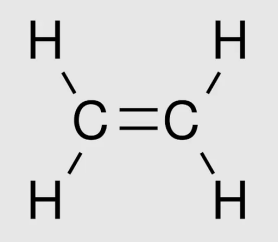
To: Cpurola **Date:** March 12, 2024

From: Zill

Subject: Summary - Ethylene-mediated metabolic priming increases photosynthesis and metabolism to enhance plant growth and stress tolerance. *Eric Brenya, Esha Dutta, Brittani Herron, Lauren H Walden, Daniel M Roberts, Brad M Binder*

Why the study

Arabidopsis Plant – Arabidopsis is in the family Brassicaceae - cabbage and mustard. A lot is known about the plant and its entire genome as been sequenced. The study delves into gene expression. Probably why they selected Arabisopsis

Hormone – complex organic molecules that are synthesized in low (1E-9M) concentrations, have an effect removed from sites of synthesis, profound effects on organism development. Ethylene (ET) is the odd one compared with other animal and plant hormones. Not a very complex molecule. 

. It's a gas, semi-sweet odor. Ethylene was discovered way back in 1669. Its role in plant life is relatively new. Ethylene has been known to induce certain responses in plants for decades. Its other name is the "ripening" hormone. A great source in your kitchen is rotting banana peels. Place your bananas on top of your avocados.

To quote the authors: "*Ethylene also promotes greening of seedlings during photomorphogenesis (19). These changes have been linked to seedling survival as they emerge from under the soil into the light."*

They authors build on what is already known about ET in attempts to improve seedling robustness for use in commercial spaces.

The Big Claim: *Incubating seedlings in the dark exposed to ethylene gas enhances photosynthesis and leads to large increases in stored carbohydrates.*

Given the Arabidopsis DNA sequence information on hand the authors we able to show that certain genes are tuned on or a gene deficient mutant was or was not affected. Chlorophyll mutants exposed to ethylene reduced the amount of stored carbohydrates compared to the wild type. So, ethylene induces accelerated photosynthesis. This was reversed by adding sugar. Enzymes used to break down stored carbohydrates (starch) are involved and not rescued by sugar.

Conclusion

Seedlings push their way to the sun through the soil. In doing so, the seedling becomes stressed, a lot of friction and cell loss. The plant responds by producing ethylene which in turn triggers the ethylene signaling in darkness before it breaks into the sunlight.

In their words: *"The growth stimulation caused by ethylene seems to be a general trait of angiosperms since we see similar ethylene-induced growth enhancement in several angiosperm species. Thus, this represents a possible new approach to increase plant vigor, perhaps in greenhouse applications where plants can be easily pretreated with* ethylene."

How does this help us?

1) The authors use Arabidopsis plant. We assume cannabis responds similarly.
2) How do we apply? Keep it simple – cut up pieces of banana peel and place that in your solo cup along with the seedling.
3) Do several with and without peel.
4) Only works at seedling stage. After it breaks into the sunlight all bets off.