thermoscientific

TOP SEED
THROUGH DETECTION

Phenotyping with the
Thermo Scientific Delta Ray IRIS

ThermoFisher
SCIENTIFIC

The planet will need

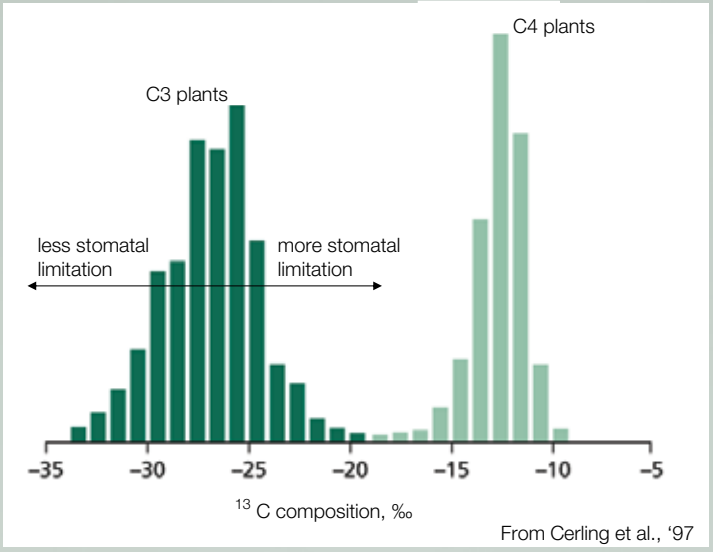
Global feed crop demand is expected to doubl
and climate change will require healthier, more

If you expect to lead in feeding the world, there's only one way to get it right.

Grow the perfect seed.

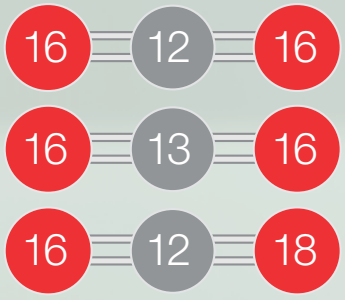
to feed 10 billion people by 2050.

e by 2050 due to the growing world population. In addition, seasonal droughts
resilient, smarter plants.



From Cerling et al., '97

The Delta Ray IRIS can be integrated into a plant chamber to detect rapid changes in the metabolism of a plant. You'll be able to measure the impact of different plants species on the oxygen isotopic signature of atmospheric CO_2 under varying environmental conditions. This is important for an accurate estimation of CO_2 fluxes in terrestrial ecosystems based on $\delta^{18}O$ in CO_2.



New Focus on Photosynthesis

The ^{13}C values of the CO_2 is a fast indication of water-use efficiency (WUE) and plant response to drought. Imagine determining $\delta^{13}C$ photosynthetic discrimination of crop plants instantly.

Delta Ray Series Speeds Up the Process

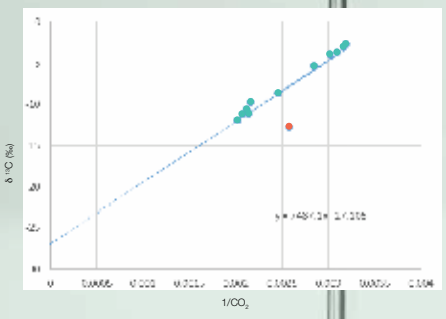
The Thermo Scientific™ Delta Ray™ IRIS consists of a laser-based Isotope Ratio Infrared Spectrometer (IRIS) and a Universal Reference Interface (URI) which can perform accurate and precise, continuous, in-situ monitoring of isotopologues of trace gases at ambient concentration.

Smarter Plants –

Input CO_2

Mix 'CO_2

Exit "CO_2



This graph shows different plant genotypes. Genotypes that stick out from the linear plot should be taken out from the production line – because of not smart WUE.

"Smart" plant: The Exit CO_2 will change in both heavy and light isotopes.

"Weak" plant: The Exit CO_2 will have mostly heavy ^{13}C, because the light molecules will be absorbed by the plant.

Stronger Outcomes

The Delta Ray IRIS can simultaneously measure the CO_2 going in and out of the plant chamber: CO_2 concentration as well as $\delta^{13}C$ and $\delta^{18}O$ isotope signatures. In the drying process, $\delta^{13}C$ significant changes are already visible after 24hrs.

The Delta Ray IRIS provides continuous, feature-rich data for plant research. The carbon isotope ratio $\delta^{13}C$-CO_2 and oxygen isotope ratio ($\delta^{18}O$-CO_2) of atmospheric carbon dioxide can be used to partition the gross fluxes of CO_2 in terrestrial ecosystems, such as plant respiration, soil respiration and plant assimilation. The characteristic $\delta^{13}C$ value is modified by plant metabolism and photosynthesis. The $\delta^{18}O$ is affected by the oxygen exchange between the molecules of CO_2 and H_2O stemming from different water pools. Similar measurements could, for example, be used to determine the efficiency of plants in phenotyping, studying the impact of elevated CO_2 concentrations in a future climate or even exchanges at ecosystem level.

Identifying smarter plants in the lab…

…can begin in the field. Share the data in the cloud.

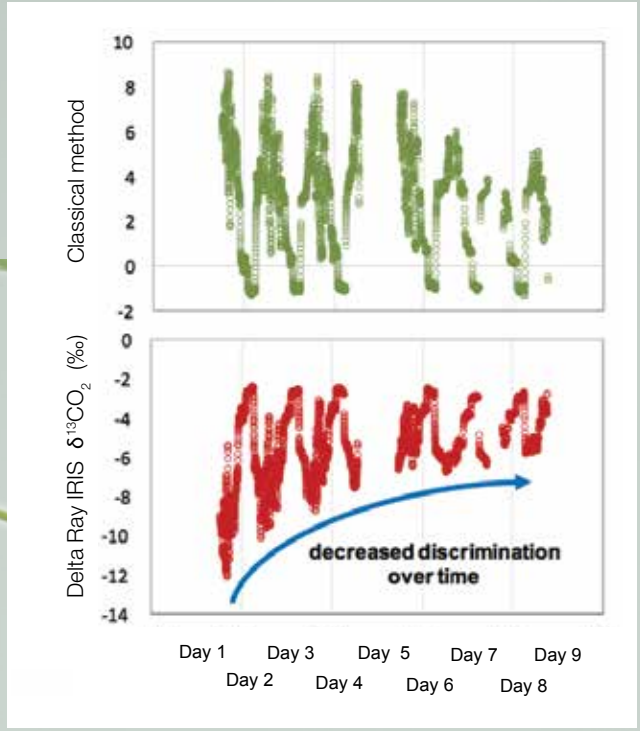
It‘s the exacting process of producing smarter plants. **Faster**.

Observe rapid changes in plant metabolism by simultaneously monitoring carbon and oxygen isotope ratios of carbon dioxide under varying ambient conditions in a plant chamber. This offers you a totally innovative, non-destructive approach to whole plant physiology and processes that shorten production time and dramatically increase your potential for global seed output.

We've exponentially reduced the time for perfect seed development.

With traditional methods, the changes in plant canopy were visible after four days.

With Delta Ray IRIS, $\delta^{13}C$ changes are already visible **in 24 hours.**



The smart, green Top Seed plant emerging among its lagging field companions is emblematic of Delta Ray's ability to quickly identify the top performers. This is the tipping point in creating your new market advantage. Your leading-edge ability will determine what seeds will best produce the abundance necessary to feed an ever-growing world population. Ensure your enterprise longevity, strengthen your R&D investment and gain a seed breeding position to be reckoned with.

Find out more at **thermofisher.com/phenotyping**

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