IWYP International Wheat Yield Partnership
Research to Deliver Wheat for the Future

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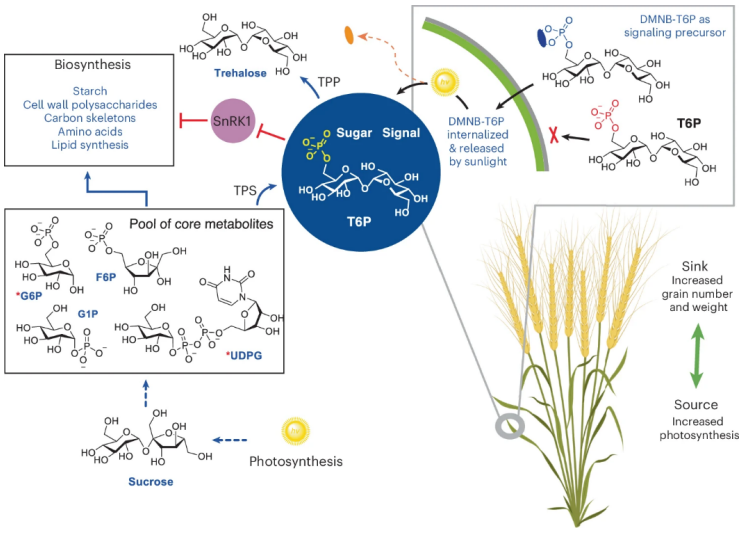
IWYP and the Birth of Spinout Company SugaROx

Bringing discoveries to a proof of concept that justifies the launch of new company usually takes many years. This is especially true in agriculture where field trials are required to provide evidence of potential impact. Multiple grants from several funders are also often required. This was the case for SugaROx, formed in 2021 as a spinout company from Rothamsted and Oxford University in the UK, with Matthew Paul, Cara Griffiths and Ben Davis as scientific architects and founders.



From 2018-2021 IWYP invested in the project "*Transforming yield through source-sink synchronization*" (PIs Matthew Paul, Matthew Reynolds and Ben Davis). The scientific concept was that the signaling molecule trehalose 6-phosphate (T6P) that boosts starch biosynthesis could enhance wheat yields if applied at the right time. The IWYP Hub at CIMMYT participated experimentally by testing the effects of spraying several spring wheat varieties 10 days after anthesis with a permeable precursor of T6P that is converted to T6P by sunlight. Yields were increased by the application of this precursor. Similar field trials were also conducted in Argentina. Fourteen authors from Rothamsted, Oxford, CIMMYT and INTA Argentina were involved in the publication in Nature Biotechnology in April this year (Griffiths, C.A. *et al*. 2025).

These positive results, coupled with the knowledge to produce the permeable precursor cost effectively and at scale, also supported by IWYP investment, brought the science to the point where formation of SugaROx was judged to be timely; the technology of the company is capable of producing higher yields in farmers' fields without additional fertilizers, including in drought years. Furthermore, this chemical route to yield enhancement appears largely independent of variety and so can be scaled rapidly and widely. Additionally, novel findings of use to wheat researchers, crop and plant scientists, and breeders were generated including:

1) Increased yields are achieved by T6P without extra fertilizer whilst maintaining grain protein content. Combined with more yield per unit of water (yield was increased under drought and in wet years) the method provides a sustainable route to yield improvements.
2) Increased expression of the whole sucrose to starch pathway in grain occurs after applying T6P, something not achieved before using technological approaches. Interestingly, it had been thought that starch biosynthesis in wheat grain was not limiting for yield.
3) Upregulation of genes for nitrate reductase, amino acid and protein synthesis also occurs in the grain which may account for the lack of dilution of protein content in higher yielding grain after T6P treatment.
4) Upregulation of the entire source to sink pathway is achieved by T6P with simultaneous increases in sink strength (starch and protein synthesis), sieve element development in the grain and increased photosynthesis in flag leaves (source strength), thus enhancing sucrose delivery to developing grain.
5) The overcoming of the recalcitrant tradeoff between grain number and grain size occurs because increases in both grain number (through retention of more grain) and grain size at harvest were achieved.

IWYP is pleased with its financial and technical investment into this multi-year, multi-funder project. It is an example where the impact is, in the short term, a new spinout company, and in the longer term the potential for higher wheat yields around the world together with all the benefits associated with such gains.