GENETICALLY MODIFIED WHEAT USING NITROGEN FIXING NODES

Nitrogen is used to build plant tissues for proteins and nucleic acids, which are essential for plant growth. However, Australian farmers use 5.25 million tonnes of fertilisers annually which unfortunately has a major impact on the health of soil, waterways and atmosphere, as well as being expensive.

Australia's main crop is wheat and it is expected to produce 34.4 mt in 2021-2022. We propose to develop a new GMO crop, by cutting the piece of genetic material from legumes out, which is responsible for creating nitrogen-fixing bacteria nodes and implant it into wheat. This will create wheat that can also fix nitrogen into the soil replacing the need for as much nitrogen based chemical fertilisers.

Genetic modification

Genetic modification is a process that alters the genetic material of plants, animals or bacteria by duplicating, removing or inserting one or more new genes to improve its characteristics.

Nitrogen-based chemical fertilisers

Nitrogen-based chemical fertilisers are bad for the environment because they destroy the soil biodiversity and create a nitrogen dependency. When farmers overuse chemical fertilisers they move away from the natural nitrogen-fixing bacteria from the soil which means there is no nitrogen coming naturally into the soil. This also can result in destroying the worm populations so no organic material is reused. They also kill the mycorrhizae (fungi strands in soil so the far away nitrogen cannot be accessed by the plants. Finally, runoff from farms can cause algae blooms which damaged waterways.

Benefits of the new genetically modified wheat

- Fewer nutrients in waterways from nitrogen-based fertilisers = decrease algae blooms.
- Using less chemical fertilisers = healthier soils from more nitrogen-fixing bacteria, worms and more mycorrhizae (fungi strands in soil)
- Includes the many benefits of polyculture (mixed crop farming) while only requiring the knowledge for monoculture
- Less money is spent on fertilisers
- Less nitrogen leaching from the soil (through the water) or through volatilization (through the air)

References

Australian crop report winter 2021-22 predictions
Wheat grown is 34.4 mt which is a new record
https://www.awe.gov.au/abares/research-topics/agricultural-outlook/australian-crop-report/overview
Mycorrhizae
https://www2.nau.edu/~gaud/bio300/mycorrhizae.htm