Claim:

Genetic engineering has revolutionised agriculture

Research Question:

Does the introduction of the GR2E trait into rice increase the concentration of carotenoids?

Evidence:

The research article *Compositional Analysis of Genetically Engineered GR2E “Golden Rice” in Comparison to That of Conventional Rice* was published in 2019 in the Journal of Agricultural and Food Chemistry. The study investigates the nutritional content found in GR2E rice compared to regular rice. The study collected rice samples from four sites in the Philippines in both the wet and dry season. These samples were then crushed and through a lengthy chemical process the concentration of carotenoids in the samples was determined.

Table 1: Concentrations of, Carotenoids in Grain Samples Derived from GR2E and Control Rice (Swamy et al., 2019)

|  | GR2E | | control |
| --- | --- | --- | --- |
| component | mean | range | mean |
| Carotenoids (mg/kg DB) | | | |
| β-cryptoxanthin | 0.31 | (0.23–0.46) | *<*[LOQ](https://pubs.acs.org/doi/10.1021/acs.jafc.9b01524#tbl5-fn1) |
| *all*-*trans*-α-carotene | 0.71 | (0.35–1.32) | *<*LOQ |
| *all*-*trans*-β-carotene | 3.57 | (1.96–7.31) | *<*LOQ |
| 9′-*cis*-β-carotene | 0.76 | (0.5–1.32) | *<*LOQ |
| total carotenoids | 5.88 | (3.5–10.9) | *<*LOQ |

Table 1 shows the results of the study and lists the concentration of carotenoids found in rice samples. These concentrations show that the presence of the GR2E trait is causing an increase in all carotenoids from below the level of quantification to a significant amount. It also shows the amount of each type of carotenoids with trans beta carotene being the most prevalent and comprising of the majority of carotenoids in the BR2E and beta cryptoxanthin and beta cryptoxanthin being in a small concentration.

The results in Table 1 are shown because of the gene which was been transferred to the rice via genetic engineering processes to create a transgenic specious of rice with altered nutritional properties. The genes transferred are from a specious of maize and bacteria which together creates plants which produce carotenoids, a molecule which the body converts to vitamin A. The genetic engineering process which was used to insert the genes into the rice was Agrobacterium-mediated transformation (Baranski, 2022).

Reference List

Swamy, B., Samia, M., Boncodin, R., Marundan, S., Rebong, D., & Ordonio, R. et al. (2019). Compositional Analysis of Genetically Engineered GR2E “Golden Rice” in Comparison to That of Conventional Rice. *Journal Of Agricultural And Food Chemistry*, *67*(28), 7986-7994. https://doi.org/10.1021/acs.jafc.9b01524

Baranski, M. (2022). *Golden Rice*. Embryo.asu.edu. from https://embryo.asu.edu/pages/golden-rice.