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Developing GC and HPLC methods for the γ-aminobutyric acid quantification in rice samples

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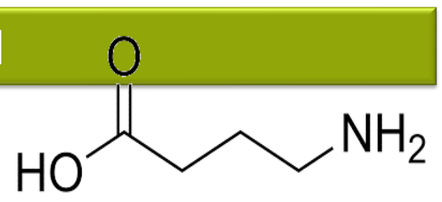
INTRODUCTION

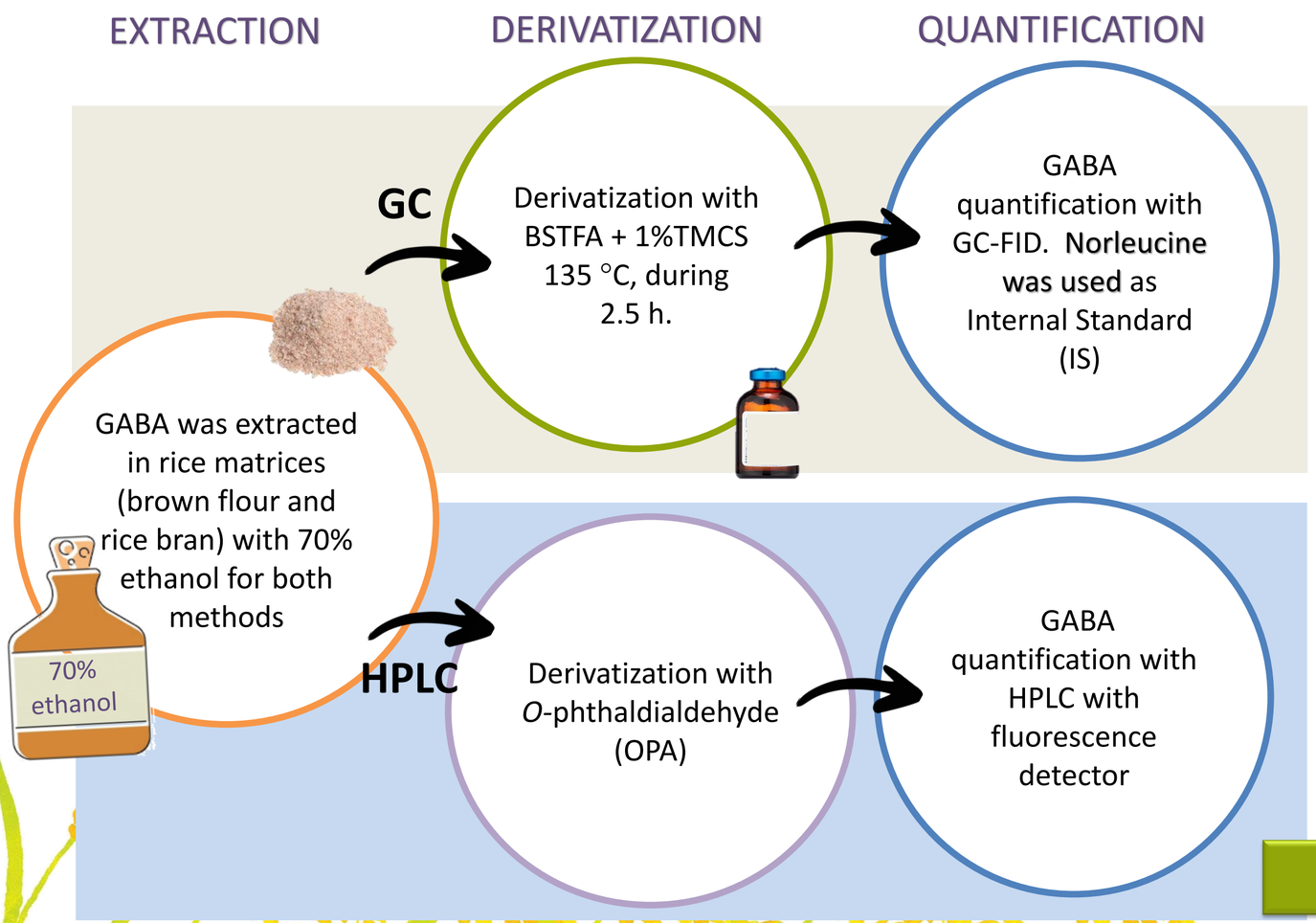


γ-aminobutyric (GABA) is a non-protein amino acid synthesized from glutamic acid, serving as a neurotransmitter in humans. It plays a crucial role in neurological functions and has been linked to the inhibition of chronic diseases like diabetes [1]. Interest in GABA-rich foods consumption and its extraction for supplements is growing. Chromatographic methods, used to determine GABA levels, generally require prior derivatization [2] which presents challenges such as reagent compatibility, side reactions and compounds instability. Optimization protocols is essential for accurate and reliable results.

OBJECTIVE

To compare two chromatographic methods: gas chromatography (GC) [3] and high-performance liquid chromatography (HPLC) for the separation and quantification of GABA in simple ethanolic rice extracts using different derivatization techniques.

METHODS



RESULTS & DISCUSSION

Linear regression was achieved for both methods (Figure 1). The detection limit (LOD) and quantification limit (LOQ) for the GC method were 0.058 mg/mL and 0.177 mg/mL respectively, while for the HPLC method they were 0.018 mg/mL and 0.054 mg/mL.

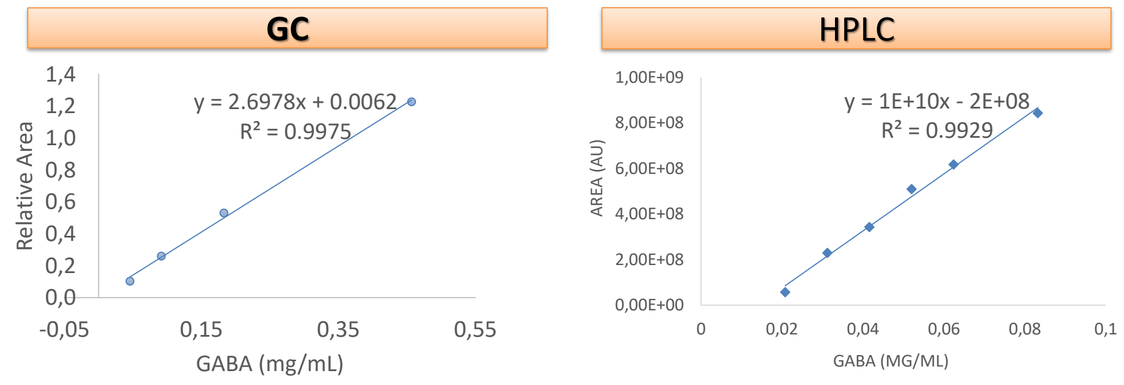


Figure 1– GABA calibration curves

Although the GC calibration curve showed a high correlation (**figure 2A**), quantification was less effective compared to HPLC for rice samples spiked with GABA and internal standard (IS). The chromatograms exhibited numerous interfering peaks, likely caused by side reactions during the derivatization process.

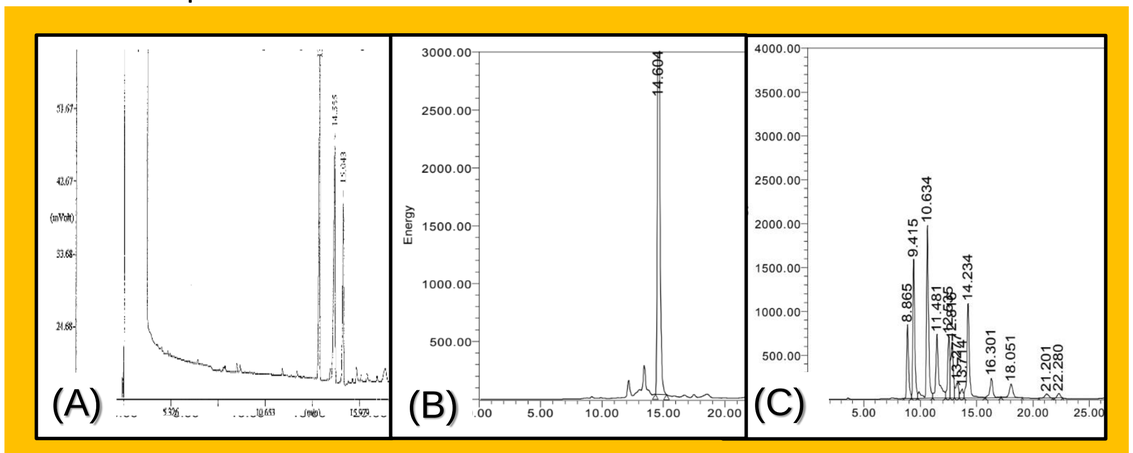


Figure 2 – **(A)** GC chromatogram 100 µL of GABA standard (t=13.700) and 100 µL of Norleucine (IS) (t=14.555); **(B)** HPLC chromatogram of GABA standard (t=14.604) and **(C)** rice bran GABA (t=14.234) obtained by HPLC method.

The HPLC chromatograms showed successful GABA quantification in rice samples (**figure 2B and 2C**), with GABA levels being significantly higher in bran (222.1 ± 19.3 mg/100g) compared to brown rice (131.0 ± 3.9 mg/100g) (**figure 3**).

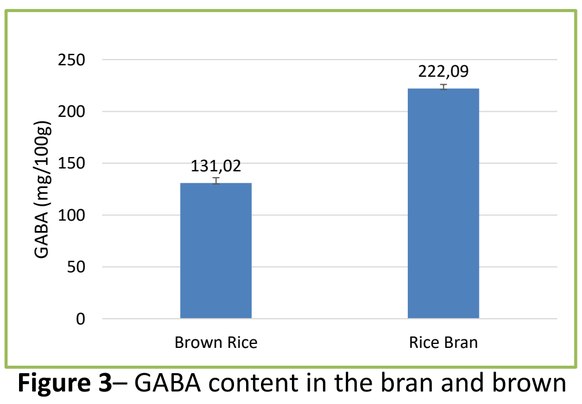


Figure 3– GABA content in the bran and brown rice of the Ariete rice variety .

CONCLUSION

GABA quantification in rice is of great interest due to its proven health benefits. However, optimized methods are essential for accurate analysis in the rice matrix. In this study, using the applied derivatization techniques, the fluorescence HPLC method was more suitable for GABA quantification than GC-FID.

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