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„Selected Methodological Aspects of Antioxidant Activity Determination in Food Products Containing Proteins and Polyphenols”

The dissertation comprises two complementary parts focused on the determination of antioxidant activity in food products containing polyphenols and proteins. The first part addresses the antioxidant properties of plant infusions and spices. The study involved the analysis of polyphenol content, total antioxidant capacity (TAC), and the amount of hydrogen peroxide (H_2O_2) generated spontaneously in the extracts, examining the relationships between these parameters. A strong correlation was observed between polyphenol content and TAC determined by ABTS• reduction, CUPRAC, FRAP, and DPPH• reduction assays. However, no direct correlation was found between polyphenol content and the amount of H_2O_2 produced. Although phenolics contribute to H_2O_2 formation through autooxidation, its concentration also depends on the antioxidant potential of the extract, particularly its capacity to eliminate H_2O_2.

The second part of the study concerns the methodological evaluation of antioxidant activity measurements in the presence of proteins. The analysis included amino acids and model proteins (bovine serum albumin and hen egg white protein), which were subjected to denaturation and enzymatic hydrolysis. It was demonstrated that these processes significantly enhance the antioxidant properties of proteins, which was attributed to an ~~release~~ increase in accessibility of redox active amino acids such as tyrosine, tryptophan, cysteine, cystine, histidine, and arginine. Particular attention was given to the reaction of tyrosine with the ABTS• radical, in which formation of a stable, violet-colored ABTS-tyrosine adduct and dityrosine were observed. These products may interfere with the interpretation of ABTS• assay results, highlighting limitations in the analysis of protein-containing samples.

In summary, the results obtained from both the analysis of plant extracts and protein-based models confirm the complexity of reactions underlying antioxidant activity measurements. The two parts of the study complement each other, highlighting not only the practical relevance of TAC measurement methods but also their limitations resulting from the presence of protein or phenolic components. The identified interferences and secondary products of radical reactions emphasize the need for a critical approach to data interpretation and for selecting analytical methods suited to the nature of the tested matrix.