

The Cytotoxicity Effects of Whey Protein Supplements Using *Allium cepa* as Plant Bioassay

Nur Amanie Husna Kasmizan^a, Lyena Watty Zuraine Ahmad^{a*}

Structured Abstract

Background: Whey protein is one of the most well-known nutritional supplements available to consumers today. However, the growing popularity of whey protein supplements has raised concerns about their potential cytotoxic effects. Apart from that, the constituents of product may cause adverse reactions in the user. This study aimed to evaluate the potential adverse effects of whey protein supplements on plant growth and cellular processes using different level of concentrations.

Methods: The test solutions were prepared by diluting whey protein with distilled water (weight/volume) for whey protein exposure. The control group was only treated with distilled water, 0% (w/v). The remaining group of *Allium cepa* were treated with whey protein of different concentrations, 7.5%, 15%, 22.5% and 30% (w/v) respectively. In each treatment, the *Allium cepa* roots were soaked for 24 and 48 hours. The measurement of macroscopic parameters was taken daily for 7 days for root growth rate. For microscopic parameters, the percentage of mitotic index and chromosomal aberrations during the cell division were determined.

Results: The exposure to whey protein affect all the parameters tested as they significantly affected the pattern of root growth rate of *Allium cepa* with the increment of exposure time. The mitotic index was significantly increased since whey protein enhances cell division in a dose-dependent manner. This suggests a potential mitogenic effect, which may disrupt the normal cell cycle regulation and could have implications for tissue growth and cancer development. Meanwhile, the chromosomal aberrations observed in the meristem cells of *Allium cepa* in each treatment was significantly high. It indicates that the whey protein has genotoxic effects, causing damage to the chromosomes. This can lead to the mutations, genetic instability, and potential health risks, including cancer and other genetic disorders.

Conclusion: In conclusion, the findings of this study indicated that there is considerable potential occurrence of cytotoxic agents in the high concentration of whey protein regardless of the period of exposure. Therefore, *Allium cepa* can be used as a reliable and cheap tool of cytotoxicity screening.

Keywords: Cytotoxicity, Whey Protein, *Allium cepa*

*Correspondence: lyenawatty@uitm.edu.my

^a School of Biology, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia