

Based on the findings from the in vitro study, samh seeds are a rich source of bioactive compounds, proteins, essential amino acids, and unsaturated fatty acids, making them a promising candidate for the development of functional foods. Thus, fermented and germinated samh seeds can be considered promising candidates for novel functional foods aimed at reducing and managing hyperlipidemia. Our findings indicate that fermented samh seed flour (FSSF), germinated samh seed flour (GSSF), and raw samh seed flour (RSSF), when administered alongside a high-fat diet, lead to reductions in weight gain, fasting plasma insulin (FPI), fasting plasma glucose (FPG), glycated hemoglobin (HbA1c), and homeostatic model assessment for insulin resistance (HOMA-IR) compared to rats fed only a high-fat diet. These treatments also improve in vitro protein digestibility, protein efficiency ratio, and the concentration of total essential amino acids while reducing antinutritional factors such as tannins and phytates, as well as carbohydrate content and glycemic index. On the other hand, fermentation increases the levels of protein, calcium, magnesium, sodium, phosphorus, iron, zinc, palmitic acid, and total saturated fatty acids, while lowering the moisture content, non-essential amino acids, and total unsaturated fatty acids. On the other hand, the results of the in vivo study revealed the effects of fermented and germinated samh seeds on hyperlipidemia and inflammatory markers in rats subjected to a high-fat diet, a condition frequently associated with obesity, elevated blood lipid levels, insulin resistance, and impaired liver function. Specifically, germination increases the levels of potassium, zinc, phosphorus, oleic acid, and unsaturated fatty acids, while reducing fat content, palmitic acid, and total saturated fatty acids, thus improving the nutritional quality. Both germination and fermentation processes can enhance the nutritional profile of samh seeds by increasing their bioactive components, including total phenolic content, total flavonoid content, phenolic compounds, and antioxidant activity. Overall, samh seeds are a nutrient-dense source of bioactive compounds, and their nutritional and functional properties are significantly enhanced by germination and fermentation treatments.