Anticancer and Antioxidant Potential of *Amaranthus Cruentus* Protein and its Hydrolysates

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Abstract

New insights on the use of peptides as therapeutic agents in the treatment of cancer have emerged with reports showing anti-tumour activity of peptides, predominantly derived from animals or microorganisms. Traditionally, Amaranth has been acknowledged to possess vital pharmacological properties with anticancer peptides having been found in Amaranthus cultivars. However, limited knowledge is available over the use of pepsin and alcalase enzymes to form hydrolysates. Thus, this study was aimed at comparing the *in vitro* anticancer effect of *Amaranthus cruentus* (grain) protein isolate and hydrolysates (alcalase, trypsin and pepsin). Protein hydrolysates were tested for their antioxidant activity (DPPH, ABTS, FRAP) together with the anticancer and apoptotic potential. The safety of hydrolysates was investigated using the Ames mutagenicity and Brine Shrimp Lethality assay. DPPH assay revealed that the hydrolysed samples had an enhanced scavenging activity compared to the unhydrolyzed sample, with pepsin having the greatest IC_{50} of 23.06 µg/ml.

Amaranthus cruentus isolate (IC_{50} 17.57 µg/ml) was a greater scavenger of the Fe+ ions compared to the control glutathione (IC_{50} 79.81 µg/ml). For ABTS, all hydrolysates had a greater antioxidant scavenging potential compared to the isolate. The MTT cytotoxicity assay revealed that the isolate produced a greater cytotoxic effect on the MCF-7 and A549 cell line when compared to the control (camptothecin). For the non-cancerous cell line (HEK 293), trypsin hydrolysate had the highest toxicity. Apoptotic results revealed that trypsin hydrolysate was the most effective compared to the isolate, which was confirmed from morphological and Caspase 3/7 results. Results obtained revealed *A. cruentus* isolate and hydrolysates had no mutagenic response against Salmonella typhimurium TA 98 and TA 100 strains. The tested samples did not induce any significant increase in the death percentage of Artemia spp. in comparison to potassium dichromate (control). It may be concluded from the findings of this research that hydrolysates from food protein isolates have the potential for use as possible anticancer therapeutics. However, more research needs to be conducted to determine the peptides responsible for anticancer activity as well as the possible mechanism of action.

Biography: Shanece Ramkisson

Shanece Ramkisson is a young professional based in Pretoria. She is the postgraduate co-ordinator / technical assistant in the Department of Consumer and Food Sciences at the University of Pretoria. She graduated from the Durban University of Technology with a National Diploma (2016), Bachelor of

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