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Optimization of monoplex and multiplex PCR assays to detect meat species and adulteration of meat products in the Sri Lankan market

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Meat identification testing, detecting intentional adulteration of meat and detecting meat contamination due to poor processing practices are essential to ensure good quality of meat products. Incidence of meat adulteration, product mislabelling, commercially motivated adulteration and contamination of meat products with undesired or forbidden meat species have been reported in some countries. In Sri Lanka, religious and cultural views are one of the primary determinants of choice of meat consumed. Therefore, the necessity for a rapid, sensitive reliable and reasonably cost effective assay that can determine the quality of meat products is high. Even though this need exists, no such reachable methods are currently available to the Sri Lankan meat producers to determine and certify the quality of their products. PCR based DNA methods are the gold standard in food species identification due to its less time consumption, specificity and sensitivity. The present study optimized monoplex and multiplex PCR assays to detect the meat species and to detect any adulterants or contaminants present in meat products. DNA was isolated by high salt TNES extraction method, from samples of raw meat and processed meat obtained from retail outlets in Colombo. The isolated DNA was amplified using PCR which demonstrated the specificity of the adopted primers to each species of raw meat. Mixtures of meat DNA were then subjected to optimized multiplex PCR; chicken-pork and beef-pork assays to detect each of the types of meat present in the mixture. Processed products of chicken (5) and beef samples (5) were subjected to these optimized multiplexes. The assay was found to be effective in determining the species of meat present in meat products containing chicken, beef and pork, clearly demonstrating species specific bands of 266 bp, 271 bp and 149 bp respectively. These PCR assays are useful in detecting main products and the contamination at the same time with reliable accuracy and specificity which can fulfil the requirement of quality testing of meat products that is important for the consumer, the meat industry and organizations that have an interest in food safety and quality. It is also economical and has wider applicability since many species can be detected with one assay. Compared to other available methods which sometimes fail to be effective when used on highly processed samples, PCR can be applied efficiently. Therefore, it is presented as a suitable assay for identification of meat species and for the detection of adulterants and contaminants in processed meat samples.

Keywords: Contamination, DNA detection, meat adulterations, PCR multiplex