

and PCR (Polymerase Chain Reaction), the presence of soy protein can be found in meat products. In this regard, in a study, Jahed Khaniki et al. (2003) managed to distinguish soybean texture from muscle tissue in 80 frozen hamburger samples using a histological method (10). An approach commonly used in food control laboratories to measure soy beans in heated of meat products by the Enzyme-Linked Immune Sorbent Assay (ELISA) method, which is indicated by AOAC (11). ELISA is also used to detect transgenic food products or genetic alterations that have a protein base (12). In the ELISA method, polyclonal antibodies are used to identify the protein of soya flour. Cota et al. (1998) managed to construct this antibody to combat fraud in the use of soy flour in meat products (13). In this study, the total protein and soy protein in heated meat products were measured using macro kjeldahl and ELISA methods, respectively. In the sample of heated meat products with meat 40%, the maximum amount of soy protein that can be present is 4%. Meanwhile, in the three samples tested in this study, the soy protein content was higher than this amount, and soy protein was detected in all samples. In a study, Medina (1988) reported on the extraction and measurement of soy protein in meat products including sausages by ELISA (14). Also, Macedo et al. (1999 analyzed quantitatively the levels of soy protein in 39 hamburgers from beef and chicken) using the ELISA method. It was concluded that the ELISA method is a fast and easy method for evaluating soy protein in food products (15). In 2004, Koppelman et al. analyzed the amount of soy in the foods by ELISA and they were able to detect the soy beans in the range of 1ppm (16). Also, Montserrat et al. (2010) succeeded in using the method Real-time PCRs to identify the soybeans in 35 types of foods include meat products, fish and cake. Some products were made from soy flour. They concluded that using the Real-time PCR method is easy method to identify soy DNA in samples (17). Usually, Soya protein assay biokits are used in the ELISA method based on the enzyme immune response. This method has a good susceptibility to soy protein in the presence of vegetables, meat and other proteins, and it is an indirectly competitive immune-enzyme assay to determine the amount of used soy protein (18). The results of this study showed that the average percentage of soy protein by using ELISA method in heated meat products samples with 40% meat was $2.68\% \pm 1.83\%$, which corresponds to the relevant standard to some extent and the average percentage of total protein was $11.19 \pm 2.01\%$ which is placed in within the standard limit. But in samples with 55%

meat, the soya protein content was $13.8 \pm 1.94\%$, which did not match the relevant standard. The average percentage of total protein was $13.79\% \pm 1.88\%$ which the standard protein limit must be at least 12%. The average percentage of soybean in samples of heated meat products with 70% meat is zero, which corresponds to the relevant standard limit and the average percentage of total protein was $6.06\% \pm 1.74\%$ while the standard protein range must be at least 14%. Also, soy protein was detected in two samples of heated meat products containing 55% meat and the total protein content measured by macro kjeldahl was also lower than standard limit (minimum 12%). Due to the fact that the heated meat products are emulsions in which the raw materials after mixing and uniformity are not recognizable in appearance and it can have the highest possible degree of fraud among different food groups. The addition of soymeal flour instead of meat in these products, in addition to the economic harm that the consumer is concerned, can, in some cases, affect the health of consumers who are susceptible to soy protein and allergy.

5. Conclusion

According to the findings of the present study, the cases of non-compliance with the Iranian national standard were observed in some samples of heated meat. In this regard, food quality control laboratories need to be more precise and more sensitive about determining the correct formulation and in accordance with national standards. The use of ELISA method can be used to identify the soybean protein and also it can determine its amount in meat products as an accurate, sensitive, fast and cost-effective method in food quality control laboratories.

Conflict of interest

The authors have no conflict of interest.

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