SIMPLE METHOD FOR DETECTION OF SOY PRODUCTS IN MINCED MEAT AND FROZEN SAUSAGE PRODUCED IN EGYPT.

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Introduction: A lot of meat plants has been established in Egypt during the past ten years. Textured soy protein is widely used in comminuted meat products of these plants as meat extender or meat replacer not only for its functional and nutritional properties but substantially for their cheap price compared to meat. Various methods has been proposed for detecting soybean content in meat products by aid of the nitrogen content, gel electrophoresis (Lee et al., 1975; Hofman, 1977 and Parşons and Lawrie, 1977), chromatographic analysis of amino acids and peptides (Lindquist et al., 1975; Rangley and Lawrie, 1977 and Olsman, 1979), stereological point count techniques (Flint and Meech, 1978), isoelectric focusing (Liewellyn and Flaherty, 1976) as well as indirect methods which has included polysaccharides, oligosaccharides, protein bound sugars, free amino acids... etc. However, most of these methods are time consumed, labour intensifier and so difficult for practice to be a routine work. The object of this study was to propose simple and applicable method for detecting textured soybean protein content in minced meat and frozen sausage produced in Egypt.

Materials: Textured soy protein (T.S.P., a protein concentrate), soaked in water for 1 hour then miced. Imported frozen beef with different ratios of fat were cut into small pieces then mixed together so as the fat tissues will be around 20% in the final product. Meat is then minced twice. Natural casings prepared from sheep intestine were used in stuffing of sausage.
Methods: The minced meat and hydrated ground texture soy protein considered as stock.

1. Mixtures of minced meat containing 10, 20, 30, 40, 50, 60, 70, 80 and 90% (w/w) of textured soy protein were prepared.
2. For sausage prepared with textured soy protein: 10, 20, 30, 40, 50, 60, 70, 80 and 90% of meat were substituted by equal amounts of hydrated (Pre soaked) ground textured soy protein.
3. Chemical analysis: Moisture, protein, total lipids, ash and sugars were determined using the methods given by the A.O.A.C. (1975).

Results and Discussion: The soybean used in this study was the textured soy protein (T.S.P) which is most commonly used by meat plants in Egypt at present time. Also, meat used in this work was the imported frozen beef of different fat ratios. It is not familiar to use the local expensive meat in meat plants. In this study, different proportions of meat (10-90%) has been substituted by equal amounts of T.S.P. Effect of adding soybean protein on the composition of minced meat and frozen sausage was studied. From Table (1), meat was characterized by high percentage of lipids being 14.23 times as great as those in T.S.P. The high fat content in meat compared to that in T.S.P. might be due to the relatively high fat tissues in beef and also to the fact that T.S.P. was prepared from defatted meal. It is important to note that when extending ground beef with soy, more fatty beef should be used. This is because the soy protein is virtually fat free (Mitkoski and Schurer, 1981). On the other hand, textured soy protein had higher moisture, protein and carbohydrate contents being 1.34, 2.09 and 3.34 times as great as those of meat respectively.

The moisture content of soy free samples was 56.43 and 49.43% for minced meat and sausage respectively (Tables 1 and 2). This difference in moisture content was basically due to the presence of some ingredients in sausage other than meat. Replacement of beef (10-90%) of minced meat and sausage mixture with equal amounts of T.S.P. increased proportionally the moisture content of both meat products. The relation between soy protein and moisture content of minced meat and sausage was linear (Fig. 1). From Fig. 1-a the two straight lines plotted for meat/soy protein ratios and corresponded moisture contents in both minced meat and sausage could be suggested as a standard curves for detecting the ratios of soy protein, possibly added to mentioned beef products.

Variation of protein content of meat (32.5%) and T.S.P. (68.1%) was great (Table 1). Differences in protein content between minced meat and sausage(Tables 1 and 2) were actually due to the other ingredients (fillers, spices, garlic... etc.) present in sausage. Replacement of meat with T.S.P. (10-90%) caused a gradual increase in protein content of both minced meat and sausage (Tables 1 and 2). The gradual increase in protein content continued up to 70% level, then a sudden increase in protein content was noticed for both minced meat and sausage as shown in Fig. (1-b). Unknown T.S.P. content of minced meat and sausage products could be detected using standard curves given in Fig. (1-b). The standard curves of moisture and protein contents could be suggested to be used together to calculate the soy protein ratios added to the mentioned beef products.

Plotting the results of lipids content in minced meat, at different added levels of T.S.P. (10-90%), standard curve could be obtained (Fig. 1-c) which might be recommended for detection of T.S.P. content in minced meat. On the contrary, plotting the results obtained for lipids of sausages prepared with different ratios of T.S.P. (10-90%) had revealed a typical sigmoidal curve which was not straight as for minced meat (Fig. 1-c). This might be due to the effect of additives added to sausage mixture.

Textured soy protein could be considered as a good source for total sugars (22.83%). This finding was in accordance with data given by Cupta et al., (1976). On the contrary, meat was characterized by low content of total sugars (5.84% on dry weight basis) as could be seen from data presented in Table (1). Replacement of meat in both minced meat and sausage by equal amounts of T.S.P. (10-90%) gradually increased sugars content of these products. From Fig. (1-d), it is evident that for minced meat a proportion relationship occurred between percent of total sugars and percent of T.S.P. Such relationship however, was true for sausage up to 80% T.S.P. level then a sudden increase of total sugars was observed.

Conclusion: Relation between moisture, protein, lipids, sugars content and proportion of added textured soy protein in minced meat was linear. Therefore standard curves of soy product-chemical component were plotted in order to deduce the ratio of soy product in minced meat by determination of one or more of the mentioned chemical components. Similar standard curves for frozen sausage were also

established except for lipids. Informations arrived at from suggested standard curves were valid between 10 and 80% added textured soy protein.

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Table 1: Effect of different proportions of T.S.P. on the chemical composition of minced meat.

Extent of admixture %		Components %				
Meat	T.S.P.	Moisture	Total Protein	Total Lipids	Total Sugars	Ash
100	00	56.43	32.50	57.20	5.84	6.90
90	10	58.24	34.48	56.57	7.38	-
80	20	60.29	37.21	52.39	8.57	4.79
70	30	63.78	39.91	46.38	11.04	-
60	40	63.99	42.99	42.42	11.39	3.22
50	50	66.75	45.60	36.94	13.62	-
40	60	67.98	47.16	33.03	15.60	3.24
30	70	68.80	49.70	29.75	17.75	-
20	80	71.34	54.08	23.38	20.78	3.14
10	90	73.44	60.84	14.60	21.85	-
00	100	75.49	68.10	4.02	22.83	2.68

Table 2: Effect of different proportions of T.S.P. on the chemical composition of sausage.

Extent of admixture %		Components %				
Meat	T.S.P.	Moisture	Protein	Lipids	Sugars	Ash
100	00	49.43	33.76	56.00	8.72	-
90	10	52.79	34.40	42.45	10.60	9.11
80	20	54.34	36.44	39.45	11.20	-
70	30	56.45	37.95	34.21	12.25	8.26
60	40	57.94	38.50	33.53	13.08	-
50	50	63.05	38.95	32.80	15.75	8.33
40	60	65.88	40.49	31.39	16.75	-
30	70	65.95	42.53	29.37	17.31	8.81
20	80	67.73	47.47	22.72	19.11	-
10	90	71.03	49.11	18.51	21.90	11.39
00	100	73.46	66.90	6.00	25.30	-

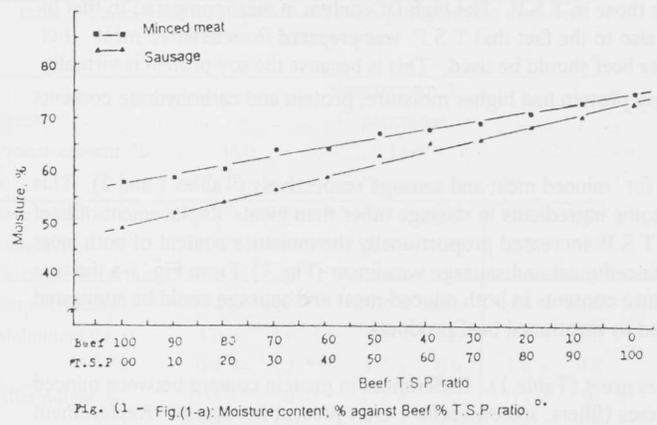

Fig. (1-a): Moisture content, % against Beef % T.S.P. ratio.

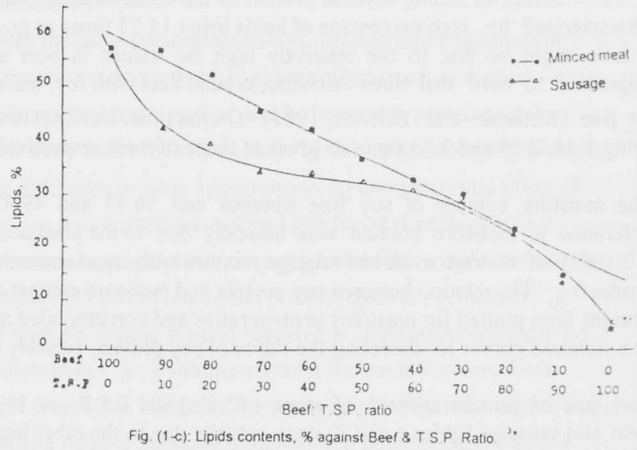

Fig. (1-c): Lipids contents, % against Beef & T.S.P. Ratio

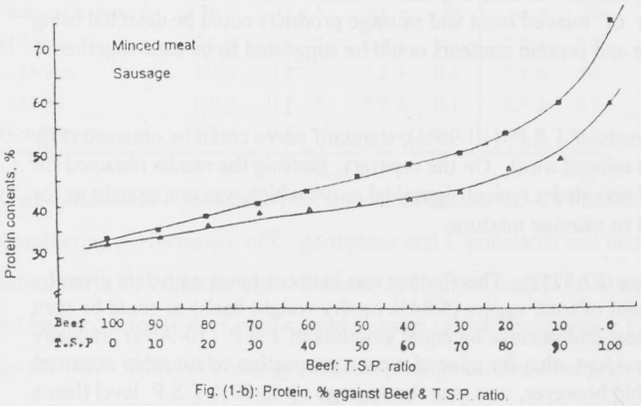

Fig. (1-b): Protein, % against Beef & T.S.P. ratio.

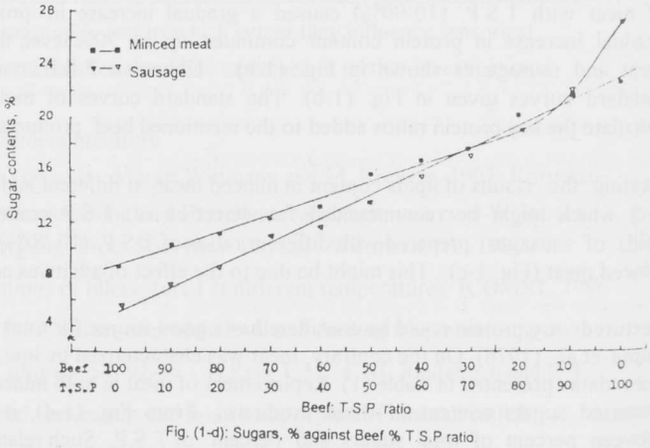

Fig. (1-d): Sugars, % against Beef % T.S.P ratio

Fig. (1): Effect of different Proportion of T.S.P. on the chemical Composition of minced meat and sausage.