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A STUDY ON THE CHEMICAL AND RHEOLOGICAL PROPERTIES OF PROCESSED CHEESE

BY

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SUMMARY AND CONCLUSION

Part (1) of the present study concerned with analysis of market processed cheese since a total of 48 processed cheese spread (PCS) samples representing 16 brands were randomly collected and tested for composition and some properties. This was also carried on 30 processed cheese block (PCB) samples representing different 10 brands located in the Egyptian market.

The attained results of section (A) revealed the following:

1- The gross chemical composition of both PC types varied widely since different values were recorded for moisture, fat, FDM, protein, ash, carbohydrate and salt contents due to individuality of the samples and also due to the brand and type of PC.

2- The pH of PCS samples had an average of 5.33 - 5.90, whereas the average of acidity (%) values was 0.06 - 0.95. The corresponding values for PCB were 4.74 - 5.95 for pH and 0.05 - 0.14% for acidity.

3- Meltability was greatly affected by the samples tested and the type of PC analysed. The ranges of PCS was 0.20 – 7.30 cm, whereas the PCB was not melted.

4- The rheological properties of market PCS varied widely since the averages ± SE were 3.73±0.26 N for hardness, 2.99± 0.18 N for gumminess, 4.44± 0.57 mm for springiness, 0.70± 0.01 for cohesiveness, 11.04± 1.12 mj for chewiness and 1.39± 0.27 mj for adhesiveness. The corresponding averages ± SE for PCB were 19.51± 1.96, 15.48± 1.57, 2.58± 0.06, 0.78± 0.0, 40.38± 4.28 and 0.06± 0.01 respectively.

5- Organoleptically, average± SE of the total score given for PCS was 76.88±0.86 out of 100, whereas the value of PCB was 76.67±1.13. This was attributed to different scoring points given for appearance, body & texture and flavour. Those of PCS as an average ±ES were 15.23±0.20 out of 20 points, 30.20±0.39 out of 40 points and 31.44±0.39 out of 40 points in order, whereas

those of PCB were 14.99±0.25, 30.85±0.47 and 30.83±0.49 respectively. Such high SE could be due to only two brands of PCS showed poor quality and only one brand of PCB was not organoleptically good enough.

In part (II), three blends for making PCS were prepared depending on the use of different quantities from green Ras cheese (RC), mature Cheddar cheese (CC), skim milk powder (SMP) and butter as main ingredients, while water was added with non-dairy ingredients. The resultant cheese samples were analysed when fresh and at 3 and 6 months of cold storage for chemical composition and some properties.

The attained results revealed the following:

1- Moisture, FDM and salt contents increased in the prepared PCS, while protein and ash contents decreased with increasing the amounts of RC (T3 >T2>T1) and decreasing the amounts of SMP and butter (T3 < T2< T1). This was true in fresh and stored PCS simples. During cold storage, moisture and carbohydrate content significantly decreased, while protein, ash and salt contents significantly increased. FDM content of T1 significantly increased from 52.81 % to 52.99 and 53.11% after storage for 0.0, 3 and 6 months respectively. The changes (increase) in FDM of T2 and T3 were insignificant.

2- Values of pH, acidity, SN, TVFA and meltability were affected by formulations of the blends used in making PCS. This effect was almost significant. During storage of PCS samples, the pH values significantly decreased reaching the values of 5.72, 5.70 and 5.61 at the end of storage of the samples of T1, T2 and T3 respectively. While acidity, SN, TVFA and meltability gradually increased with significant rate. The values of meltability- the important property - were 5.34, 4.10 and 4.46 cm for the samples of 6 months old made from T1, T2 and T3 in order.

3- All the rheological properties including hardness, gumminess, springiness, cohesiveness, chewiness and adhesiveness had the lowest values of 19.90 N, 9.10 N, 5.04 mm, 0.33, 45.95 mj and 72.43 mj respectively when fresh PCS samples were made from blend 3 (T3) which contained the highest amount of

RC (20%) and the lowest amount of SMP (5.5%). The changes due to the applied treatments (T1, T2 and T3) were almost insignificant (P> 0.05) for hardness, springiness, and cohesiveness and significant(P> 0.05) in gumminess and chewiness. The changes in adhesiveness were insignificant (P> 0.05).

4- All the organoleptic properties - except appearance - were not significantly affected by the applied treatments (T1, T2 and T3). The scores given for appearance were 16.7, 17.31 (P>0.05) and 18.15 out of 20 point in case of T1, T2 and T3 in order, whereas the total scores were 86.46, 89.31 and 91.92 (P> 0.05) out of 100 points respectively.

In part (III), different formulations were prepared for making PCS. The formulations contained the same main dairy ingredients but with different quantities such as milk protein concentrate in a powder form (MPC), SMP, CC and butter, whereas water and non-dairy ingredients were such as salt, emulsifying salts (ES), stabilizers and preservatives. The PCS samples were analysed when fresh and at 3 and 6 months of cold storage for gross chemical composition and some properties.

The attained results revealed the following:

1- Moisture, FDM, protein, ash and carbohydrate contents of fresh, 3 and 6 months old PCS samples were significantly affected by formulations of the blends used, whereas salt content was not affected. The highest moisture and the lowest fat, FDM, protein and ash contents were accompanied by increasing the amounts of MPC and CC (T3> T2> T1) and decreasing the amounts of SMP and butter (T3< T2< T1). This was true in fresh and stored PCS samples. A significant decrease was recorded in moisture and carbohydrate contents during storage of PCS samples, whereas a significant increase was noticed with respect to FDM, protein and ash contents especially at the end of storage period.

2- Values of pH, acidity, SN, TVFA and meltability were affected by composition of the blends used in making PCS. All the prementioned values except - pH and acidity - significantly increased during storage, while storage had almost a significant impact on decreasing the pH. The acidity was

increased during storage of PCS from T1 (P>0.05). But the increase was significant in case of T3. The pH values of T1, T2 and T3 at the end of storage were 5.78, 5.83 and 5.79 in order, whereas those of acidity were 1.04, 108 and 1.18 % and those of meltability were 8.08, 7.08 and 4.84 cm respectively.

3- Hardness, gumminess, cohesiveness and chewiness had the lowest values of 12.25 N, 8.40 N, 0.43 and 46.82 mj respectively when fresh PCS samples were made from blend of T1 which contained the lowest values of MPC (2%) and CC (7%) and the highest amount of SMP (15%). The changes in values of hardness due to the applied treatments (T1, T2and T3) were statistically significant ($P \leq 0.05$), while those of cohesiveness were insignificant($P > 0.05$).

4- The applied treatments of different quantities from the same main ingredients had no significant impact on the organoleptic attributes of the prepared fresh samples. The samples were ranked the total scores of 86.54, 89.00 and 89.77 out of 100 points when their made from T1, T2 and T3 respectively.

In conclusion, formulation of processed cheese (PC) blends greatly affected composition and many properties of market PC and the PCS of the present study. The organoleptic properties of PCS samples in our experiments were fully accepted. So, feasibility study was carried out and revealed that the production costs of 100kg of PCS were 4103.2, 3887.98 and 3646.7 LE for blends 1, 2 and 3 of part (II) and were 3594.6, 3887.1 and 4028. 6 LE for blends 1, 2 and 3 of part (III) respectively.