Optimization of Peanut Pancake Instant Mix Formulation

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Peanuts are one of the widely cultivated and consumed oil seeds in the world. In the US, peanuts are mostly consumed in the forms of peanut butter, candy and confectionaries, and roasted nuts. Peanuts cake or flour obtained after peanut oil production is a nutrient dense, protein rich material which is an important source for nutrition fortification. Pancakes are favorite food for breakfast and can be a potential vehicle to deliver the target protein and essential nutrients to help meet our daily nutritional requirements with appropriate fortification. Recently, popularity of frozen breakfast items has grown significantly and frozen pancakes are one such easy option to incorporate peanuts. This project investigated the effect of freezing and reheating of peanut pancakes produced from a ready to use peanut pancake mix.

Two different peanut flours, 12% fat medium roast (12M) and 28% fat light roast (28L) were used for the study. Other ingredients include all purpose flour, peanut oil, baking soda, dried egg powder, baking powder, non-fat dry milk, enriched golden peanut oil, sugar and salt. For both formulations, pancake mixes contain 30% peanut flour and 70% regular all purpose flour. To mimic the commercial frozen pancakes, peanut pancakes were made and stored at -20^{o}C freezer for 24 hrs and then reheated for different length of times (20, 30, and 50 sec) under 100% power in a microwave oven. For comparison purpose, commercial whole grain pancakes were reheated for 30 sec.

The density of fresh pancakes made with 12M (0.52) and 28L (0.50) peanut flour were not significantly different. However, subjecting the frozen pancakes to different reheating times significantly increased the density to 0.54, 0.62, 0.78 for 20, 30, 50 sec reheating, respectively. The density of the commercial brand frozen pancakes was measured after 30 sec reheating and had similar density as reheated peanut pancakes.

The increase in density can directly related to the percentage of moisture loss during reheating. The average percentage moisture loss for peanut pancakes was 14 % after 20 sec reheating while it has increased to 22% and 40 % when the reheating times were increased to 30 and 50 sec, repectively. The moisture loss of the commercial brand pancakes after reheating for 30 sec was similar to peanut pancakes at 20 sec reheating.

The Texture parameters like hardness, cohesiveness, springiness and chewiness of reheated-frozen peanut pancakes were measured and found hardness, chewness and cohesiveness were not significantly affected by roasting and reheating time.

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Peanuts are one of the widely cultivated and consumed oil seeds in the world after soybean and cotton. In the US, peanuts are mostly consumed in the forms of peanut butter, candy and confectionaries, and roasted nuts. Peanuts being oilseed crop are naturally good source of fat but at the same time they are a valuable source of protein too. Hence, peanut cake or meal which is a byproduct of the peanut oil production is a nutrient dense, protein rich material which when processed under appropriate conditions is an important source for nutrition fortification. Peanut flour also has no strong taste or any off flavor and naturally has a tan color which has shown promising results when substituted in many products for example noodles, breads, cookies and muffin etc. Defatted peanut flour is available in different degree of roasting (dark, medium and light roast) and different fat contents (12% and 28%). By understand the effect of roasting on the physicochemical properties of peanut flour, it can help develop and optimize formulations that allow a substitution of decent amount of peanut flour and thereby increase the nutritional value of the products. Due to the popularity of pancakes as favorite food for breakfast, they have been chosen in this study as potential vehicles to deliver the target protein and essential nutrients to help meet the nutritional requirements. Furthermore, popularity of the frozen meals and breakfast items have grown significantly in recent years and frozen pancakes are one such easy and ready to eat options. Hence, this project was investigated on the effect of freezing and reheating to facilitate the preparation of peanut pancakes for school lunch program or for the general consumer as a ready to use peanut pancake mix based on the formulation developed in 2009.

Two different peanut flours, 12% fat medium roast (12M) and 28% fat light roast (28L), obtained from Golden peanut company were used for the study. All purpose flour, peanut oil, baking soda, baking powder, non-fat dry milk, enriched golden peanut oil, sugar and salt were purchased from a local grocery store. Dried egg powder was obtained from Barry farms Inc. Peanut pancake mix formulation and method of preparation developed in 2009 was used for these experiments. Formulation for a 30% peanut flour substitution was chosen for this study. In order to mimic the commercial frozen pancakes, peanut pancakes were made and stored at -20°C freezer for 24 hrs and then they were reheated forr different length of times (20, 30, and 50 sec) under 100% power in a microwave oven (Amana Radarange, Model AMC2206BAW, Benton Harbor, MI). Two pancakes from each batch were selected for each treatment. Weight was measured using a lab scale weighing balance and bulk density was measured using a glass beads method. After bulk density measurement, pancakes

were gently tapped and cleaned using a pastry brush to remove the glass beads. The cleaned samples were carefully placed in Ziploc (S. C. Johnson & Son, Inc., Racine, Wisconsin) bags and then stored at -20°C. The same samples after 24 hours frozen storage were reheated as mentioned earlier and the weight and bulk density measurements were repeated. The pancake reheating instruction for a commercially available whole grain and regular pancakes were found not suitable for peanut pancakes. For comparison purpose, commercial whole grain pancakes were reheated for only 30 seconds. The weight difference before and after heating was calculated as moisture loss. The experiment was repeated three times.

Texture measurements were made using an Instron® universal testing machine (model 5544, Instron Corporation, Canton, MA, U.S.A). Pancake samples from a freshly made batch were selected and cut into small circular pieces using a 1 cm radius stainless steel borer and then subjected to a double compression test (5 mm compression from the surface of the pancake) at a crosshead speed of 10 mm/min. After the first compression, crosshead was returned to the initial position and rest for 10 sec before the second compression. The force-deformation curve was recorded and used to calculate hardness, springiness, cohesiveness and chewiness. Stastical analysis was carried out using SAS 9.2 software (SAS institure Inc, Cary, NC).

The bulk density of fresh pancakes made with 12M and 28L peanut flour were not significantly different (Fig.1). The average bulk density of the fresh 28L peanut pancakes was 0.516 (± 0.002). Subjecting the frozen pancakes to different reheating times of 20, 30 and 50 seconds, it was observed that there was a significant difference in their bulk densities. The bulk density of the 28L increased to 0.542 after 20 second reheating while the increase was much significant when the reheating time was increased to 30 and 50 seconds with bulk densities of 0.616 and 0.770, respectively. The bulk density of fresh 12M pancakes was 0.498 (± 0.007) and it increased to 0.553 when frozen pancake was reheated for 20 seconds and the bulk density went further up signifincatly to 0.633 and 0.792 when reheated for 30 and 50 seconds, repectively. Statistical anlaysis shows that the reheating time significantly affect the bulk density of pancakes. It has also been observed that there is no effect of roasting on the bulk density of fresh and reheated-frozen pancakes. The bulk density of the commercial brand frozen pancake was measured after 30 second reheating and had similar density as reheated peanut pancakes.

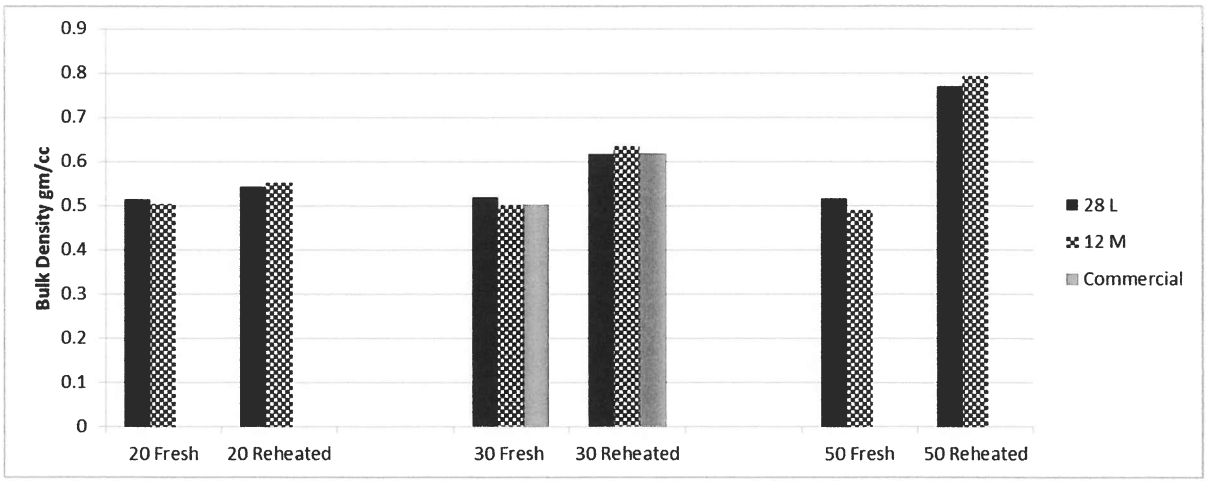

Fig. 1 Bulk density of fresh and reheated 28% fat light roast pancakes (28L), 12% fat medium roast pancakes (12M) and a commercial brand frozen ready to eat pancakes.

Although Hussain et al. (2008) reported that the density of the roasted flaxseed flour was more dense than the unroasted flour, it is not clear whether roasting has any effect on the density of peanut flour. The increase in bulk density can directly related to the percentage of moisture loss during reheating (Fig. 2). The average percentage moisture loss for 28L peanut pancakes was 11.88 % after 20 seconds reheating while it has increased to 19.22% and 36.65 % when the reheating times were increased to 30 and 50 seconds, repectively. The average percentage moisture loss for the 12M peanut pancakes was 15.94% when reheated for 20 seconds and increased to 24.61% and 43.32% for 30 and 50 seconds, repectively. The moisture loss of the commercial brand pancakes after reheating for 30 seconds was similar to 28L peanut pancakes at 20 seconds reheating. Statistical analysis also demonstrated that reheating time has strong and significant effect ($p = 0.006$) on the moisture loss while roasting has shown little or no effect ($p = 0.257$).

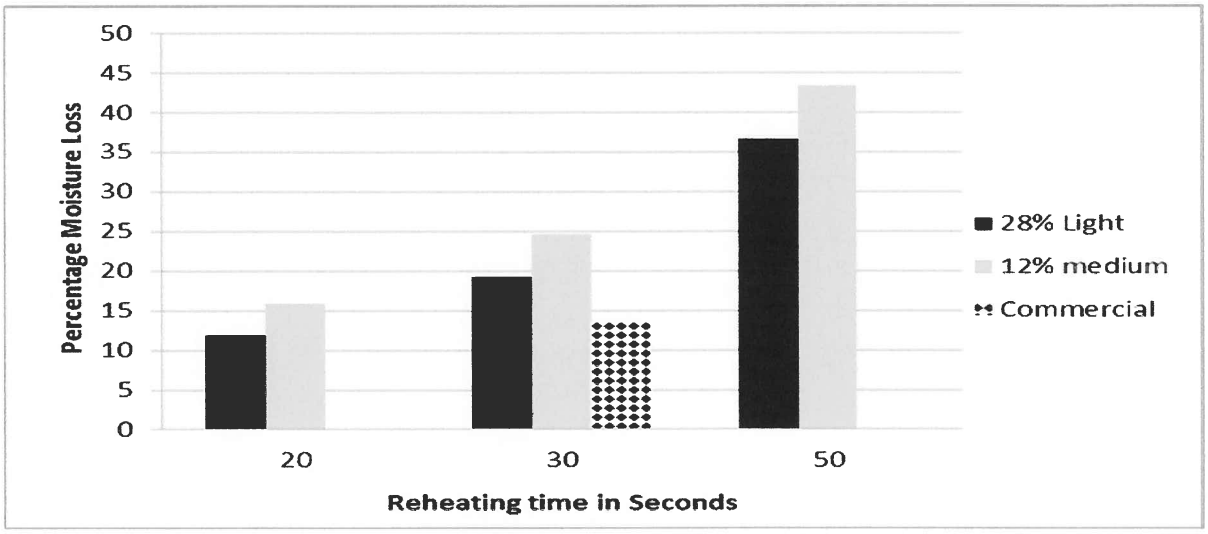

Fig. 2 Percentage of moisture loss of 28% fat light roast pancakes (28L), 12% fat medium roast pancakes (12M) and a commercial brand frozen ready to eat pancakes after reheating.

The Texture parameters like hardness, cohesiveness, springiness and chewiness were also analysed to determine the effect of reheating time and degree of roasting. It was observed that hardness was not significantly affected by roasting and reheating time. Results also suggested that reheating time and degree of roasting also did not significantly affect the cohesiveness. Chewiness was not significantly affected by reheating nor by the degree of roasting. But, the 28L peanut pancakes when reheated for 20 seconds were less chewy than the fresh ones (Fig. 3). It is also noticed that the peanut pancakes reheated for 20 seconds were more springy than the fresh and 30 second reheated pancakes (Fig. 3). It is interesting to note that the degree of roasting had little or no effect on other textural parameters but the data suggested that springiness of the pancakes was affected significantly by both reheating time and degree of roasting. In a study conducted by Seguchi (1990) on pancakes with heated wheat flour, it was noticed that the springiness was singnificantly affected when the wheat flour was reheated and suggested this could be due to the development of hydrophobic nature of the wheat proteins. Although there is no specific data available on heating effect on peanut proteins, increase in springiness could be due to roasting.

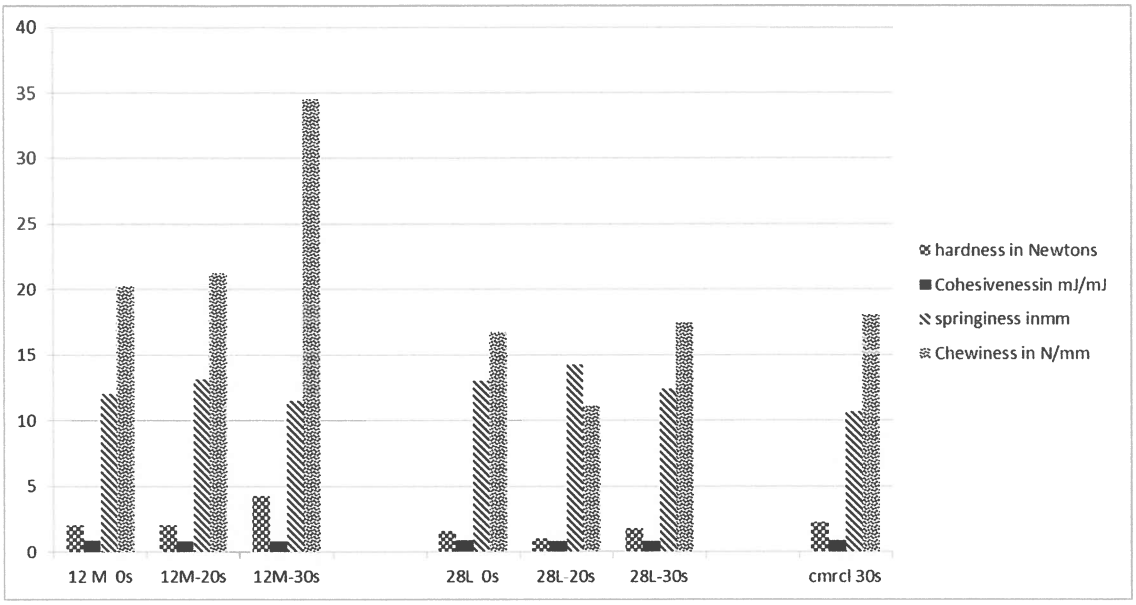

Fig.3. Texture properties of fresh and reheated 28% fat light roast pancakes (28L), 12% fat medium roast pancakes (12M), and a commercial brand frozen ready to eat pancakes.

References

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