



## PHYSICAL PROPERTIES AND FOLDING TEST OF COMMERCIAL MEAT BALLS IN THAILAND

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### Background

Meat ball is quite popular for one-dish serving meal in Thailand. There are several ways of cooking meat ball i.e. deep fry, yum (spicy salad), roasting and even to be in recipe with noodle. If we look at the amount of produced meat balls in Thailand from year 2000 to 2003, the amount of pork balls was 843.36-1339.14 ton, chicken balls was 6923.72-4962.87 ton. There are basic three types of meat balls, i.e. pork ball, chicken ball and fish ball. Most of Thai people prefer to have meat ball with a high springiness and softness. To know the good quality of those meat balls, only the highly experienced person can tell. This is one restriction in processing of meat ball especially in SMEs (Small Medium Enterprises) since there is an instrumental limitation for checking and measuring the products. For a big manufacturer, the problem seems smaller since they can afford having a good quality control. Besides the taste of product, the texture of product is quite important factor to be judged for a good quality (e.g. no sponginess, smoothness, not too hard, etc.). This study wants to investigate the properties of some meat balls producing from some big and small factories by using the texture analyzer which is available in our laboratory and also using a simple method, e.g. folding test, to investigate those meat balls. We expect to find the correlation among those properties in order to encourage small factory to implement the simple method for checking the quality of meat ball.

### Objectives

The purpose of this study is to investigate the physical properties of commercial meat balls (pork ball, chicken ball and fish ball) by using texture analyser and folding test and to look for their correlations.

### Materials and methods

The materials are ten items of each type of meat balls (pork, chicken and fish) in the market of Thailand as shown in Table 1. We pick up some of the most popular and non popular meat balls in order to having a wide range of samples. The high price meat balls will be numbered from 1 to 4 while numbers 5-7 will be the medium price and numbers 8-10 will be the cheap ones. The texture analyzer model TA.TX2i was used to measure the physical properties. The conditions are as follows: TPA (Texture Profile Analysis), 75 mm of probe size, compression 30 % deformation, the pre-test speed and test speed at 1.0 mm/sec, post-test speed at 10.0 mm/sec. The properties such as hardness, fracturability, springiness and so on will be obtained from this instrument. To investigate the folding test, meat ball was sliced having thickness around 2-3 mm and then checked the cracking after folding one-half and one-fourth. The ranking of folding test score was 5 to 1 as shown in Table 2. Score 5 means meat ball having more softness and score 1 means meat ball having more hardness.

### Results and discussion

When the texture analyzer (TPA) is used, several information can be obtained, i.e. hardness (g-force), fracturability (g-force), adhesiveness (g.sec), springiness, cohesiveness, gumminess and chewiness. Figure 1(a)-(c) shows the hardness and folding test scores of pork ball, chicken ball and fish ball, respectively. Figure 1(a) shows pork ball having the hardness mainly range from 8000 -11000 g-force, and the folding test scores range from 3 to 5. We observe that the products having high scores (score 5) of folding test reveals the hardness from 8000 – 10000 g-force except two products, i.e., item 5 and item 9. This result may have occurred if the texture of that product was not smooth enough. When the hardness spot of product was touched by the probe, the high value of hardness can be found. We can say that folding test score 5 will be



found in the group of high price. Whereas, the score 3 and 4 will be found in the group of medium and low price which is implied that raw material for producing is in different quality.

Figure 1(b) shows the hardness and folding test score of chicken balls. They have the value of hardness around 5000 -8000 g-force and have the folding test scores around 3-5. There are some products having quite high hardness, i.e., items 1, 2 and 7. This may happen in the same manner with pork ball. However, we can conclude that the chicken ball at low and medium price have a low folding test score (score 3).

Figure 1(c) shows the hardness and folding test scores of fish balls. They are mainly around 2500-5000 g-force, and the folding test score around 4-5. The scores of folding test 3 will be not found here in fish ball. There is only item 4 which have a high value of hardness (around 8500 g-force). The other information can be plotted in the same manner, but they are not shown in here. For example, the springiness of pork ball, chicken ball and fish ball will be 0.761-0.850, 0.682-0.882, and 0.832-0.949, respectively. The cohesiveness of pork ball, chicken ball and fish ball will be around 0.344-0.472, 0.259-0.498 and 0.491-0.542, respectively. Figure 1(d) shows the correlation of hardness and folding test score of those meat balls. Since there is the fluctuation of data, the correlation was not fit so well ( $R^2$  is quite low in three of meat balls). However, if we neglect the scattered data, we should have a better correlation. It is noticeable that there is no data at the low value of folding test score (1-2). This may imply that those commercial meat balls should not have such a low value. Since low score of folding test means too fragile and cracking can be found easily in the product. This kind of property should be avoided. Figures 2(a)-(d) show the result of other properties, i.e., fracturability, springiness, cohesiveness and gumminess versus the folding test score in order to look for the correlation among them. In Figure 2(a) shows fracturability and folding test score of three meat balls. The correlation of pork balls is quite fair since the value of  $R^2$  is satisfactory ( $R^2 = 0.81$ ), whereas correlation of chicken balls is poor ( $R^2 = 0.54$ ) as well as of fish balls. As we can see the rest of all figures from (b)-(d), the correlation is quite poor. However, the correlation could not expand to the low range of folding test, i.e. score 1-2. Since in this range, when the product was fold one half, the cracking could be observed in the product which is undesirable property.

## Conclusions

We can conclude that the folding test score of commercial pork balls is 3-5 (majority is 5), and hardness is 8184.95-15859.28 g-force. The springiness is 0.761-0.850. The folding test score of chicken ball is 3-5 (majority is 3), and hardness is 5217.65-12522.13 g-force, springiness is 0.682- 0.882. The folding test score of fish ball is 4-5 (majority is 5), hardness is 2401.88-8539.04 g-force, and springiness is 0.832-0.949. The correlation of folding test and their properties could not draw conclusion since R square value is quite poor.

Table 1 Name and price of some commercial meat balls in Thailand

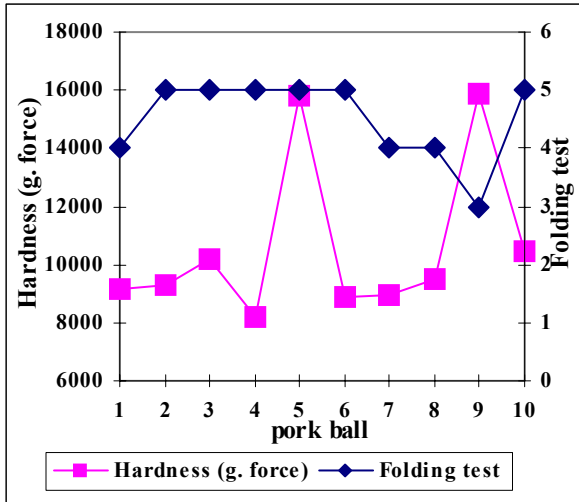
Pork ball		Chicken ball		Fish ball	
name	Price (Baht/kg)	name	Price (Baht/kg)	name	Price (Baht/kg)
1. Sechaun	150	1. C.P.	100	1. TaeJew	153.5
2. C.P.	135	2. Lotus	70	2. C.P.	110
3. Seanthai	125	3. Carefour	70	3. Tanachai	106
4. Moodee	90	4. BigC	69	4. Laojeung	103.5
5. Bualoi	75	5. Sahafarm	40	5. Lee Seafood	80
6. J.P.M.	72.50	6. B.K.P.	40	6. Heng Heng	70
7. Lotus	70	7. Golden B	35	7. Bangrak	63.5
8. Jitjaruen	70	8. A.P.B.	35	8. Jae Ju	55
9. Rodded	70	9. J.F.	30	9. See Praya	50
10. Top	64	10. P.P.	30	10. Ponjaruen	46

(48 Baht = 1 Euro)

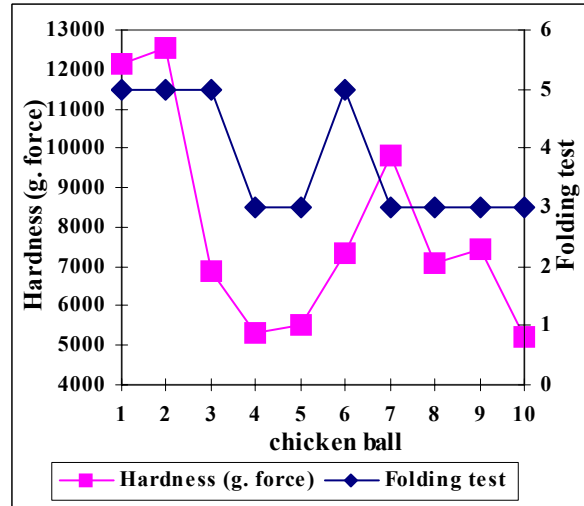


Table 2 Ranking score of folding test

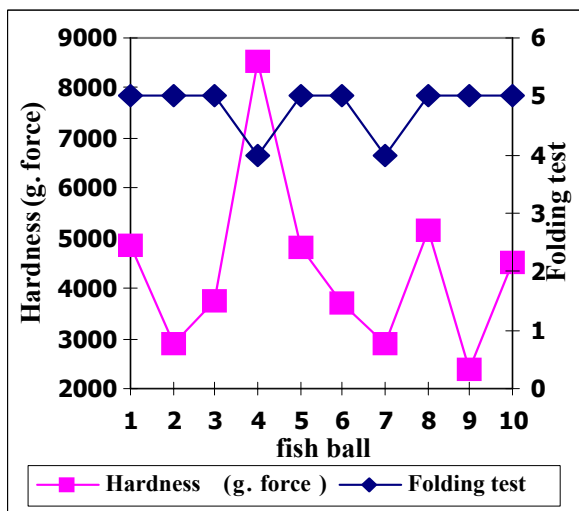
Ranking	Description
5	Folding one-fourth, cracking can not be observed
4	Folding one-fourth, cracking can be slightly observed
3	Folding one-fourth, cracking can be observed
2	Folding one-half, cracking can be slightly observed
1	Folding one-half, cracking can be observed



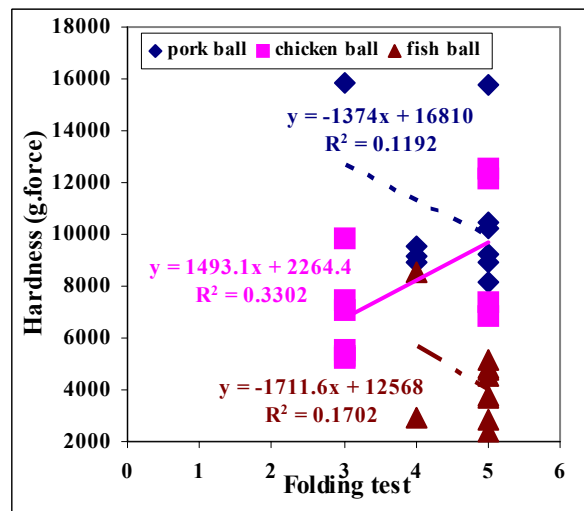
(a)



(b)



(c)



(d)

Figure 1 (a)-(c) Hardness and folding test of meat balls  
 (d) correlation of hardness and folding test

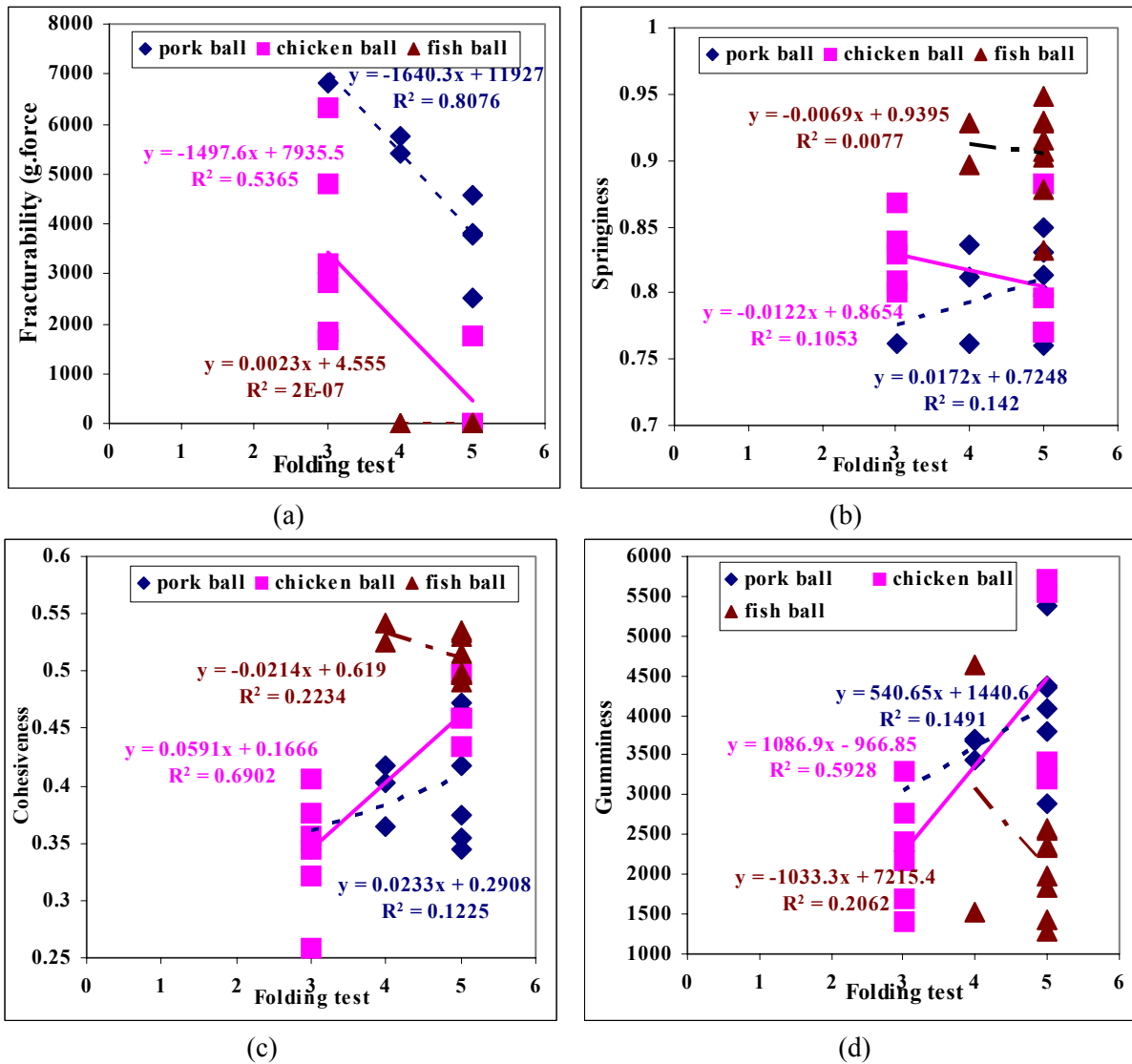


Figure 2 (a)-(d) Correlation of data from texture analyzer and folding test of meat balls

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