The effect of processing condition

ASSIGN BUSTER

The aim of this experiment is to evaluate the effect of processing condition such as the effect of lecithin on the quality physicochemical properties and organoleptic attributes of burger. The pH for uncooked control and cooked control are 5. 77 and 6. 04 respectively. Meanwhile for burger with 0. 5%, 1. 0%, 2. 0% lecithin, the pH for uncooked are 5. 86, 5. 49, 5. 48 while for cooked are 6. 06, 6. 05, and 5. 80. The fat for uncooked control and cooked control are 8. 50% and 10. 25% respectively. Meanwhile, for burger with 0. 5%, 1. 0%, 2. 0% lecithin, the fat for uncooked are 4. 16%, 5. 32%, 9. 54% while for cooked are 10. 59%, 0. 27%, 12. 91% respectively. The moisture for uncooked control and cooked control are 32. 40% and 54. 73% respectively. Meanwhile, for burger with 0. 5%, 1. 0%, 2. 0% lecithin, the moisture for uncooked are 68. 86%, 52. 29%, 64. 92% while for cooked are 59. 59%, 45. 13%, 60. 68% respectively. The protein for uncooked control and cooked control are 13. 71% and 3. 91% respectively. Meanwhile for burger with 0. 5%, 1. 0%, 2. 0% lecithin, the protein for uncooked are 16. 39%, 15. 94%, 16. 57% while for cooked are 14. 33%, 23. 82%, 17. 25% respectively. The ash for uncooked control and cooked control are 2. 54% and 6. 73% respectively. Meanwhile for burger with 0. 5%, 1. 0%, 2. 0% lecithin, the ash for uncooked are 2. 51%, 12. 25%, 5. 68% while for cooked are 2. 97%, 10. 25%, 2. 79% respectively.

Introduction:

Burger and other product manufacturing can use fresh or frozen meat as the starting raw material and both systems have particular advantages and disadvantages in the logistics of processing. It can be argued that, for frozen products, which can be regulated by formulation and process effects, the

quality difference between fresh & frozen is minimal and product quality is far more likely to be dominated by intrinsic quality of the meat via the factors mentioned previously. However the physical properties are highly influenced by temperatures have a profound effect on manufacturing and indeed on the processing methods that can be used. (C. P Mallett, 1993)

Fat content has a basic effect on various physic-chemical and sensory characteristics as flavor, mouthfeel, juiciness, texture handling, bite, heat transfer etc. The food industry has responded to consumer demand by offering an ever-increasing variety of low-fat meat choices. Most fat replacers currently in use are reformulations of previously used meat ingredients. (Ozlem Tokusoglu et. Al, 2003)

Other factors that contribute to the organoleptic acceptance of the burger are the type of binder, the mixing time, temperature and time of cooking. Addition of soy proteins as meat substitutes provide to cut costs. These substances example lecithin can withstand stresses due to various forms of processing and preparation. Processed and whole meat products can be improved by adding soy protein, which provides the product flexibility and cost stability consumers demand. Adding soy protein to meat and poultry products can enhance moisture holding, texture, binding and cohesion, product yield, juiciness, protein quality, appetizing color and appearance, longer shelf-life, palatability and total nutrition.

The ground meat enhancer comprises not only the whey protein concentrate or isolate, starch, maltodextrin and non-fat dry milk, but may also include additional spices and flavor modifiers to further erihance the organoleptic

qualities of these meat products. These include, for example, seasonings and spices, such as onion powder, salt, pepper, vegetable oil, corn starch and tapioca starch, non-hygroscopic dried whey and the like. When all the ingredients are combined, a cream to off-white free flowing powder is prepared. In this experiment students will learn the methods and effects of processing of beef patties with varying amounts of lecithin added into the formulation.

Materials and methods

2. 1. Material

Required amount of beef meat, fat, salt, sugar, garlic, black pepper, lecithin (optional) and warm water were prepared as the table below:

Ingredients

Mass(g)

Beef meat

1000

Fat

150

Sugar

16

Salt

20

Garlic

10

Black pepper

6

Lecithin(optional)

0. 5%, 1. 0% or 1. 5%

Warm water

2. 2. Apparatus

Meat cutter, meat grinder, mincer /silent bowl cutter, burger mold, weighing machine, plastic line, wrapper freezer and nat. stick pan/griller

2. 3. Sample preparation

Burgers were prepared by divided to two parts of preparation.

Part 1: Production of Burger

The frozen meat was cut into small pieces. Meat pieces were washed and the dry meats were dripped. With using meat grinder, the meats were grinded. After that, all ingredients except fat were put in silent bowl cutter and the ingredients were mixed for 5 minutes. Then, fat was added in the mixture and continuous mixed for another 10minutes until ingredients were homogeneous. Homogeneous mixture was transferred into mold. Mold was pressed to obtain a patty of approximately 80g. Patties were placed in a

stack of 10 with plastic liners in-between. Patties were wrapped in a plastic bag. Lastly, the evaluation on frozen patties was done on the following week

Part 2: The effect of incorporation of lecithin on the quality of burger

The frozen meat was cut into small pieces. Meat pieces were washed and the dry meats were dripped. With using meat grinder, the meats were grinded. After that, all ingredients except fat were put in silent bowl cutter and the ingredients were mixed for 5 minutes. 0. 5, 1 and 2% of lecithin were dissolved by weight of total ingredients.

Then, fat was added in the mixture and continuous mixed for another 10minutes until ingredients were homogeneous. Homogeneous mixture was transferred into mold. Mold was pressed to obtain a patty of approximately 80g. Patties were placed in a stack of 10 with plastic liners in-between. Patties were wrapped in a plastic bag. Lastly, the evaluation on frozen patties was done on the following week.

2. 4. Analysis

Analysis

Both parts of preparation were analyzed based on measurement actual weight of mixture and the number of patties in plastic bag. The overall weight of patties also analyzed. Then, the weight of cooked patties and the average weight, determination of proximate analysis (fat, moisture, protein and ash), pH and Thiobarbituric acid value (TBA) for uncooked and cooked patties were analyzed. Then, the diameter in a hot stick pan or a giller was measured until cooked.

Analysis of sensory properties of patties

The sensory properties of the cooked patties were analyzed based on

texture, flavor and overall using 5 point hedonic scale:

1-like extremely 2-like moderately 3-neither like or dislike

4-dislike moderately 5-dislike extremely

3. Results & Discussion

3. 1 Results (Raw data):

Table 1: Average diameter and average weight of the burger with and without lecithin

Control

(without lecithin)

Lecithin

Uncooked

Cooked

0. 5%

1. 0%

2. 0%

Uncooked

Cooked

Uncooked

Cooked

Uncooked

Cooked

Average Diameter (cm)

9. 90

6. 90

9. 73

7. 23

9. 50

7. 57

9. 50

7. 10

Average Weight (g)

79. 56

53. 47

80. 00

63. 31

80. 95

52. 91

79. 68

63. 61

Table 2 : proximate analysis of burger with and without lecithin

Control

(without Lecithin)

Lecithin

Uncooked

Cooked

0. 5%

1. 0%

2. 0%

Uncooked

Cooked

Uncooked

Cooked

Uncooked

Cooked

pH

5. 77

6. 04

5. 86

6. 06

5. 49

6. 05

5. 48

5. 80

Fat

8. 50

10. 25

4. 16

10. 59

5. 32

0. 27

9. 54

12. 91

Moisture

32. 40

54. 73

68. 86

59. 59

52. 29

45. 13

64. 92

60. 68

Protein

13. 71

3. 91

16. 39

14. 33

15. 94

23. 82

16. 57

17. 25

Ash

2. 54

6. 73

2. 51

2. 97

12. 25

10. 25

5. 68

2. 79

Table 3: Sensory characteristic on different lecithin content on burger

Lecithin (%)

Texture

Flavour

Overall

0. 0

3

3

3

0. 5

1

2

2

1. 0

2

3

2

2. 0

2

3

3

Key:

1- Extremely like

2- Like moderately

3- Neither like or dislike

4- Dislike moderately

5- Dislike extremely

Table 4: overuse weight of burger on different lecithin content

Lecithin (%)

0. 0

0. 5

1. 0

2. 0

No. of patties

29

28

30

29

Actual weight of mixture

2. 3802

2. 236

2. 045

2. 203

Overuse weight of patty

0. 0602

0. 0035

0. 0027

0. 0048

Emulsifier plays essential roles in burger processing. It contributes to the dough strengthening, crystal modification besides facilitates in the aeration and foam stabilization. Emulsifier is also function as a binding agent in burger processing. Theoretically, the inclusion of a binding agent increases the stability of a patty at the cost of a little loss in flavor. Temperature, coarseness and moisture levels of ground meat and other ingredients greatly influence the binding properties of a patty.

The emulsifier that was used in this experiment is lecithin. Soy lecithin consists of three types of phospholipids; phosphatidylcholine (PC),

phosphatidylethanolamine (PE) and phosphotidylinositol (PI). It is extracted from soybean oil and is generally used as a natural emulsifier or stabilizer in various food applications (Awazuhara H et al., 1998). It has low solubility in water and in aqueous solution its phospholipids can form liposomes, bilayer sheets, micelles or lamellar structure depending on hydration and temperature. This results in surfactant that is classified as amphoteric. During emulsification, the nonpolar groups embedded in fat while the polar group extends into the aqueous phase.

The used of lecithin in burger preparation caused the meat to bind closely and hence gave good quality burger. Lecithin also helps in binding the water in the meat. By binding water, these ingredients can improve yields and packaged product appearance. The emulsifying properties of lecithin can reduce the impact of raw material variations and prevent fat release. Functional concentrates can also improve texture, juiciness and slice-ability in finished meat products. And because they are tolerant of the multitude of conditions associated with processed meat procedures, they function without changing current manufacturing processes (Wilson N. R. P., 1981).

Fat is also used as one of the ingredient in burger preparation. The main role of fat is to retain the juiciness in the meat. Other than that, fat also contributes to the flavor and aroma of the burger. This is resulted by the volatile fatty acid when the burger is cooked. While for salt, it brings out natural flavors of the burger and makes it more palatable and acceptable. In burger preparation, salt also acts as preservatives to retard the growth of spoilage microorganisms. Salt gives proper texture to burgers. It is also used

to create the gel necessary to process meats and sausages. As a result, more heavily processed foods usually contain more salt.

Different percentages of lecithin (0. 5, 1 and2%) were used in this experiment in order to study the effect of incorporation of lecithin on the quality of burger. The parameters that were use to determined the effects of lecithin in burger are diameter and weight of burger, pH value, moisture content and proximate analysis for all fat, protein and ash. Sensory evaluation was also carried out in order to assess the sensory attributes of the burger after it was cooked.

Diameter and weight

In this experiment, different percentage of lecithin (0. 5, 1 and 2%) was used in order to study the effects of lecithin in the changes of diameter and weight of the burger before and after cooking. Based from the result, it is observed that the diameter and the weight of beef burgers with or without lecithin decreased after they were cooked. This is primarily associated with the removal of water or the loss of moisture in the beef burger during cooking (Rhee KS et al., 1982).

When burger is cooked it shrinks. This may be due to some change in the fibrous tissue, or to coagulation of the muscle fibre (Vincent & Lewis, 1901). The â€Ëœshrink´ takes place at 63°C, and is relatively more important in these days of shortage of meat. All meat will shrink in size and weight during cooking. The amount of shrinkage will depend on its fat and moisture content, the temperature at which the meat is cooked, and how long it is cooked. Basically, higher cooking temperature will causes greater shrinkage.

Cooking burger at moderate temperatures will reduce shrinkage and help retain juices and flavor. Overcooking draws out more fat and juices from ground beef, resulting in a dry, less tasty product. As percentage of lecithin used is increased, the water-holding capacity of the burger also increased. Thus, the shrinkage supposed to be less severe. However, for 1% lecithin the shrinkage was the most compared to the others. The loss of weight for burger that contained 1% lecithin is 28. 04 g. This high amount might be due to the over cooking time as heat tends to shrink the patties (Tony Rosenfeld, 2007).

pH

The pH of the meat burger were increase with the percentage of addition of lecithin, which was mainly due to the higher pH values of soy lecithin (Das , Anjaneyulu, Gadekar, Singh and Pragati, 2008). The pH for cooked burger were higher than the uncooked burger due to the natural compound that present initially in the uncooked meat and melting and breakdown of fats, organic acids, and nitrogen containing compound during heating (Brown, 2008).

Proximate analysis

The moisture content before and after cooking were differ for the control meat burger samples with the treatment. For the control, the cooked sample had higher moisture content than the uncooked samples. But, for the samples that treated with lecithin, the moisture content of the meat burger is higher in uncooked burger compared to the cooked burger due to the loss of moisture during cooking. Exposing meat to high temperature shortened

the muscle fiber, denatured protein, and caused the meat to dehydrate (Brown, 2008). The moisture loss for 2% lecithin added was the least compared to 0. 5% and 1% lecithin due to the presence of lecithin which minimized the loss of water-binding capacity.

The fat content of the treatments were higher compared to the control, and the higher the percentage of lecithin used, gave the higher percentage of fat content in the cooked samples. It was clearly showed that the addition of lecithin helped to minimize the loss of fat during cooking as the meat fat were melt as it is cooked. Fat in the emulsified products immobilized and stabilized by the formation of protein interfacial membrane and protein matrices. The adsorption of protein on the surface of fat globules decreased the interfacial energy, and denaturation of the adsorbed protein lead to the formation of a protein gel matrix that enhanced the emulsion stability (Fennema, Parkin and Damodaran, 1996).

The ash and protein content of the control and treatments were not differs very much. It indicated that lecithin did not affect the ash content to the burger patties. The percentage of ash content for cooked meat burger was higher than the uncooked burger.

Sensory attributes

For the sensory characteristics, the panelist preferred the cooked burger with 0. 5% lecithin because of its tenderness that influenced by the role of the lecithin. It acted as the binding agents that bind the protein with the fat as well as moisture to keep the good texture and prevent dehydration during cooking. Other than that, lecithin helped to give consistency to the

distribution of fat and protein throughout the burger patties. It also prevents the loss of fat because the fat that presence in the burger patties will melt during high temperature processing, which increased tenderness, juiciness and flavor (Brown, 2008). The control sample was the least like samples because it′s hard and dry texture due to moisture loss during cooking.

The panelists gave similar score to the control and samples with treatments in terms of flavor, showed that lecithin did not help in improving the flavor of meat burger. The role of lecithin can only be seen in the aspect of texture quality but not in flavor. For the overall acceptability, samples that treated with 0. 5% and 1% lecithin were preferred compared to the control and 2 % lecithin. Control sample gave low eating quality in terms of the texture, while high intensity of lecithin also lowered the consumer acceptability.

Tenderness of the meat burger can also be increased by the addition of salts in the form of potassium, calcium, or magnesium chlorides. These salts retain moisture and breakdown the component that surrounds the muscle fibers, resulting in the release of proteins (Brown, 2008).

Conclusion:

The use of lecithin has potential as a functional ingredient to improve the cooking properties of burger patties. Better fat and water retention reduce the cooking losses. The substitution of the main meat component constitutes an additional textural benefit to the meat burger and can cut the cost of production. Least, besides an equivalent overall acceptance for some of the extended product, the use of citrus lecithin may be attractive to some consumers as a positive alternative to conventional fillers in meat products.