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Abstract. Eggs are a high protein, easy to digest and highly nutritious food. Various types of processing have been done to increase the diversification and consumers' preferences on eggs. One type of processing eggs is mayonnaise. Mayonnaise is an emulsion product that uses a mixture of ingredients including egg yolk, salts, sugars, oils and acids. The combination of poultry eggs and acids on the physicochemical characteristics of mayonnaise has not been widely studied. The research objective was to determine the effect of the combination of poultry eggs and acids on the physicochemical characteristics of mayonnaise. This studies used a completely randomized design (CRD), with 9 combinations and 3 replications. The treatment combinations were A1; duck eggs and lime, A2: duck eggs and apple vinegar, A3: duck eggs and synthetic acid, A4: native chicken eggs and lime, A5: native chicken eggs and apple vinegar, A6: native chicken eggs and synthetic acid, A7: chicken eggs and lime, A8: chicken eggs and apple vinegar, A9: chicken eggs and synthetic acid. The parameters observed were yield, pH value, water content and rancid odor. The results showed that the using different types of poultry eggs and acid had a significant effect ($P \leq 0.05$) on the yield and pH value of the mayonnaise. However, the combination of the two did not show a significant effect on moisture content and the rancid odor of mayonnaise. The combination of duck eggs and apple vinegar improved the physicochemical characteristics of mayonnaise.

1. Introduction

Eggs are an ingredient of food results poultry which contains a source of protein in animal high, easily digestible and nutritious high [1]. Egg processing has been done a lot to increase shelf time and consumer acceptance. Some of the available processed eggs are salted eggs, boiled eggs, pickled eggs, cracker eggs, egg powder, frozen eggs, liquid eggs, and mayonnaise.

Type**s** and amount of yolk eggs can affect the magnitude of the viscosity and strength emulsion *mayonnaise* [2,3]. Yolk eggs can be obtained from various types of poultry that include of eggs chicken (layer), native chicken , ducks, and others. Each types of poultry contains different phosphatidylcholine or lecithin [4]. Lecithin is a phospholipid in egg yolk [2]. Egg yolks in chickens and ducks contain 77% and 75.6% lecithin in 100% phospholipids. The phospholipids content in chicken egg yolk was 31.4% and in duck egg yolk was 26.5%. In general, the manufacture of mayonnaise uses egg yolk as an emulsifier. It is necessary to study the use of other types of poultry eggs, including native chicken eggs and duck eggs.

Mayonnaise is an emulsion product that uses a mixture of ingredients including egg yolk, salts, sugars, oils and acids [2,3]. The combination of poultry eggs and acids on the physicochemical

characteristics of mayonnaise has not been widely studied. The research objective was to determine the effect of the combination of poultry eggs and acids on the physicochemical characteristics of mayonnaise.

2. Research method

The equipment used in this study were bottles, beaker glass, mixers, trays, analytical scales, containers, spoons, infrared sterilizers, plates, ovens, pH meters, stationery, test sheet packages and panelists. The materials used in this study were duck eggs, native chicken eggs, chicken eggs, lime, apple vinegar and synthetic acids, sugars, salts and palm oils.

This studies used a completely randomized design (CRD), with 9 combinations and 3 replications. The treatment combinations were A1; duck eggs and lime, A2: duck eggs and apple vinegar, A3: duck eggs and synthetic acid, A4: native chicken eggs and lime, A5: native chicken eggs and apple vinegar, A6: native chicken eggs and synthetic acid, A7: chicken eggs and lime, A8: chicken eggs and apple vinegar, A9: chicken eggs and synthetic acid. The parameters observed were yield, pH value, water content and rancid odor.

The procedure for making mayonnaise was (a) washed eggs to remove dirt on the surface of the egg shells, (b) dried eggshells with a tissue, (c) eggs wrapped in aluminum foil, (d) sterilized eggs in an infared sterilizer [2]. Then the eggs were separated from the shell and the contents of the eggs. The contents of the eggs were put into a container and then added with sugars, oils, acids, and salts. The mixture of these ingredients was stirred until the dough was homogeneous and expands. Then the dough was put in a bottle and cooled in the refrigerator for 120 minutes [2]. After that, parameters measured were yield value, pH value, water content and rancid odor.

3. Results and discussion

3.1. Yield value

The combination of eggs and acid types had significant effect ($P<0.05$) on the yield of mayonnaise. Figure 1 showed that the combination of egg types and acids obtained significantly different yield of mayonnaise.

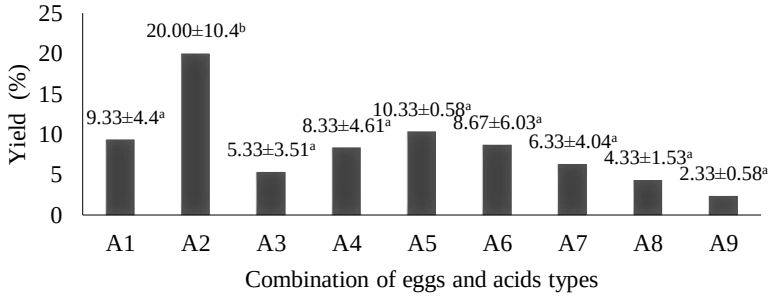

Figure 1. The yield value of mayonnaise with a combination of poultry eggs and acids

[abc]Different superscripts in each treatment showed a very significant difference ($P<0.01$).
A1 = Duck eggs and lime, A2 = Duck eggs and apple vinegar, A3 = Duck eggs and synthetic acids, A4 = Native chicken eggs and lime, A5 = Native chicken eggs and apple vinegar, A6 = Native chicken eggs and synthetic acids, A7 = chicken eggs and Lime, A8 = Chicken eggs and Apple vinegar, A9 = Chicken eggs and synthetic acids

The results showed that the use of a combination of duck eggs and apple vinegar had a higher yield value compared to other combinations. This was likely due to the formation of a stronger polymer chain between duck eggs and apple vinegar. The strong polymer chain prevented water from escaping so that the weight of the material doid not decrease [3,4].

The other treatments showed no difference between the treatments. Low protein denaturation so that the resulting yield was not different and still low. The types of acid added results in the addition of H + ions which can neutralize proteins. Protein is easily damaged or denatured by acids, thereby reducing the ability of the protein to bind water. The water content that binds to the protein evaporates [5].

3.2. pH Value

The study showed that the combination of egg types and acids had a significant effect ($P<0.05$) on the pH value of mayonnaise. Figure 2 showed that each combination produced a different pH value.

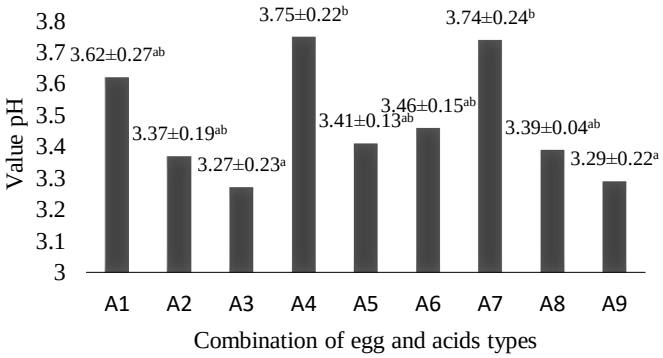

Figure 2. Value pH *mayonnaise* with a combination of poultry eggs and acids

[abc]Different superscripts in each treatment showed a very significant difference ($P < 0.01$).
A1 = Duck eggs and lime, A2 = Duck eggs and apple vinegar, A3 = Duck eggs and synthetic acids, A4 = Native chicken eggs and lime, A5 = Native chicken eggs and apple vinegar, A6 = Native chicken eggs and synthetic acids, A7 = chicken eggs and Lime, A8 = Chicken eggs and Apple vinegar, A9 = Chicken eggs and synthetic acids

Mayonnaise that has the highest pH value was a combination of chicken eggs and lime, while the lowest pH value was a combination of duck eggs and synthetic acids. Mayonnaise that used eggs types had no effect on the pH value, while the using of acid types affected the pH value of mayonnaise. This showed that each addition of lime, the pH value increased. This was in accordance with the opinion of Ardiyanti which stated that the pH differences depend on the type of acid used during manufacture [6].

The content of citric acid in lime has an acidic pH of 2.48–2.5 which increased the pH of mayonnaise. Reference Amertaningtyas et al stated that acids added to food reduced the pH value [7]. The study of Setiawan et al which also used different egg yolks, namely broilers, native chickens and ducks, found that they contributed to the pH value of mayonnaise, this study also found that the resulting average pH value was 4.3 [8].

3.3. Water content

The results showed that the combination of different types of eggs and acids had no significant effect ($P>0.05$) on the moisture content of mayonnaise. In figure 3, the combination of different types of eggs and acids in the study did not show changes in the moisture content of mayonnaise.

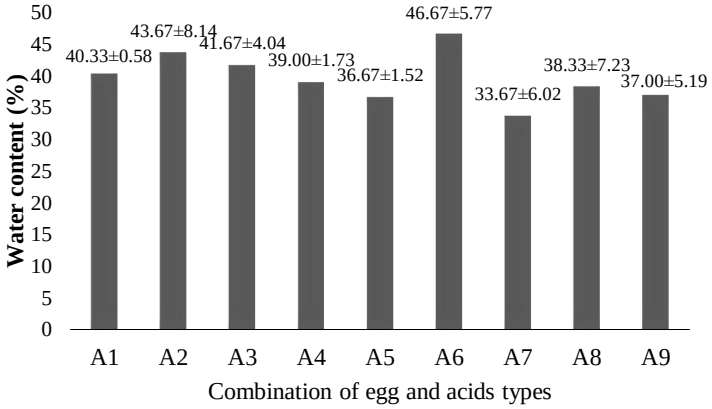

Figure 3. Value of *mayonnaise* moisture content with a with a combination of poultry eggs and acids

A1 = Duck eggs and lime, A2 = Duck eggs and apple vinegar, A3 = Duck eggs and synthetic acids, A4 = Native chicken eggs and lime, A5 = Native chicken eggs and apple vinegar, A6 = Native chicken eggs and synthetic acids, A7 = chicken eggs and lime, A8 = Chicken eggs and Apple vinegar, A9 = Chicken eggs and synthetic acids.

This showed that by using a combination of egg types and acids as raw materials in making mayonnaise did not result in changes in the water content of mayonnaise. However, the water content of the combination treatment of native eggs and synthetic acid was higher than other combinations.

Mayonnaise is an emulsion product that uses raw materials, including egg yolk, vegetable oil and other types of acids [3]. However, this study showed that the combination of eggs and acids did not show any change in water content. Different things according to Amertaningtyas and Jaya that increasing the concentration of egg yolk will increase the moisture content of mayonnaise [7].

The range of water content in this study was 33.7%–47.0%. This value was still in accordance with the Standard National Indonesia or SNI, namely 30%.

3.4 Rancidity odor

The results showed that the using of different types of eggs and acids had no significant effect ($P>0.05$) on the value of the rancid odor in mayonnaise. Figure 4 showed that the used of different types of eggs and acids did not show a change in the rancid odor value of mayonnaise.

In general, adding acid to the mayonnaise treatment degraded the protein so that the rancid odor didn't stand out. This was probably due to the type of acid used which binds the fat to the mayonnaise, reducing the smell. Reference Afifah stated that kitchen spices such as sugar and lime juice affected the smell, color and taste of food [9]. It can also masked unwanted odors.

There was a tendency for the used of a combination of chicken eggs and acids to show a higher odor value (not rancid). Mayonnaise with a combination of duck eggs and lime had a lower rancidity value (smells rancid) than other combinations.

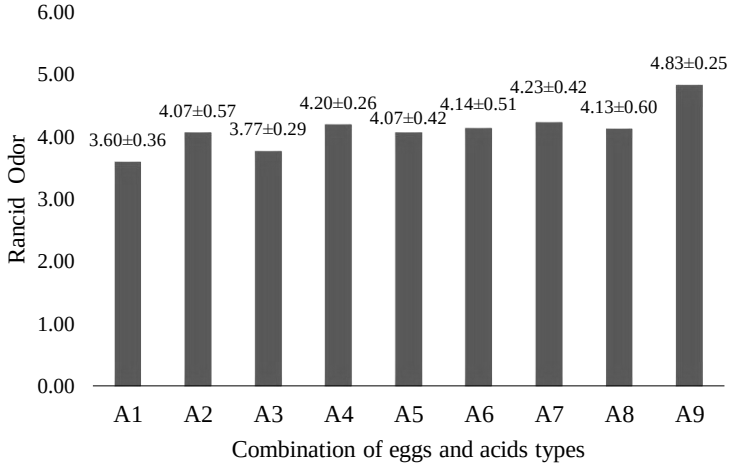

Figure 4. Value rancid odor *mayonnaise* with a combination of poultry eggs and acids

A1 = Duck eggs and lime, A2 = Duck eggs and apple vinegar, A3 = Duck eggs and synthetic acids, A4 = Native chicken eggs and lime, A5 = Native chicken eggs and apple vinegar, A6 = Native chicken eggs and synthetic acids, A7 = Chicken eggs and lime, A8 = Chicken eggs and Apple vinegar, A9 = Chicken eggs and synthetic acids.

The assessment of smell was a subjective assessment and required sensitivity to the senses of taste and smell. Odors exhibited sensory properties that were difficult to be assessed to classify. The odors was also difficult to be explained because it varies [10].

4. Conclusion

The combination of duck eggs and apple vinegar improved the physicochemical characteristics of mayonnaise.

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