Effect of gelatine addition and storage time on the quality of semur seasoning pasta

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Abstract. Semur seasoning pasta is one of the most popular instant products for the public. However, this product's shelf life is short (1-2 days at room temperature), and it is not effective if semur seasoning pasta is marketed to the public. The addition of a binder/stabilizer (gelatine/gelatin) is needed to bind water to extend shelf life. The method used was completely randomized design, with 2 (two) factors i.e. gelatine concentration (G) : (0% ; 0.4% ; 0.8% ; 1.2%) and shelf life (L) : (0 week ; 1 week ; 2 weeks ; 3 weeks). The parameters observed were water content, ash content, total solids, total microbe, syneresis, the hedonic value of colour, flavour, taste, and viscosity. The results showed that the interaction between the two factors had a highly significant effect on the product's hedonic viscosity. The product with 1.2% gelatine concentration and 1-week shelf life produced semur seasoning pasta with the best quality.

1. Introduction
Semur is a traditional Indonesian food that is very popular among the public, from children to elders, which is usually presented in daily life to celebrations. Semur is a dish that cannot be quickly served because it requires many spices, ingredients, and a long time. While, people tend to eat fast food, easy to be carried and stored. One way to solve the problem during storage and distribution is to process food in an instant. This also affects the preparation and way of serving of seasoning needs resulting in changes of seasoning and spice product in instant form.

Seasoning pasta is a semi-dry product that is better for processing flavorings than seasoning products, which is hygroscopic. Pasta flavor products can be directly used to process food ingredients and are generally used as a mixture of various spices with specific compositions.

Some of the seasonings that are often used in pasta and thought to inhibit microbial and antioxidant activity include: turmeric, ginger, hazelnut, coriander, lemongrass, galangal, pepper, cloves, cinnamon, ginger, onion, garlic, and cumin. Spices are aromatic in nature, because of their high content of essential oils as components to form specific flavors. Semi-wet food ingredients such as seasoning pasta will easily become damaged due to microorganisms or chemical processes when stored for a long time at room temperature.

The growth of microorganisms in food can cause various undesirable physical, chemical, and microbiological damages because these foodstuffs are no longer suitable for consumption. Physical damage can occur such as changes in color, texture, and flavor, and chemical damage such as increased gas due to oxidation by oxygen or radiation, as well as microbiological damage such as mold growth on
the seasoning surface. The seasoning form of pasta has a high water content which causes this seasoning to have relatively lower resistance so that a stabilizer or binder is needed to bind water from foodstuffs which can extend the shelf life.

Gelatin is a hydrocolloid that can be used as a gelling, thickening, or stabilizer. In addition, gelatin also has a very high gelling power and is heat reversible in which the gel formed will dissolve again if it is heated. Another function is that it can be used as a filler, emulsifier, binder, and has high digestibility [1,2].

According to [3], water absorption or gel formation occurs due to the development of gelatin molecules during heating. The heat will open the bonds in the gelatin molecules, and the liquid that is free to flow becomes trapped in the structure so that the solution becomes thick. The water trapped in the gelatin structure will be difficult to escape so that it can extend the shelf life.

Shelf life is one factor determining whether the quality of food is good or not. The longer the storage period will affect the consumption and storage time of the food. Temperature and storage containers need to be considered because it can reduce food quality and make the food unable to be used properly, causing producers to experience losses. After all, the product cannot be marketed.

This study was conducted to find out the effect of gelatin addition as a stabilizer and on semur seasoning pasta’s shelf life to determine the amount of gelatin to produce the best semur seasoning pasta, to determine the storage time and to determine the panelists' acceptance by organoleptic test on semur seasoning pasta.

2. Materials and methods
The research materials used were onion, tomatoes, garlic, hazelnut, cinnamon, pepper, star anise, nutmeg, and cardamom. The chemical used in this study was NaCl. PCA (Plate Count Agar), and aquades.

2.1 Research tools
The tools used for this research were jars, containers, cookers, blenders, supporting tools (stainless steel knives, stainless steel sutures, stainless steel spoons), analysis tools (Erlenmeyer, beaker glass, test tubes, aluminum plates, ovens, desiccators, porcelain cups, analytical scales (Sartorius TE 2145), filter paper, furnace and colony counters).

2.2 Research methods
This research was conducted using a completely randomized design (CRD), which consisted of two factors, namely: Factor I (G): Gelatin concentrations were 4 levels, namely: G0 (0%), G1 (0.4%), G2 (0.8%), G3 (1.2%). Factor II (L): Storage time were 4 levels, namely: L0 = 0 weeks, L1 = 1 week, L2 = 2 weeks, L3 = 3 weeks. A number of treatment combinations or Tc were 4x4=16. The minimum number of repetitions to be done was 2 times, so that the total sample size was 32 samples.

2.3 Semur seasoning pasta making
The ingredients were prepared and washed. Then it was discarded and weighed according to the formula. Raw ingredients such as 87 g of onion, 67 g of tomatoes, 22 g of garlic, and 16 g of hazelnut were mashed using a blender. Then the ingredients and spices such as 2 g of cinnamon, 2 g of pepper, 2 g of star anise, 1.5 g of nutmeg, 0.5 g of cardamon, and gelatin which had been dissolved in warm water with a concentration of 0%, 0.4%, 0.8%, and 1.2%, were added, stirred and heated for 15 minutes at 80°C. Then, the heated pasta was put into a glass bottle which had already sterilized, exhausted and closed tightly, cooled, and stored at room temperature for 0 weeks, 1 week, 2 weeks, and 3 weeks.

3. Results and discussion
The results showed that the increase in the concentration of gelatin and the length of storage of the pasta had an effect on the observed parameters as shown in Table 1 and Table 2.
Table 1. Characteristics of the *semur* seasoning pasta at several levels of gelatin concentration.

| Parameter                  | G₀   | G₁   | G₂   | G₃   |
|----------------------------|------|------|------|------|
| Water content (%)          | 67.897 | 69.375 | 71.964 | 73.526 |
| Ash content (%)            | 1.121 | 1.229 | 1.341 | 1.413 |
| Total solids (%)           | 32.10 | 30.625 | 28.036 | 26.474 |
| Total microbes (Log CFU/g) | 4.830 | 4.751 | 4.675 | 4.578 |
| Syneresis (%)              | 15.845 | 14.502 | 13.392 | 12.003 |
| Color of processed semur   | 4.125 | 4.083 | 4.042 | 3.979 |
| Flavor of processed semur  | 2.741 | 2.633 | 2.600 | 2.512 |
| Taste of processed semur   | 3.770 | 3.804 | 3.825 | 3.921 |
| Viscosity of processed semur | 3.221 | 3.517 | 3.692 | 3.783 |

Table 2. Characteristics of the quality of the *semur* seasoning pasta at several stages of storage time.

| Parameter                  | L₀      | L₁      | L₂      | L₃      |
|----------------------------|---------|---------|---------|---------|
| Water content (%)          | 66.032  | 67.642  | 72.914  | 76.174  |
| Ash content (%)            | 1.2404  | 1.2837  | 1.2840  | 1.2973  |
| Total solids (%)           | 33.968  | 32.358  | 27.086  | 23.826  |
| Total microbes (Log CFU/g) | 4.5924  | 4.6822  | 4.7469  | 4.8125  |
| Syneresis (%)              | 12.086  | 13.924  | 14.469  | 15.261  |
| Color of processed semur   | 4.2333  | 4.1208  | 4.0333  | 3.9208  |
| Flavor of processed semur  | 3.8875  | 3.3542  | 1.6667  | 1.5792  |
| Taste of processed semur   | 4.0208  | 3.8833  | 3.7583  | 3.6583  |
| Viscosity of processed semur | 4.3875  | 4.0250  | 3.5542  | 2.2458  |

3.1 Water content

The addition of gelatin concentration to *semur* seasoning pasta had a significant effect (P <0.01) on water content (Table 1). The addition of gelatin concentration could increase the moisture content of *semur* seasoning pasta in the addition of 1.2% gelatin. This phenomenon showed gelatin, which is a hydrocolloid, can bind some soluble particles in the mixture. According to [4], the total soluble solids increased because free water was bound by particulate matter bound by a stabilizer, thereby reducing the sediment (total solids) formed. Gelatin could also increase water content by reducing the hydrophobic properties of protein [5]. Water content is an important parameter of a food product because the water content in food determines the acceptability, freshness, appearance, texture, taste, and quality of the food.

The storage duration could significantly increase the moisture content of *semur* seasoning pasta starting from the 2nd week. During storage time, there was a syneresis process in the gel, which could increase the moisture content of *semur* seasoning pasta. This condition was consistent with the statement of [6] which stated that during the storage time, a syneresis process occurred in the gel. The discharge of water from the gelatin of *semur* seasoning pasta during storage could cause the moisture content to rise.

3.2 Ash content

The addition of gelatin concentration to *semur* seasoning pasta had a very significant effect (P <0.01) on the ash content (Table 1). The addition of gelatin significantly increased the ash content of *semur*
seasoning pasta at a gelatin concentration of 0.4%. This phenomenon occurred due to the content of minerals and organic ions from the gelatin so that the ash content in *semur* seasoning pasta increased. The value of the ash content shows the value of the minerals contained in that food material. Ash is an inorganic substance that does not burn in the combustion process of organic substances. These substances are calcium, potassium, sodium, iron, magnesium, and manganese. The storage time had no significant effect (P > 0.05) on ash content (Table 2).

3.3 Total solids
The addition of the gelatin concentration to *semur* seasoning pasta had a very significant effect (P < 0.01) on the total solids (Table 1). The addition of gelatin could significantly reduce the total solids of *semur* seasoning pasta with the addition of 0.8% gelatin. This condition occurred because gelatin is a hydrocolloid that can bind many soluble particles in the mixture. According to [4], the total soluble solids increased because free water was bound by particulate matter bound by a stabilizer, thereby reducing the sediment (total solids) formed. Total solids are all components of the *semur* seasoning pasta without the water content, including solids such as carbohydrates, proteins, vitamins, and minerals.

The storage time had a very significant effect (P < 0.01) on the total solids (Table 2). The duration of storage could significantly reduce the total solids of *semur* seasoning pasta starting from week 2. This condition occurred because, during storage, a syneresis process in the gel increased the *semur* seasoning pasta's moisture content. This phenomenon was in accordance with [6], which stated that a syneresis process took place in the gel during storage, which resulted in longer storage time would increase the water content in the material so that the total solids decreased. Total solids are all constituent components of the material reduced by moisture content.

3.4 Total microbe
The addition of gelatin concentrations to *semur* seasoning pasta had a very significant effect (P < 0.01) on the total microbes (Table 1) when added 0.4% gelatin (4.75 Log CFU / g or 57500 CFU / g). This condition showed the addition of gelatin could increase the consistency of the pasta, which would inhibit microbial growth so that it could reduce the number of microbes. [7] stated that water is an important factor for microbial growth, which indicates that the more water gelatin that can be bound to, the longer bacteria will grow and divide.

The storage time had a very significant (P < 0.01) different effect on total microbes (Table 2). The duration of storage could significantly increase the total microbial to *semur* seasoning pasta starting from week 1. The longer the storage time, the number of microbial colonies would increase because they have undergone multiplication. According to [8], the population of microorganisms in each food ingredient was influenced by various factors, such as the availability of nutrients, water, temperature, pH, and the presence of inhibitors. There was an increase in water content in *semur* seasoning pasta, which caused microbial growth to increase over time until it reached the maximum number of colonies. The water from the packaging would make the bacteria is easy to grow. This condition was in accordance with [9], which stated that factors that influenced bacterial growth include pH and water content.

According to [10], TPC is influenced by extrinsic factors, namely environmental conditions, handling methods, and product storage. The increase in total microbes during storage was also related to the storage room temperature. This phenomenon occurs because room temperature (28-30°C) is the optimum temperature for microbial growth [11].

3.5 Syneresis
The addition of the gelatin concentration to *semur* seasoning pasta had a very significant (P < 0.01) effect on syneresis (Table 1). The addition of gelatin could significantly reduce the syneresis of *semur* seasoning pasta. This condition occurred because gelatin could bind free water to *semur* seasoning pasta, which caused less water to come out, so the higher of the gelatin content, the lower the syneresis condition. According to [12], syneresis is a condition of spontaneous or stimulating release of dispersed medium or stimulation during a gel product's storage period.
The storage time had a very significant (P <0.01) different effect on syneresis (Table 2). The storage time could significantly increase the syneresis of the pasta from week 1. This condition showed that there was a syneresis process in the gel during storage, which increased the moisture content in *semur* seasoning pasta. This condition was in accordance with the statement of [6], which stated that during the storage time, a syneresis process occurs in the gel, which results in longer storage time, which will cause the moisture content in the material to increase.

### 3.6 Hedonic value of color

The addition of gelatin concentration to *semur* seasoning pasta had no significant effect (P> 0.05) on hedonic color (Table 1). Storage time had a very significant effect (P <0.01) on color hedonic (Table 2). The storage time could significantly reduce the color hedonic value of *semur* seasoning pasta starting from week 2. This condition occurred because the longer it was stored, the product's quality would decrease so that it turned the color darker and was not preferred by the panelists. According to [10], most dry and semi-wet foods can experience browning. This reaction is influenced by water content. Semi-wet foods are in the water content range that allows browning. At the third week of storage, the hedonic value of color was 3.9208, which means that panelists still enjoyed it.

### 3.7 Hedonic value of flavor

The addition of gelatin concentration to *semur* seasoning pasta had no significant effect (P> 0.05) on the hedonic flavor (Table 1). Storage time had a very significant (P <0.01) different effect on hedonic flavor (Table 2). The storage time could also significantly reduce the hedonic value of *semur* seasoning pasta's flavor, starting from week 1. The flavor is a property of the material (food) and also the receptor mechanism for people who consume it. Aroma includes the arrangement of compounds in food that contain taste or smell. The flavor is usually sensed due to the presence of a mixture of several odorous compounds [13]. The decrease in the hedonic value of flavor was due to the longer storage time, the lower the quality of the product, and the evaporation of the compounds contained in the product so that the flavor of *semur* seasoning pasta was getting rancid (not normal). In the first week of storage, it was still acceptable to the panelists, while at the third week of storage, the hedonic value of flavor was 1.5792, which means that the panelists very disliked it.

### 3.8 Hedonic value of taste

The addition of gelatin concentration to *semur* seasoning pasta had no significant effect (P> 0.05) on the hedonic taste (Table 1). Storage time had a very significant (P <0.01) different effect on the hedonic taste (Table 2). The storage time could significantly reduce the *semur* seasoning pasta's hedonic value starting from the 2nd week. Taste is influenced by several factors, such as chemical compounds, temperature, and interactions with other taste components [6]. The longer the storage was carried out, the lower the quality of the product so that the taste of the pasta was not normal. At the third week of storage, the taste hedonic value was 3.6583, which means that the panelists somewhat favored it.

### 3.9 Hedonic value of viscosity

The addition of gelatin concentration to *semur* seasoning pasta had a very significant effect (P <0.01) on hedonic viscosity (Table 1). The addition of gelatin could significantly increase the hedonic value of the viscosity of *semur* seasoning pasta at the addition of 0.4% gelatin concentration. This condition occurred due to the fact that the resulting viscosity tends to be thicker, like other seasoning pasta in general, so that panelists preferred it. This situation showed that gelatin is able to form a firm gel. Gelatin serves as a potent thickener, an effective stabilizer, and an excellent gelling agent. Viscosity is a measurement of the resistance of a fluid that is changed with both pressure and stress.

The duration of storage had a very significant (P <0.01) different effect on the hedonic viscosity (Table 2). The storage time could significantly reduce the hedonic value of *semur* seasoning pasta's viscosity starting from week 1. This condition occurred because the water content increased during storage, and there was a syneresis process in the seasoning pasta. The longer the pasta was stored, the
thinner it due to the increase of water content. The syneresis process is the discharge or seepage of liquid from a gel [6].

The interaction of adding gelatin concentration and storage time to *semur* seasoning pasta had a very significant effect (P <0.01) on the hedonic value of viscosity of *semur* seasoning pasta, the interaction effect of the increase in gelatin concentration and storage time on viscosity can be seen in Figure 1.

According to [6], water which was previously free to move, when it was added with gelatin, water could not move freely anymore because it was absorbed and bound to the gelatin so that the solution became thicker due to an increase in viscosity. The higher the concentration of gelatin added, the more water was bound so that it could increase the pasta’s viscosity [14].

According to [15], the longer duration of red fruit sauce storage made the thinner of the sauce consistency. It occurred because microbes degraded ingredients into simpler compounds, causing a decrease of the soluble solids. The same phenomenon occurred too in the *semur* seasoning pasta which became thinner when the storage time was longer. The syneresis of *semur* seasoning pasta also affected the viscosity value. According to [12], syneresis is a condition of the spontaneous or stimulating release of dispersed medium or stimulation during a gel product's storage period. A longer storage period would increase the syneresis and decrease the viscosity value. The relationship between gelatin concentration level and storage time also affected the viscosity value. When the gelatin concentration was higher and the shorter the shelf life, the higher the seasoning pasta's viscosity value. In the addition of 0% gelatin concentration and the third week of storage, it can be seen that the pasta has a viscosity that is thinner than the others (Figure 1). Sample G0L3 experienced a very sharp decrease in hedonic viscosity up to 1.5. This condition occurred because the amount of water bound to *semur* seasoning pasta triggering bacterial growth. The syneresis process made the viscosity of semur seasoning pasta became thinner. Therefore, the panelists' preference for *semur* seasoning pasta was less.

![Figure 1](image-url)
4. Conclusions
The parameters observed were water content, ash content, total solids, total microbe, syneresis, the hedonic value of color, flavor, taste, and viscosity. The results showed that the interaction between the two factors had a significant effect on the product’s hedonic viscosity. The product with 1.2% gelatin concentration and one-week shelf life produced semur seasoning pasta with the best quality.

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