# Experimental Use of Natural Yeast (Sourdough) as a Replacement of Conventional Yeast in the Making of Artisan (Homemade) Bread

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Abstract: As one of the staple foods consumed by humans, bread is food that can be easily made at home. In making bread, we need a developer made from yeast where the yeast can convert sugar into carbon dioxide (CO2) so that it can expand the bread. Today the lifestyle and consumption of Indonesian people in general increasingly want to consume foods that are natural, healthy and nutritious. Therefore, the development of bread by utilizing lactic acid bacteria as a source or starter that has the same developer ability as conventional yeast needs to be done in order to suppress the growth of mold Rhizopus sp that can cause damage to the bread and can extend the storage period of bread and more importantly is to provide complete nutrition to consumers. Sourdough or levain is the oldest form of yeast which is a natural bread development agent that can be used for making healthier home-based bread. Based on the results of our experiment, the results of using sourdough as compared to conventional yeast are the similarities in color when exiting the oven, which is golden brown, chewy texture with larger cavities, and also a longer shelf life. In addition, the benefits of using sourdough can also be seen in terms of the efficiency of the time of making bread. So from the use of sourdough, a home-based bread product is obtained that is almost similar to conventional yeast bread, with better nutrition and is free of preservatives and additional coloring.

## 1 INTRODUCTION

Bread is one of the staple foods consumed by humans since the ancient times. In making bread, we need a developer made from yeast. Bread yeast is a spore culture of a type of yeast that grows and ferments sugar in the dough (Afrianti, 2013). Yeast is needed in the fermentation process in making bread that can convert sugar into carbon dioxide (CO2), so that it can expand bread.

In addition to developing bread, yeast can also ripen and smooth gluten so that the dough can capture the CO2 gas produced by bread. Yeast can also help the formation of aromas and flavors in making bread. The use of yeast in making bread does not function as a preservative so that the bread has a limited shelf life of only three days (Rumeus and Turtoi, 2013).

Yeast itself can increase antinutrient substances namely phytic acid so that the nutrients in bread cannot be absorbed optimally (Yousif and Faid, 2014). This is contrary to the lifestyle and consumption of Indonesian people today who increasingly want to consume foods that are natural, healthy and nutritious. Therefore, the development of bread by utilizing lactic acid bacteria (BAL) as a source or starter that has the same developer ability as conventional yeast needs to be done in order to suppress the growth of mold Rhizopus sp that can cause damage to the bread and can extend the storage period of bread and more more important is to provide complete nutrition to consumers.

One type of lactic acid (BAL) or commonly referred to as a starter that can be used as an ingredient in making bread is a sourdough starter. Sourdough or levain (in france) is the oldest form of yeast which is a natural bread development agent that is believed by many people to be first created by the Egyptians (Couch, 2016), containing microflora such as BAL and yeast. Until the discovery of commercial yeast in the nineteenth century, sourdough was the only method of bread development. In 1910, the use of traditional sourdough sources was much less used because bread made using commercial yeast was much faster and easier, and produced more consistent products. The positive quality of sourdough bread is unfortunately ignored because of the speed and



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consistency offered by commercial yeast (Couch, 2016).

According to Corsetti and Settanni (Corsetti and Settani, 2007), BAL contained in a sourdough starter are Leuconostoc, Weissella, Pediococcus, Lactococcus, Enterococcus, Streptococcus and Lactobacillus. However, the Lactobacillus strain still dominates sourdough. These microbes in sourdough play a role in the process of acidifying and developing bread (Corsetti and Settani, 2007).

Research conducted by Gocmen et al. (Gocmen et al., 2007) and Thiele et al. (Thiele et al., 2002) produced a conclusion that the application of sourdough to wheat bread produced several effects, including yeast, acidification, improved dough properties, flavor of bread, texture, firmness and delayed staling, increased resistance to microbial spoilage and increased availability of nutrients and fiber. In addition, it has been noted that when sourdough is added, there is a change in the fundamental rheological properties of the wheat dough, making it soft, less elastic and easily formed (Crowley et al., 2002).

The results of bread made using sourdough itself has advantages that can improve taste and aroma, improve nutrition, bind water content, improve texture and extend the shelf life of bread naturally. This is because BAL, yeast, and endogenous enzymes found in sourdough are able to hydrolyze carbohydrates, phenolic compounds, lipids, and proteins. Lipid metabolism during fermentation takes place increasing the activity of antioxidants, anticonductors, and some flavor-forming compounds thereby increasing the shelf life of bread to be doubled or more (Czerny and Schieberle, 2002).

The increasing number of consumer demand for foods that are more natural, tastier and healthier, has made the use of sourdough primers again popularly applied to bread making in bakeries and conventional bread producers in recent years (Thiele et al., 2002). Therefore it is necessary to conduct research on good developers and provide many nutrients and other benefits in making bread. So this makes the basis why the authors are interested in making a research on the use of sourdough primers in making bread for daily consumption that is healthier, easier, and cheaper.

The aim of this study is to gain a better understanding of sourdough starter as a substitute of conventional yeast on the making of artisan (home-made) bread as a healthier option for daily consumption. The benefit of this research is to know how much influence the sourdough starter is giving on the production of artisan bread, and to know how the sourdough starter is performing in term of flavor, aroma, texture, and the shelf life of the bread itself compared to the usage of conventional yeast.

# 2 MATERIALS AND METHODS

## 2.1 Sourdough Starter

Sourdough starter production only requires two ingredients, namely flour and water. Starter production is not limited to the use of wheat flour, because other types of flour used including rice, rye, spelled, barley, and spinach can be used (Couch, 2016)

High-protein wheat flour (Cakra Kembar Premium) was used to make this sourdough starter. The starter was stored in a covered glass container on a room temperature at 25°C. The duration of this experimemt is 2 weeks, the starter was feed once a day with 100mL spring water (Amidis) and 100g of wheat flour then mixed. The starter was fully activated by numerous feedings and close temperature monitoring.

The initial step taken when making this sourdough starter is to make sure the glass bottle to be used is really clean so it is not contaminated. Then mix the flour and water into a glass jar with the same ratio using a ratio of 1:1, stirring until evenly mixed. Then keep the glass jar in a dark and warm place. Leave the glass jar in the closed position for 24 hours. Feed the yeast every 24 hours or once a day, remove half of the mixture from the glass jar and then replace it with a mixture of new ait and flour. This treatment is carried out until the 5th day of fermentation.

## 2.2 Conventional Yeast

Conventional yeast or baker's yeast is a commercial preparation consisting of dried cells of one or more strains of the fungus Saccharomyces cerevisiae. Bakers use yeast as a leavening agent in the rising of dough for baking. A secondary contribution of yeast to bread is flavouring and aroma. Bakers yeast was produced in a high volume and low value, with 1574 x 106 kg being produced per annum on a global scale (O'Shea, 2005). Baker's yeast is marketed in two ways, either as compressed cakes or as a dry powder, however there is also a saleable intermediate of the process known as 'cream yeast'.

Now a days, baker's yeast is a product of biochemical, microbiological, technical knowledge and experience. Biochemistry has led to an insight

into the fermentation process; microbiology has made it possible to breed new and better strains of yeast and to develop better techniques for sterilization and disinfection. Advanced technologies have led to the large scale production of yeast with a high degree of automation and process control, giving commercial yeast of consistent quality and activity at an economic price. By feeding on sugars from the starch in flour, yeast produces carbon dioxide. This gas expands the gluten proteins in the flour and causes the dough to rise, this process of bread making being the most commonly associated with yeast.

## 2.3 Preparation of Sourdough Starter

Thirty-six hours prior to using the starter to make dough, the starter was fully activated by removing 40 g of the culture from the glass container and mixing with 40mL of spring water (Amidis) and 40g of high-protein wheat flour. During this 36-hour activation process the mixture was covered loosely and kept at room temperature, 21°C, between each feeding. After 12 hours the mixture was fed for a second time with 120mL of spring water and 120 g of bread flour. The third feeding was 8 hours later with 360 ml of water and 360 g of bread flour, and the fourth feeding was 8 hours after the third and required 1080 mL of water and 1080 g of bread flour. At this point the culture was active and doubled in size in less than 8 hours.

## 2.4 Bread Making using Sourdough Starter

To conduct this research, researchers made a Baguette bread product made using Instant Yeast and Sourdough Starter so that it can be seen through a comparison after the bread is cooked.

Food for bacteria and yeast consists of an evenly mixed mixture, based on weight, flour and water that is put into the starter. To keep the sourdough starter active at room temperature, microorganisms must be fed regularly every 12 or 24 hours depending on the type of flour and the maturity of the source. When making new starter, for example, it is recommended to feed them every 12 hours for at least the first three days. To activate an inactive starter, the process can take between 1 and 3 days. Often the starter is produced in large mason jars that are lightly covered with cloth such as nets or cheesecloth when being activated at room temperature. This unclosed environment allows microorganisms to breathe.

After the starter is active and mature, in at least two weeks, it is ready to produce a sourdough bread. On making the bread itself requires ingredients:

- 220g wheat flour (Cakra Kembar Premium), plus extra for dusting
- 125g water
- 1/2tsp. sea salt
- 121g sourdough starter

Instructions:

- Combine all ingredients in a mixing bowl and mix well.
- Sprinkle just a couple of tablespoons of flour onto a work surface and knead the dough slightly. It should be a little sticky; avoid adding too much flour to it while kneading.
- Form the dough into a ball and cut in half. Form each half into a long baguette shape. Place the formed baguettes onto a baguette pan or a greased cookie sheet.
- Cover lightly with a damp towel and let rise until double in size in a warm place, 3-6 hours.
- Preheat oven to 220°C. Bake baguettes 15 - 25 minutes, or until golden-brown.
- Remove to a cooling rack for at least 20 minutes and serve.

## 2.5 Bread Making using Conventional Yeast

On making the bread using conventional yeast requires ingredients :

- 383g wheat flour (Cakra Kembar Premium), plus extra for dusting
- 284g water
- 2g instant yeast
- 1tsp salt

The first stage of making is to mix all the dry ingredients, bread flour, salt into a large bowl and stir. Make a well in the middle of the flour mixture, then add the yeast in the middle, mix. Add cold water, little by little, while stirring. Knead the mixture until it is smooth. After it is smooth, cover the bowl with plastic wrap and let it rise to twice the volume. Divide the dough into 4 equal portions, and shape each into a long loaf (about 15 inches in diameter and 1 1/2 inches), with a pointed tip. Place the bread on a flour-wrapped towel, cover with an oiled plastic wrap, and let it rise for 30 to 45 minutes. Sprinkle with flour, and make 4 long cuts down each with a knife, razor, or sharp blade. The bread is ready to bake.

# 3 ANALYSIS REPORT

## 3.1 Time Efficiency

Time spent on preparing each bread dough and fermentation.

## 3.2 Baking Time

The maximum length of baking time each bread sample was baked in a temperature of around 205°C to 220°C until each bread is ready to serve (golden brown in color).

## 3.3 Color

Caracterization of the color on each bread sample after being baked and made.

## 3.4 Flavor

Caracterization of the flavor on each bread sample after being baked and made.

## 3.5 Texture

Caracterization of the texture on each bread sample after being baked and made.

## 3.6 Shelfing Time

The maximum length of storage time each bread sample was stored in a closed state at room temperature for several times until it changes in terms of texture or visualization.

# 4 RESULTS AND DISCUSSION

## 4.1 Time Efficiency

By using sourdough, stirring the dough will be faster because the yeast is already in the starter, so that when the sourdough mixing process does not need to use additional yeast again. In addition, the first development fermentation is faster because there are already some active yeasts and final proofing is also faster. While the drawback is that it takes quite a long time in making this sourdough starter.

Conventional yeast requires a longer time for the fermentation process, thus the use of conventional yeast is more efficient in its use because it does not need to be made first.

## 4.2 Baking Time

In terms of baking time, each bread sample was baked for 15 - 25 minutes in a temperature of around 220°C until golden brown.

## 4.3 Color

In terms of the color, both breads that uses conventional yeast and sourdough are both golden brown when exiting the oven.

## 4.4 Flavor

The more time dough takes to rise, the more flavor will be in the final loaf of bread. Sourdough bread has a slightly sour taste because sourdough itself is an artificial yeast that produces lactic acid bacteria (BAL) which is dominated by Lactobacillus strains.

While for the bread with conventional yeast does not have a sour taste. Dough made with conventional yeast rise very quickly, this make the bread sample made with conventional yeast doesn't have as much flavor. This is why other ingredients, like oil, butter, sugar, or honey, are often used in recipes calling for instant yeast.

## 4.5 Texture

In terms of the texture, both bread have crunchy cured on the outside and rather chewy in the inside. The differences from both breads are sourdough bread is more resilient, has a larger cavity also much more softer and moist compared to bread that uses instant yeast. While for the bread using conventional yeast comes with smaller spreaded cavity and drier inside.

## 4.6 Shelfing Time

Then in terms of storage / shelfing time, sourdough bread have a longer shelfing time (5 days) when stored in a closed state at room temperature until it become harder and bread that uses instant yeast more quickly becomes harder than sourdough bread when stored in a closed state at room temperature (3 days).

Table 1: Result of The Experiment

| | **Conventional Yeast** | **Sourdough Starter** |
|---|---|---|
| **Time Efficiency** | It takes a shorter time in the bread fermentation process, and faster in preparation of making dough. | Longer time in fermentation process, takes time and patience in making the sourdough starter. |
| **Baking Time** | 15 - 20 minutes in a temperature of around 220°C until golden brown | 15-25 minutes in total until it reaches golden brown color. |
| **Color** | Golden brown | Golden brown |
| **Flavor** | Plain | Sourish |
| **Texture** | Crunchy at the outside with a soft and chewy texture in the inside. Small spreading cavaties, drier body. | Crunchy at the outside with a soft and chewy texture in the inside. Larger spreading cavities, moist and softer body. |
| **Shelfing Time** | 3 days in room temperature until the bread hardens | 5 days in room temperature until the bread hardens |

# 5 CONCLUSION

From the above results it might be concluded that there are weaknesses and strengths of using sourdough as a source of bread development. It tastes much better, more fragrant and more moist. Its softness level also seems stable even though it's been days compared to commercial yeast. In addition, sourdough can last for years if properly maintained, fed with regular drinking and drinking to stay alive. Sourdoughfermentation process is relatively long. That is why the resulting bread becomes more delicious, easy to digest the stomach, and soft and moist. Thus, bread using sourdough is more healthy than bread using conventional yeast.

From this research the authors recommend using sourdough starter instead of conventional yeast to used in making bread. Sourdough has better taste and texture compared to conventional yeast, sourdough also uses beneficial microorganisms that come from natural ingredients, not from artificial yeast. Naturally fermented bread will be a lot more healthy because there are no artificial additives.

From this research, it can be developed further as a reference for further research on the nutritional content of sourdough sources and also the production of sourdough sources using other media besides water and flour.

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