

THE EFFECT OF ADDITION OF GARLIC'S (*Allium sativum*) EXTRACT ON BEEF PROTEIN LEVELS WHICH IS EXPOSED BY MICROWAVE RADIATION

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ABSTRACT

Aim/Objective The aim of this study was to determine the effect of adding garlic which contains antioxidant compounds, to beef protein levels exposed to microwaves in the cooking process using a microwave oven. **Material and method** This research method is a pure experimental research with pretest posttest control group design. The independent variable in this study was the concentration of garlic which was varied in 3 different concentrations namely 25%, 50% and 100%. The solvent used in making garlic extract is water. Dependent variable is the level of meat protein before and after administration of antioxidants and microwave radiation exposure. The type of meat used is beef sirloin. A total of 100 grams of meat with a thickness of 2.5 cm, applied with garlic extract and left for 1 hour at room temperature. The meat is then cooked using a microwave oven with a temperature of 150°C and baking time for 8 minutes. Protein content test using the Kjeldahl method before and after treatment, carried out in the health laboratory, Universitas Citra Bangsa. **Results** The results showed that there was a significant effect between garlic concentration on beef protein levels exposed to microwaves (p -value = 0.048). The correlation coefficient (R^2) between garlic concentration and protein content is 0.906. **Conclusion** Garlic concentration has a positive influence on meat protein levels. This means that the higher the concentration of garlic added to the meat before cooking, the higher the level of meat protein can be maintained.

Keywords: Garlic, protein level, microwave radiation

INTRODUCTION

Protein as a body building substance, has the function of forming new tissues in the body. Lack of protein can reduce the body's resistance to disease. High protein intake can strengthen the immune system so it is not susceptible to disease, especially in the current covid-19 pandemic[1]. Pregnant women also need large amounts of protein. Protein needs of pregnant women per day between 75-100 grams [2]. One food source that is rich in protein is beef.

The protein content in beef is different for each part. The sirloin has the highest protein content, which is about 27 grams per 100 grams of meat [3]. However, the cooking process, can reduce protein content in meat. Research conducted by Sundari *et al* (2015) found that the protein content of meat cooked by frying can

reduce protein content by 16%, whereas by boiling it reduces the protein content by 8.8% [4]. Decreased protein levels are due to protein denaturation due to increased temperatures in the cooking process.

Protein denaturation is a decrease in protein levels due to damage to the protein chain in food. Protein denaturation can be caused by various things such as an increase in temperature [5]. The use of temperatures between 180⁰ C to 300⁰ C in the cooking process will cause considerable damage or can reduce the nutritional value of protein [5,6]. Damage to the protein chain can cause the formation of radical compounds in food. Radical compounds that enter the body can bind to healthy cells or tissues in the body so that abnormal cells and tissues are formed which trigger various diseases such as cancer. Research conducted by a team of researchers from Shahid Baheshti

University Iran, explained that cooking meat using a microwave can cause the formation of heterocyclic amine compounds that trigger cancer [7]

Microwave oven is one of the cooking instruments that is currently widely used because it is more practical and effective. This oven can be used easily, only by connecting to a power source, without the need to use gas fuel. In addition, the time needed to cook is also faster than other cooking instruments. The heat produced to ripen food comes from microwave radiation that is exposed to food. This radiation is not classified as ionizing radiation, so that its exposure will only result in the excitation of electrons in food. However, the use of high temperatures can trigger the occurrence of protein denaturation thereby reducing protein levels and forming radical compounds in food. To reduce the activity of radical compounds, anti-free radical compounds are needed or known as antioxidants [8,9].

Antioxidant compounds are compounds that are able to donate electrons to radical compounds thereby reducing the reactive nature of these radical compounds. One ingredient that has potential as an antioxidant is garlic (*Allium sativum*). Garlic is a popular cooking spice and is very often used in Indonesian cuisine. Previous research results showed that garlic extract contained alkaloids, flavonoids and triterpenoids [10]. This compound has antioxidant potential that can reduce the reactive nature of free radical compounds. Referring to the potential possessed, and the use of garlic as a cooking spice, the researchers felt the need to conduct research related to the potential of garlic in preventing free radicals that might arise during the cooking process using a microwave oven.

MATERIAL AND METHODS

This research is a true experimental research with pretest posttest control group design. The independent variable in this study was the concentration of garlic which

was varied in 3 different concentrations namely 25%, 50% and 100%. Garlic extract is made using water as a solvent. Dependent variable is the level of meat protein before and after administration of antioxidants and microwave radiation exposure.

Beef sample used is sirloin. A total of 100 grams of meat with a thickness of 2.5 cm, distributed with garlic extract and left for 1 hour at room temperature. The meat is then cooked using a microwave oven with a temperature of 150°C and a baking time for 8 minutes. The purpose of choosing the temperature and roasting time is to get the level of medium well maturity. This level of maturity is the level of maturity for steaks that most people like most.

The test sample was divided into 5 groups, consisting of 2 control groups and 3 experimental groups. The control group was divided into negative control group, which was the sample group without the addition of extracts and microwave exposure. While the positive control group for samples cooked using a microwave oven but without the addition of garlic extract was added. The three experimental groups were given the addition of extracts with different concentrations for each group, then cooked using a microwave oven.

Protein content testing using the Kjeldahl method. Protein content test is done before and after the treatment of the addition of onion extract and cooking with a microwave oven, carried out in a health laboratory Universitas Citra Bangsa.

RESULT

3.1. Identification of Beef Protein Retention in Control and Experiment Groups After Exposure to Microwave Radiation

The retention rate of meat protein for the control and experimental groups before and after treatment is shown in the diagram in Figure 1 below

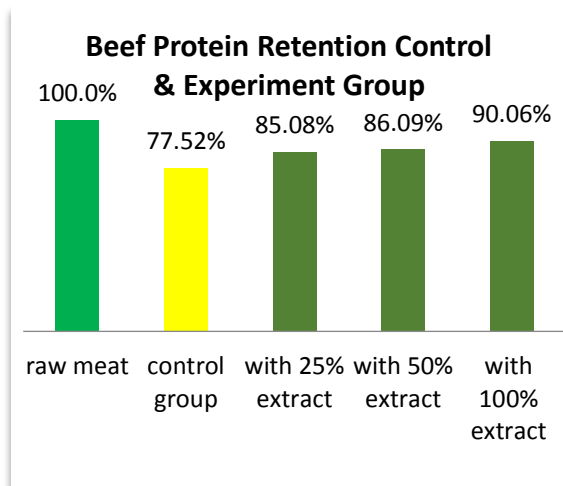


Figure 1. Beef protein retention rates in the control and experimental groups after exposure to microwave radiation.

Based on Figure 1 above, it is known that the control group which was given microwave exposure without the addition of previous garlic extracts, had a protein retention rate of 77.52% or decreased by 22.48% compared to when in raw conditions. In the experimental group given the addition of garlic extract before irradiation, the retention rate of meat protein showed a higher value. At a concentration of 25%, meat protein retention was 85.08%, or 7.56% better than the control group without extracts. As for the group that was given garlic extract with concentrations of 50% and 100%, the retention rate of meat protein showed values of 86.09% and 90.06%, respectively. This shows that there are differences between each control and experimental group, therefore a statistical test was performed to determine the effect of variations in the concentration of garlic extract on meat protein retention exposed to microwave radiation. The statistical test used was a simple linear regression test with the independent variable (X) being the concentration of garlic extract, and the dependent variable (Y) was the level of meat protein retention

3.2. Effect of Garlic Extract Concentration on Beef Protein Retention after Exposure to Microwave Radiation

Linear regression test results showed that the concentration of garlic extract given to meat before exposure to microwave radiation had a significant effect on the level of meat protein retention (p-value 0.048). The linear curve of the effect of extract concentration on meat protein retention is shown in Figure 2 below

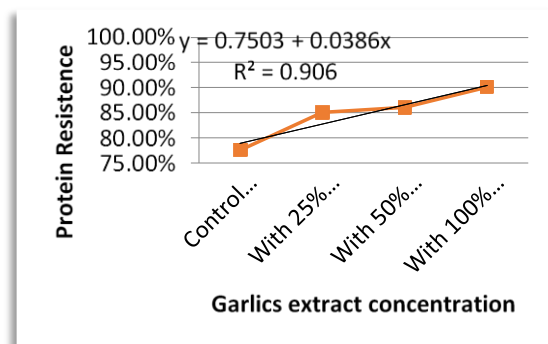


Figure 2. Linear curve effect of garlic concentration on the level retention of meat proteins exposed to microwaves

Figure 2 above shows that the regression equation formed from this relationship is $Y = 0.7503 + 0.0386X$. This equation illustrates that without the addition of garlic extract to meat, meat protein retention is estimated to be at the value of 0.7503 or 75.03%, with the addition of 1 unit of garlic concentration, will increase meat protein retention by 3.86%. The regression coefficient (R^2) formed is 0.906 or 90.6% which means that there is a strong positive influence between the concentration of garlic extract and the level of beef protein retention exposed to microwaves.

CONCLUSION

Based on the description of the findings above, it can be concluded that the cooking process using a microwave oven can reduce beef protein content by about 22.48%. however, the addition of garlic extract at a concentration of 100% can increase beef protein retention to around 90.06%. the

concentration of garlic extract has a positive impact on the retention of beef protein cooked in a microwave oven. the higher the concentration of garlic added, the higher the beef protein retention.

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