

# Investigating the effect of ratio *Lactobacillus acidophilus* to the antioxidant of fermented eggplant (*Solanum melongena*)

Nguyen Thi Ngan, Dong Thi Anh Dao \*

Dong Nai University of Technology, Bien Hoa City, Dong Nai province, Vietnam

## Email address:

ngantp76@gmail.com (Đ. T. A. Dao)

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**Abstract:** Fruit juice serves as a source of energy, vitamins, minerals and dietary fiber. In addition, certain fruit juices contribute bioactive compounds with different functional properties to human. Eggplant is ranked as one of top ten vegetable in terms of oxygen radical scavenging capacity due to the fruit's phenolic constituents. Among the various processing options, lactic acid (LA) fermentation is considered as a valuable processing method for maintaining and improving the safety, nutritional and sensory properties of vegetables. In this study, the ratio of *Lactobacillus acidophilus*  $1 \times 10^{10}$  cells/ml supply to fermented eggplant have the highest level of total polyphenol and antioxidant and higher material.

**Keywords:** Eggplant, Antioxidant, Polyphenol, *Lactobacillus acidophilus*

## 1. Introduction

Eggplant (*Solanum melongena* L.) is one of the popular vegetables in tropical and subtropical countries [1]. Eggplant is well-known in Asian such as Egypt, China and Italia [2]. Eggplant is ranked amongst the top ten antioxidant-rich vegetables for health benefits and wellness. Further, the antioxidant and polyphenol have been found in both eggplant's skin and its flesh [3].

Fermenting fruits and vegetables is a process of producing lactic acid using fruits, veggies, sugar, salt and other ingredients. The fermented products are not only delicious, easy to digest but also enhance nutrients such as folic acid, riboflavin, niacin, thiamin and biotin and are high in antioxidant activities [7]. A recent study shows fermented cabbage enhances its antioxidant activities.

## 2. Material and Experimental Method

### 2.1. Material

- Eggplant used in this study was originated from a farm in Dalat.
- *Lactobacillus acidophilus* was originated from department of biotechnology, faculty of chemical engineering, Ho Chi Minh City University of

### Technology

### 2.2. Analytical Methods

Total phenolic content were evaluated by spectrophotometric method using Folin-Ciocalteu reagent [4]

The results were expressed as the equivalent to mg of gallic acid per litre of eggplant juice (mg GAE/L).

The antioxidant activity of eggplant was evaluated by FRAP (Ferric Reducing Ability of Plasma)[5].

### 2.3. Experimental Method

#### 2.2.1. Investigate Fermented Eggplant

Slice eggplant, treatment browning with vitamin C 0.5% in 5 minutes. Supply *Lactobacillus acidophilus* with ratio 0;  $0.5 \times 10^{10}$ ;  $1 \times 10^{10}$ ;  $1.5 \times 10^{10}$  cells/ml. Determining total phenolic content and antioxidant activity.

#### 2.2.2. Statistical Analysis

All experiments were performed in triplicate. Means were compared by Multiple range tests with  $p < 0.05$ . Analysis of variance was done using the software Statgraphics plus, version 3.0.

### 3. Results and Discussion

#### 3.1. Total Polyphenol of Fermented Eggplant

When adding lactic acid bacteria, the highest total polyphenol content is at the third day of the study and then gradually decreases. With additional bacteria ratio is  $1 \times 10^{10}$  (cells/ml), total polyphenol content peaked in the 3rd day of fermentation is 790,908 mg GAE/L higher than experiment not supply bacteria lactic 506,817mg GAE/L.

Table 1. Total polyphenol of fermented eggplant after 5 days

Day	Ratio <i>L.acidophilus</i> (cells/ml)	TPC (mg GAE/l)
1	0	423,863 <sup>bc</sup>
	$0,5 \times 10^{10}$	406,817 <sup>ab</sup>
	$1 \times 10^{10}$	438,636 <sup>c</sup>
	$1,5 \times 10^{10}$	389,772 <sup>a</sup>
2	0	552,273 <sup>b</sup>
	$0,5 \times 10^{10}$	520,454 <sup>c</sup>
	$1 \times 10^{10}$	670,454 <sup>a</sup>
	$1,5 \times 10^{10}$	523,863 <sup>c</sup>
3	0	506,817 <sup>a</sup>
	$0,5 \times 10^{10}$	709,091 <sup>c</sup>
	$1 \times 10^{10}$	790,908 <sup>b</sup>
	$1,5 \times 10^{10}$	720,454 <sup>c</sup>
4	0	561,363 <sup>a</sup>
	$0,5 \times 10^{10}$	636,363 <sup>ab</sup>
	$1 \times 10^{10}$	677,272 <sup>b</sup>
	$1,5 \times 10^{10}$	672,726 <sup>b</sup>
5	0	339,772 <sup>a</sup>
	$0,5 \times 10^{10}$	545,454 <sup>c</sup>
	$1 \times 10^{10}$	492,045 <sup>b</sup>
	$1,5 \times 10^{10}$	542,045 <sup>c</sup>

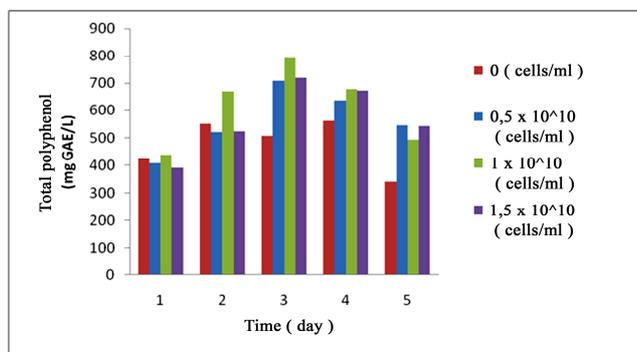


Figure 1. The effect of ratio *L.acidophilus* to the total polyphenol of fermented eggplant

Lactic acid bacteria can produce  $\beta$ -galactosidase, catalyses the production of polyphenol compounds [6]. Moreover, the fermentation process softens the structure of fruits and vegetables, making phenolic easily be extracted. Thus, lactic acid fermentation increases the total polyphenol content than fermented material before.

#### 3.2. Antioxidant Activity of Fermented Eggplant

Through Table 2 and Figure 2, we see, in the same proportion in  $10^{10}$  cells / ml, the total antioxidant activity is the highest and the difference is significant at  $P > 0.05$  compared to the other through the day rate up yeast. Total antioxidant activity peaked on the third day was 13,720

mmol TE / g significant difference with other treatment.

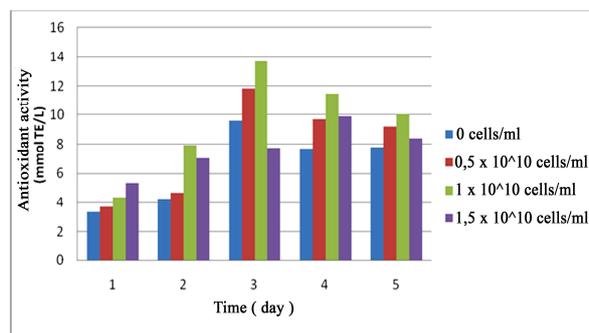


Figure 2. The effecting of ratio *L.acidophilus* to the antioxidant activity of fermented eggplant

Table 2. Experimental of antioxidant activity of fermented eggplant

Day	Ratio <i>L.acidophilus</i> (cells/ml)	Antioxidant activity (mmol TE/g)
1	0	3,367 <sup>a</sup>
	$0,5 \times 10^{10}$	3,692 <sup>a</sup>
	$1 \times 10^{10}$	4,359 <sup>b</sup>
	$1,5 \times 10^{10}$	5,325 <sup>c</sup>
2	0	4,267 <sup>a</sup>
	$0,5 \times 10^{10}$	4,665 <sup>b</sup>
	$1 \times 10^{10}$	7,926 <sup>c</sup>
	$1,5 \times 10^{10}$	7,025 <sup>d</sup>
3	0	9,607 <sup>a</sup>
	$0,5 \times 10^{10}$	11,814 <sup>b</sup>
	$1 \times 10^{10}$	13,720 <sup>c</sup>
	$1,5 \times 10^{10}$	7,745 <sup>d</sup>
4	0	7,664 <sup>a</sup>
	$0,5 \times 10^{10}$	9,699 <sup>b</sup>
	$1 \times 10^{10}$	11,488 <sup>c</sup>
	$1,5 \times 10^{10}$	9,920 <sup>d</sup>
5	0	7,761 <sup>a</sup>
	$0,5 \times 10^{10}$	9,176 <sup>b</sup>
	$1 \times 10^{10}$	10,069 <sup>c</sup>
	$1,5 \times 10^{10}$	8,376 <sup>d</sup>

### 4. Conclusion

Total polyphenol content of eggplant seed density fermentation of  $10^{10}$  cells / ml complement 100g eggplant is the highest maximum in the 3rd day of fermentation and then gradually decreases but remains higher than raw material. Total antioxidant activity of eggplant fermentation also increased according to the law of total polyphenol content.

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