

THE EFFECT OF THE ADDITION OF YEAST ISOLATES ON THE COLOUR DIFFERENTIATION IN COCOA BEANS DURING THE FERMENTATION

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Abstract

The concern of cocoa beans process is the fermentation process. In this process, there is a the formation of potential flavor, bitter taste reduction and improved physical appearance, including the colour of cocoa beans and cocoa beans pieces consistency. During the fermentation process of cocoa beans, the microbes which take a role are acid-forming yeasts and bacteria. Generally, the fermentation of cocoa beans only takes advantage of microbial activity derived from spontaneous inoculation, including contamination of the environment, the worker, cocoa fruit, and the tools used in the process of it. The problem is when the pure yeast isolate added to the fermentation, not be known influence on the final product of fermentation, especially for the colour quality of cocoa beans. The purpose of this research was to determine the effect of the addition of yeast isolates and the time of fermentation of color differentiation in cocoa beans during fermentation. The result of this study is expected to improve the fermentation process in order to improve the quality of cocoa beans, especially the colour of them. The analysis method used in this research includes the descriptive methods and the Random Group Design with factorial arrangement consisting of two factors, the pretreatment factors before the fermentation process (A) with two steps, ie, A0 = no addition of yeast isolates (control) and A1 = with the addition of yeast isolates. The second factor is the length of fermentation (B) with 7 steps, namely fermentation day-0 until the 6th day of fermentation (B0-B6). The conclusion from the result of this research indicates that the addition of yeast isolates and long fermentation gives a real different effect of Fermentation Index and the value of *L, a and b Colour Reader*. The interaction of the addition of yeast isolates and long fermentation give a real effect on Fermentation Index and the value of *L, a and b Colour Reader*. With the addition of yeast isolates and the length of time of fermentation, the brown color that appears in the fermented cocoa beans is better. The Fermentation Index of the treatment with the addition of yeast isolates on day-5 is 1.84 with a value *b Colour Reader* reached 17.5.

Keywords : *Cocoa Fermentation, Yeast Isolates, Colour Differentiation.*

Introduction

Cocoa in Pelita IV is one of commodities which is peculiarly paid attention. To push the increase of national foreign exchange acceptance, then government avert their attention seriously to the increase and the development of cocoa commodity. The effort which are done by the government are expansion, rehabilitation, intensification, diversification. According to Statistical data of Plantation of Indonesia, export volume, Indonesian cocoa

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in 1997 is reaching 265,949 ton with \$ 274526.000 US export value. While the import volume of cocoa in Indonesia is reaching 6410 ton with import value \$ 9.981.000 US (Central Bureau of Statistic, 1998).

Since the emulation in marketing cocoa to the international market is tighter, then we need various effort to increase our compotitiveness. Those efforts are upgrading quality, efficiency, promotion (Hardjosuwito, et al, 1985). According to Wahyudi (1994) in Aziz (1996), the production of Indonesian cocoa during the time is dominated by people cocoa which is commonly low quality and characterized by: high water rate, low fat content, tasteless, and the fuctuative seed quality.

One of the prior processes which is done in the cocoa processing is fermentation. There are so many important changes happen in the fermentation process. Those changes give positive effect to the quality of cocoa itself. This process creates such kind of compound that make dry seed aroma in cocoa seed. According to Rohan (1963), the aim of fermentasion are to discharege the pulp from its seed and to kill the seed. How does it work? It works by making etanol from sugar which consist in the pulp, then etanol creates asetate acid. Fermentation can also generate flavor and improve its colour. Flavor forming happens by enzymatic way after the seed is death.

Cocoa processing focuses on fermentation process. In this process flavor is created, bitterness is decreasing, and the appearance of the seeds are improved. Those appearance improvement are the colour and the cocoa seeds consistency. Furthermore, fermentation failure cannot be fixed by by other process. In other word we can say that it is total failure of cocoa seeds processing.(Wahyudi et al., 1988).

In globalization or free trade era, market competition will be so tighter that quality will become prior attention. This condition will make Indonesian cocoa unappreciated and unacceptable by consumer. To solve and to anticipate those problem, we need to make it better and we need also make the quality of people cocoa improved (Aziz, 1996).

During cocoa fermentation process, yeastand sourness maker bacterium are the microbe which play important role. Generally cocoa fermentation only exploiting microbe spontaneous inoculation activity which happen on environmental contamination, worker's hands, cocoa itself and devices used in processing. The problem is if pure yeast isolates added in fermentation process, but the final product especially the quality of cocoa colour has not been known. Related to this condition, we need to do a study about: "The Effect of

Adding Yeast Isolates to The Colour Differentiation on Cocoa Seed During Fermentation".

The aim of the study are : 1) to know the effect of yeast isolates on the colour of cocoa seed which is produced ; 2) to know the effect of time depth fermentation on cocoa seed colour differentiation. ; and 3) to know the effect of yeast isolates and fermentation time depth , when they are combined to each other, on the colour differentiation of cocoa seed which is produced. The result of the study are hoped to be able to make cocoa fermentation process better, in order to improve the quality of cocoa seed, especially the colour.

Methodology

This research use type of Farastero cocoa which is got from Kebun Kota Blater PTP Nusantara XII in Jember. Pure breeding of yeast used is isolat which is dominated on pektinolitik power and alcohol fermentation (Susijahadi dan Jinap, 1998) in Microbiological Quality Control Laboratory of the Faculty of Agriculture Processing, University of Jember. Research and analysis are conducted in Microbiology Laboratory of Agricultural Products Processing Technology Department, Faculty of Agricultural Technology, University of Jember and Jember Coffee and Cocoa Research Center.

Analysis methods used in this reaserch are: 1) deskriptif method for *cut-test* parameter, in this method data used is interpreted to a graph then the graph is described ; 2) other parameter is L, a and b are *colour reader* which is analyzed using Randomized Group Design, the factorial formation consists of 2 faktor those are antecedent treatment before fermentation process (A) with 2 level, those are A0 = without adding yeast isolates (control) and A1 = by adding isolat khamir. The second factor is fermentation time depth (B) with 7 level, those are day-0 to day-6 fermentation (B0-B6). Data obtained is analyzed differently (variant analysis). Real differences which is yielded is analyzezd using Turkey Test (BNJ). Parameter perceived in this research are : cut-test (MARS Standard Method), Indeks Fermentasi (Gourieva dan Tserevitinov Method, 1979) and *L value, a and b Colour Reader* (Fardiaz Method, 1992).

Result and Discussion

Cut-Test

Cut-test is done in order to know part defectsof seed and fermentation degree which is based on the seed cleft colour value. Cut-test is done to 100 seeds with colour value criterion/seed Slaty = 0 ; full purple = 1 ; dominant purple = 2 ; dominant brown = 3 and full brown = 4. Fermentation result in cut-test value to 100 cocoa seeds is shown in figure 1.

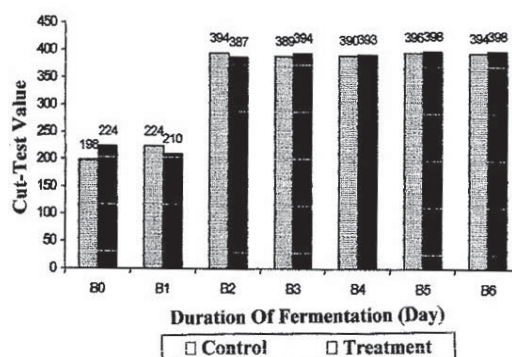


Figure 1. Fermentation result in cut-test value to 100 cocoa seeds graph

Figure 1 shows average value of cut-test which is obtained from both treatment is > 300 shows that from 100 cocoa seeds which are taken as sample, each of seeds has average colour value 3, this mean, cocoa seed commonly brown-purplish (brown is more dominant than purple). Cu-test result also shows that there is not slaty seed (0 value), mouldy seed and seed which is surrounded by insects. Thereby, as special requirement of SNI 01-2323- 1998, fermentation seed product from both treatments can be included to I quality.

Fermented cocoa seed cut-test result based on colour category and part defect is shown by graph in figure 2 shows control, figure 3 shows yeast isolates adding treatment.

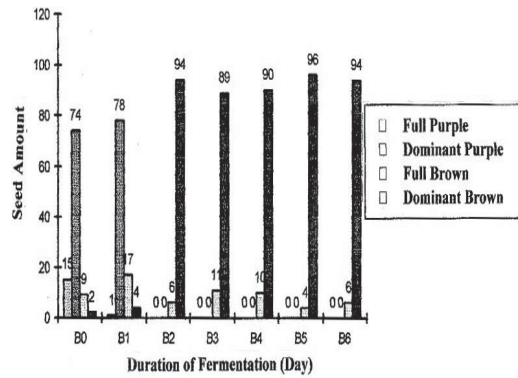


Figure 2. Test result graph of 100 fermented cocoa seed without yeast (control)

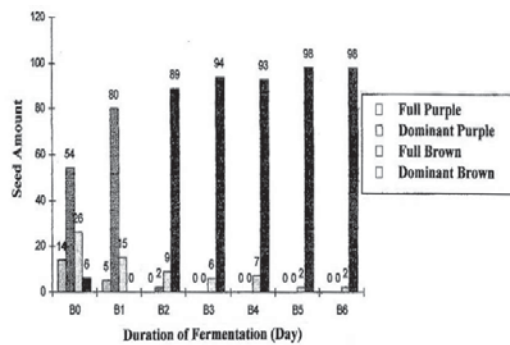


Figure 3. Test result graph of 100 fermented cocoa seed with adding yeast isolates treatment

From the graph in Figure 2 and Figure 3 can be seen the difference in the amount of cocoa beans brown in the fifth and sixth days of the fermentation. On treatment with the addition of yeast isolates, from 100 cocoa beans are taken as samples to be tested on day-5 and-6, 98% are pieces of brown cocoa beans. While in control, brown cocoa only reach 94 – 96% only.

Fermentation Index

Fermentation index is a measurement of the degree of fermentation chemically. The results of chemical measurements are more objective than the cut – tes results, because its value is based on the absorbance of the compounds of fermentation and the constituent. The compound is the result of fermentation of tannin-brown colored complex with maximum absorbance at a wavelength of 460 nm, a compound that decreases during the fermentation is purple anthocyanins with maximum absorbance at a wavelength of 530 nm (Gourieva and Tserevitinov, 1979).

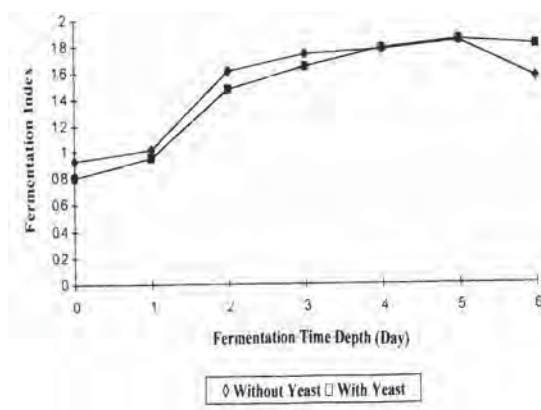


Figure 4. The graph of the relation between the fermentation Index and the duration of fermentation

From the graph in Figure 4 can be seen that the cocoa bean fermentation index values for both treatments have increased with the length of time of fermentation. Although the chart pattern formed by two treatments are slightly different, but at the end of fermentation all have the fermentation index value > 1.00. Thus the degree of fermentation is already good.

This is in accordance with the opinion expressed by Alamsyah (1991), which is the anthocyanin is a purple pigment, and it is the characteristic of cocoa lindak. Anthocyanins diffused out after the beans have died from acetic acid seeped into the grain and the increasing temperature during the fermentation process that leads to the rupture of the cell walls. Under aerobic conditions, the color purple is progressively reduced and at the same time will form a brown liquid in the space between the seed and seed pieces. The second component is in the beans after fermentation ends.

Colour Reader

1. *L value of Colour Reader*

L value of Colour Reader indicates brightness (lightness) of a material. L values range from 0-100. The higher the value of L, showing material color is near white (bright), while the lower value of L, then the color of the material close to the black (dark). The measurement of L value of Colour Reader toward the cocoa beans during the fermentation for both treatments can be seen in Figure 5

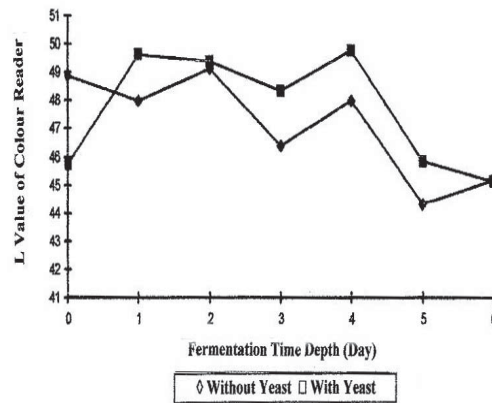


Figure 5. The chart of relationship between *L value of Colour Reader* with Long Fermentation

The graph in Figure 5 shows that the *L value of Colour Reader* for both treatments experiences not permanent changes during the fermentation. At the end of fermentation, *L Colour Reader* for both treatments point to a common point. This proves that the longer duration of fermentation, the cocoa bean pieces brightness levels tended to decrease, which means that the brown color which is formed at the end of fermentation is high enough so that the value of *L Colour Reader* tends to lead to a darker color (black).

2. *a Value of Colour Reader*

a value of Colour Reader indicates red to green color of a material. The range of *a value of Colour Reader* is about (-80) – (100). The higher the value of *a*, then the color of the material closer to red, while the lower the value of *a*, then the color of the material closer to the green color.

The results of measurement of the *a value of Colour Reader* on cocoa beans during the fermentation for both treatments can be seen in Figure 6.

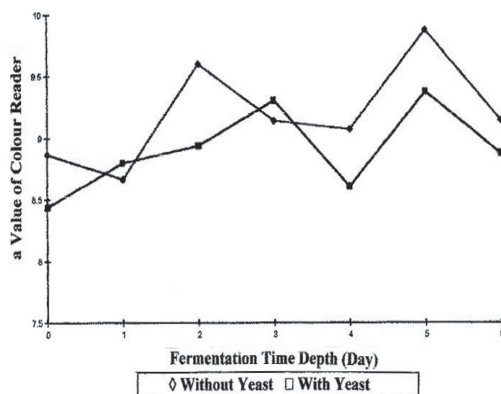


Figure 6. Chart of relationship between *a values of Colour Reader* with the duration of fermentation

Based on the graph in Figure 6, it is known that during the fermentation, the *a value of a Colour Reader* experience not permanent changes. At the end of fermentation, the *a value of a Colour Reader* on the sixth day for treatment with the addition of yeast isolates was 8.87, where as for the treatments without yeast is 9.13.

From Figure 6 it can be seen that the length of fermentation affect the *a value of Colour Reader*, in other words the level of the red color of the pieces of cocoa beans changes during fermentation, although in very small quantities. This happens because the component of the color of the beans which is degraded during the fermentation takes place is the purple – pigmented anthocyanin, including the polyphenol compounds. According to Forsyth (1952), aerobic fermentation of polyphenols form of brown colour. Thus, the value of *a Colour Reader* from fermented cocoa beans tends to be little changed.

3. *b Value of Colour Reader*

b value of Colour Reader indicates a blue to yellow color of a material. *B values* ranged between (-80) – (70). The higher value of *b*, the material closer to yellow, whereas the lower value of *b*, then it getting closer to the blue color. Purple and brown colour contained in cocoa beans, was detected in the *b Colour Reader*.

The result of the measurement of *b value of Colour Reader* toward the cacao bean during the fermentation for both treatment can be seen in figure 7

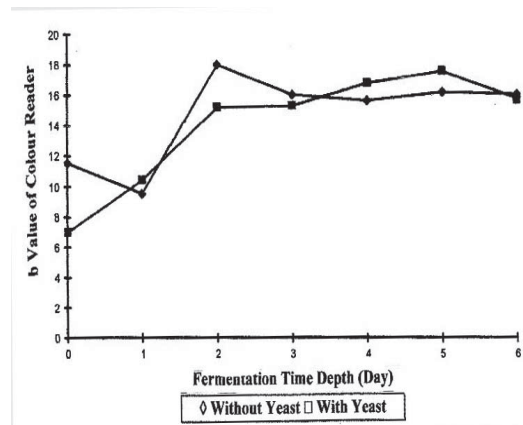


Figure 7. The graph of relationship between *b value of Colour Reader* with the duration of Fermentation

From the graph in Figure 7 it can be seen that the *b value of Colour Reader* of both treatments began to increase high enough on the second day of of fermentation. The next *b value Colour Reader* tended little changed until the end of of fermentation, *b value of Colour Reader* from the two treatments, that is the control and treatment with the addition of yeast isolates nearly lead to a common point.

Conclusion

Based on the research that has been done, it can be concluded as follows:

1. The addition of yeast isolates and the length of time of fermentation give a very real influence on fermentation index and the value of *L, a and b Colour Reader*.
2. The interaction between the addition of yeast isolates and the length of time of fermentation give a very real effect on fermentation index and the value of *L, a and b Colour Reader*.
3. With the addition of yeast isolates and the length of time of fermentation, the brown color that appears in the fermented cocoa beans becomes better.

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