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Cause Analysis of Cutting Process Problems on The Size of Nata De Coco Cutting Type NDC 12

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ABSTRACT

The nata de coco cutting process takes place using three types of cutting machines, namely conventional cutting machines, conveyor cutting machines, and chain conveyor machines. The process of cutting nata often experiences practical problems, especially on the size of the pieces that do not match the predetermined criteria. This result in a decline in product quality and customer acceptance. The purpose of this study was to determine the causes of problems in the process of cutting nata de coco type NDC 12. Problem analysis was carried out using quantitative methods presented in the table of oversize nata de coco test data on each machine used so that deviations in the size of the nata produced against the criteria had been determined. determined, as well as qualitative methods with fishbone diagrams based on data from observations, interviews and documentation. The results of the size of the NDC 12 nata de coco pieces in general are still not in accordance with the standards set by the company, it can be seen from the average value of the largest defect in the chain conveyor machine, which is 12.75g pre-sorting treatment and 7.17g post-treatment. sort. This is largely due to machine work that is less than optimal and the pre-cutting process is not in accordance with work procedures.

1. INTRODUCTION

Nata de coco is a food product made from coconut water. Nata is used to refer to the floating gel-like or agar-agar growth produced by the bacterium *Acetobacter xylinum* on the surface of media containing sources of carbon (sugar), hydrogen, nitrogen, and acids (Hamad & Kristono, 2013). Nata in the form of a thick membrane containing 35-62%

cellulose, cloudy white, and chewy. Cellulose produced during fermentation is a type of microbial polysaccharide composed of cellulose fibres produced by *Acetobacter xylinum* and bound together by microfibrils (Gresinta et al., 2019; Rahayu & Rohaeti, 2014).

The development of the company is directly proportional to the increasing demand for nata de coco products, this has an impact on increasing the intensity of the production process (Rahmayanti et al., 2019). However, the increase in the production process has the potential to cause new problems for the company, namely the quality of the products produced. This problem is often encountered in the demand for NDC 12 nata de coco products with a cut size criterion of 0.3 cm. The quality of the nata de coco pieces that do not meet the criteria set by the company can result in a decrease in the quality of the resulting product. This is a concern in the production process, especially in the nata de coco cutting process on the number of product defects. As a result, the company can suffer losses both in terms of energy and costs (Wahyuni & Jumiati, 2019).

2. MATERIALS AND METHODS

2.1. Materials

The material used in this study was nata de coco which was obtained from a company in Yogyakarta.

2.2. Research Methods

The data analysis method used is descriptive quantitative by calculating the product size oversize from conventional cutting machines, conveyor machines, and chain conveyor machines on NDC 12 nata de coco cutting. In addition, qualitative descriptive methods are also used to analyze data based on observations, documentation and interviews that aim to understand the possible causes of the observed problems which are then presented in the form of a fishbone diagram.

3. RESULT AND DISCUSSION

The oversize test is used in quantitative analysis to determine the deviation of the size of the nata de coco pieces produced against the predetermined cut size criteria (Basuki & Fahadha, 2020). The sample of nata de coco observed was nata from 0.3 cm in size which was taken as much as 100g and came from conventional cutting machines, conveyor machines, and chain conveyor machines. There are two types of cuts that are considered as defects resulting from the nata de coco cutting process, these two defects are called oversize (to the size of 0.3 cm) and frog eggs as shown in Table 1. The oversize test procedure is described as shown in Figure 1.

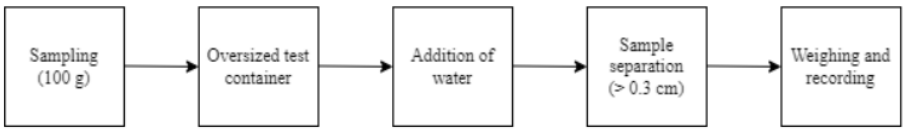

Figure 1. Oversize test procedure

Table 1. Type of defect cut nata de coco type NDC 12

Defect type	Characteristic
Oversize nata de coco 	• Size greater than or less than 0.3 cm. • Does not pass the filter or sieve sort. • Does not have a clear shape.
Frog eggs 	• Size greater than or less than 0.3 cm. • Shaped like chains or frog eggs. • Nata pieces are not separated from one another.

The oversize value is also used to determine the quality of the cut on the cutting machine used. Oversize test observation data are presented in Table 2 and Table 3.

Table 2. Nata de coco oversize test results on conventional cutting machines

Sample mass (g)	Pre-sort Oversize (g)	Post-sort Oversize (g)
100	4	3.30
100	5.34	3.30
100	4.50	3.90
100	5.80	4.10
100	3.70	2.70
100	4.20	3.20
100	3.26	2.60
Total	30.8	23.10
Average	4.40	3.30

Oversize test results on conventional cutting machines were carried out in two types of oversize test treatments on 100 g of nata de coco samples, namely pre-sorting and post-sorting. In the test results, it was found that the pre-sorted oversize with a total value of 30.8 g so that the average value of the oversize test in the pre-sorted treatment was 4.4 g. This means that there is a deviation from the results of the nata de coco cut in the pre-sorted treatment of 1.4 g against the maximum oversize value limit that has been set (3 g).

While the results of the oversize test in the post-sorting treatment obtained data with a total value of 23.1 g so that the average value of the oversize test in the sorting treatment was 3.3g. This means that there is a deviation from the results of the nata de coco cut in the sorting treatment of 0.3 g against the maximum oversize value limit that has been set (3 g).

Table 3. Nata de coco oversize test results on conveyor and chain conveyor cutting machines

Sample Mass (g)	Conveyor Cutting Machine				Chain Conveyor Cutting Machine			
	Pre-sort (g)		Post-sort (g)		Pre-sort (g)		Post-sort (g)	
	Oversize	Frog egg	Oversize	Frog egg	Oversize	Frog egg	Oversize	Frog egg
100	4.86	6.20	2.20	4.60	3.74	12.60	2.33	7.60
100	4.60	5.20	3.42	5.28	3.60	12.80	3.60	7.26
100	5.20	5.80	2.14	4.80	4.20	13.60	3.50	8.30
100	5.00	7.63	3.60	4.73	6.20	9.80	2.70	5.00
100	4.20	6.80	2.80	3.90	5.22	13.30	3.86	7.50
100	3.64	5.45	3.90	4.50	5.63	11.33	4.30	6.36
100	3.90	6.20	3.53	5.40	4.80	15.80	2.90	8.20
Total	31.4	43.28	21.59	33.21	33.39	89.23	23.19	50.22
Average	4.50	6.18	3.10	4.74	4.77	12.75	3.30	7.17

Two types of nata de coco oversize test treatments were performed on conveyor and chain conveyor machines, namely pre-sorting and post-sorting, with two types of defects divided, namely oversize and frog eggs. In the test results, the average value of the oversize conveyor machine for pre-sorting treatment is 4.50 g and on the chain conveyor machine is 4.77 g. This means that there is a deviation from the results of nata de coco pieces on the pre-sorted treatment conveyor machine of 1.50 g and on the chain conveyor machine of 1.77 g against the maximum oversize value limit that has been set (3 g). While the average value of frog egg defect on the conveyor machine for pre-sorting treatment is 6.18 and on the chain conveyor machine is 12.75 g. This means that there is a deviation from the results of the nata de coco pieces on the conveyor machine for pre-sorting treatment of 3.18 g and on the chain conveyor machine of 9.75 g against the maximum oversize value limit that has been set (3 g).

In the test results, the average oversize value on the post-sorting treatment conveyor machine is 3.10 g and on the chain conveyor machine is 3.30 g. This means that there is a deviation from the results of nata de coco pieces on the post-sorting treatment conveyor machine of 0.10 g and on the chain conveyor machine of 0.30 g against the maximum oversize value limit that has been set (3 g). While the average value of frog egg defect on the conveyor machine for post-sorting treatment is 4.74 g and on the chain conveyor machine is 7.17 g. This means that there is a deviation from the results of nata de coco pieces on the conveyor machine for post-sorting treatment of 1.74 g and on the chain conveyor machine of 4.17 g against the maximum oversize value limit that has been set (3 g).

In the test results, the average oversize value on the post-sorting treatment conveyor machine is 3.10 g and on the chain conveyor machine is 3.30 g. This means that there is a deviation from the results of nata de coco pieces on the post-sorting treatment conveyor machine of 0.10 g and on the chain conveyor machine of 0.30 g against the maximum oversize value limit that has been set (3 g). While the average value of frog egg defect on the conveyor machine for post-sorting treatment is 4.74 g and on the chain conveyor machine is 7.17 g. This means that there is a deviation from the results of nata de coco pieces on the conveyor machine for post-sorting treatment of 1.74 g and on the chain conveyor machine of 4.17 g against the maximum oversize value limit that has been set (3 g).

The comparison of the oversize value of nata de coco pieces with conventional

cutting machines, conveyor machines and chain conveyor machines is shown in Figure 2 and Figure 3. Based on these figures, the results show that both pre-sorting and post-sorting treatments, the highest oversize value is found in the results of pieces using a conveyor machine. chain, with a pre-sorted oversize value of 8.76 g and a post-sorting oversize value of 5.23 g.

Nata with defects that are sorted will then be sold to other consumer segments, of course at a cheaper price compared to the price of nata in general, so that this can reduce company revenue and increase raw material costs considering the number of nata sheets that are cut have many defects. So, it is necessary to take action to handle maintenance and repair of nata de coco cutting machines, especially on chain conveyor machines to minimize the number of defects produced.

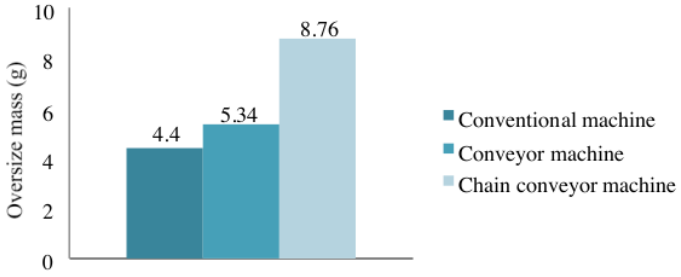

Figure 2. Nata de coco pre-sort oversize average value comparison chart

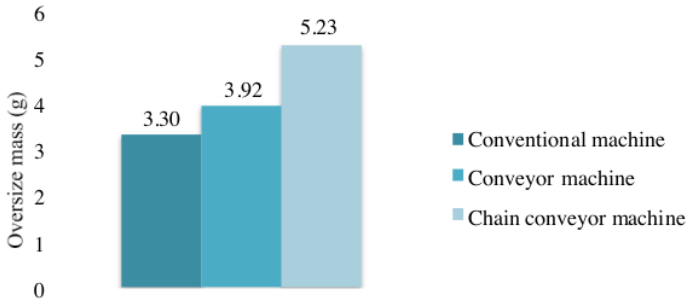

Figure 3. Nata de coco post-sort oversize average value comparison chart

Based on the data obtained through the observation process and through the process of oral interviews with related employees/staff. In addition, documentation of the work process in the cutting division of nata de coco and other production divisions was also carried out and data obtained from the analysis of the causes of discrepancies in the results

cuts on nata de coco type NDC 12 that affect quality degradation is presented in the fishbone diagram in Figure 4.

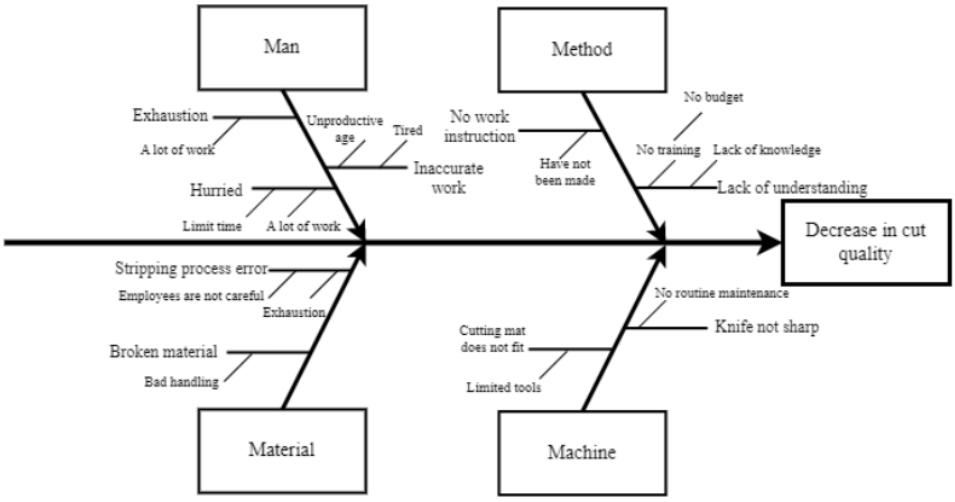

Figure 4. Fishbone diagram of decrease in cut quality

Fatigue makes the performance of workers decrease, thus hampering the smooth cutting process of nata de coco. Generally, fatigue is caused by age, health conditions, sleep quality, and the intensity of working time. High total production achievement due to increased consumer demand forces workers to complete the nata de coco cutting process in a short time, this actually makes workers rush, thereby reducing the level of accuracy. Lack of accuracy in the use of production equipment is also a factor causing the decline in the quality of the final product. The addition of workers in the nata de coco cutting process division can be a solution to avoid obstacles to the work process due to increased production intensity.

The work instructions in the nata de coco cutting process that have been made and determined are not well understood and applied, so that the implementation of the work process tends to be inconsistent with what should be done. The work instructions that have been made should be better understood and applied in the implementation of the work process, in-depth supervision and control are needed for each division, especially in the nata de coco cutting process to maintain the smooth production process for the quality of the final product.

In the process of stripping the epidermis, there is usually physical damage to the harvested nata that is being peeled. Lack of accuracy in peeling the epidermis results in the condition of the nata de coco's flesh being peeled or torn in the middle and ends. So that the peeled nata has an uneven surface and creates a fairly deep incision (Figure 5). Nata with an uneven surface when flattened by splitting into nata sheets will result in poor sheet quality. The nata sheet in question has the characteristics of imperfect sheet shape, different sheet thickness, there are incision marks on the surface and so on (Figure 6). So, it is necessary to control and supervise pre-cutting to avoid physical damage to the sheet nata, especially in the process of stripping the epidermis.

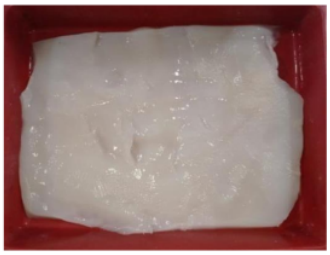

Figure 5. Nata de coco's flesh with physical damage

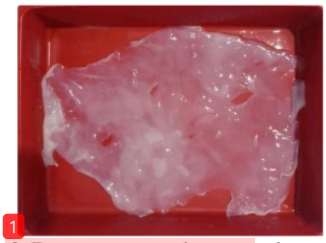

Figure 6. Damage nata de coco cleavage sheet

In the cutting process, a cutting mat is needed as a medium for placing the nata de coco to be cut, but the inaccuracy (not parallel to the machine) in the placement of the base can be a factor in reducing the quality of the cut. Such as untidy cuts, oversized grains arise and so on (Anam, 2019; Melliawati, 2008). The knife used in cutting nata is less sharp, especially on conveyor machines, generally conveyor machines cause a higher defect value than conventional cutting machines. In the oversize test, many product defects were found in the form of frog eggs, which means that the cut results cannot split the nata into granules according to the predetermined size. The high factor of machine use with low maintenance intensity affects the quality of the final result of cutting nata de coco. Periodic maintenance and rejuvenation of the machine is necessary to maintain the effective performance of the machine. So that in the process of cutting nata de coco, good cuts are produced and minimal defects to avoid losses in terms of time, energy and economy (Nugroho & Aji, 2015; Sholahuddin et al., 2019).

4. CONCLUSIONS

The implementation of the cutting process in the production of nata de coco has not been fully in accordance with the provisions of the applicable work process and the work of the cutting machine is less than optimal so that this affects the problem of the size of the nata de coco pieces and the final product produced. Another factor that is also the cause of this problem is at the stage of the production process before the cutting stage, especially at the time of stripping the epidermis and dividing the nata into thinner sheets.

REFERENCES

Anam, C. (2019). Mengungkap Senyawa pada Nata De Coco sebagai Pangan Fungsional. *Jurnal Ilmu Pangan Dan Hasil Pertanian*, *3*(1), 42–53. https://doi.org/10.26877/jiphp.v3i1.3453

Basuki, M., & Fahadha, R. U. (2020). Identification Of The Causes Nata De Coco Production Defects For Quality Control. *Spektrum Industri*, *18*(2), 175–181. https://doi.org/https://doi.org/10.12928/si.v18i2.14393

Gresinta, E., Pratiwi, R. D., Damayanti, F., & Putra, E. P. (2019). Komparasi Yield Nata De

Tomato Dengan Nata De Coco Berdasarkan Durasi Fermentasi. *Indonesian Journal of Integrated Science Education*, *1*(2), 169–174. https://doi.org/http://dx.doi.org/10.29300/ijisedu.v1i2.2248

Hamad, A., & Kristono. (2013). Pengaruh Penambahan Sumber Nitrogen Terhadap Hasil Fermentasi Nata De Coco. *Momentum*, *9*(1), 62–65.

Melliawati, R. (2008). Kajian Bahan Pembawa untuk Meningkatkan Kualitas Inokulum Pasta Nata de Coco. *Biodiversitas*, *9*(4), 255–258. https://doi.org/https://doi.org/10.13057/biodiv/d090403

Nugroho, D. A., & Aji, P. (2015). Characterization of Nata de Coco Produced by Fermentation of Immobilized Acetobacter xylinum. *Agriculture and Agricultural Science Procedia*, *3*, 278–282. https://doi.org/https://doi.org/10.1016/j.aaspro.2015.01.053

Rahayu, T., & Rohaeti, E. (2014). Sifat Mekanik Selulosa Bakteri Dari Air Kelapa Dengan Penambahan Kitosan. *Jurnal Penelitian Saintek*, *19*(2), 1–13.

Rahmayanti, H. D., Amalia, N., Munir, R., Yuliza, E., Utami, F. D., Sustini, E., & Abdullah, M. (2019). A Study of Physical and Mechanical Properties of Nata de Coco in the Market. *IOP Conference Series: Materials Science and Engineering*, *599*, 1–5.

Sholahuddin, A., Analita, R. N., Irianti, R., & Suharto, B. (2019). Pemberdayaan Perempuan Desa: Produksi Dan Pemasaran Nata De Coco. *Bubungan Tinggi: Jurnal Pengabdian Masyarakat*, *1*(2), 49–55. https://doi.org/tps://doi.org/10.20527/btjpm.v1i2.1806

Wahyuni, S., & Jumiati, J. (2019). Potensi Acetobacter Xylinum Dalam Pembuatan Nata De Syzygium. *Bio-Lectura*, *6*(2). https://doi.org/https://doi.org/10.31849/bl.v6i2.3575

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