

## **Fermentation of Carrot Juice Waste (*Daucus carota L*) with Probiotics and Utilization in Races of Chicken Layers on Egg Production and Quality**

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### **Abstract**

The aim of this study was to test the use of carrot juice fermentation with probiotics in rations with different levels on the production performance and quality of egg-laying hens. The material used was Lohman Brown strain of laying hens, 27 weeks old with an average initial body weight of 1.69 kg, as many as 45 birds. The research was conducted with experimental methods and used a Complete Design Acal (CRD). The treatment tested was the use of Carrot Extract Fermentation (FLSW) with probiotic SOC in the feed consisting of T1 = 100% basal ration, T2 = basal ration (97.5%) + FLSW (2.5%); T3 = basal ration (95%) + FLSW (5%); T4 = basal ration (92.5%) + FLSW (7.5%); T5 = basal ration (90%) + FLSW (10%). The variables observed were production performance (consumption, egg production (HDA / Hen Day Average), egg weight, egg mass, feed conversion and income over feed cost) and egg quality variables (albumin index, yolk index, Haugh Unit (HU), yolk color, albumin pH, yolk pH). The results of the analysis of variance showed that the use of carrot extract fermentation (FLSW) with different levels had a significant effect on feed consumption (Sig.115) and HDA (Sig.063), yolk index value (Sig.087) and yolk color (Sig. 000). , and not significantly different on feed conversion (Sig. 403), albumin index value (Sig. 522), and Haugh Unit (Sig. 259). The conclusion of the research showed that the use of fermented carrot juice waste (FLSW) in the feed of laying hens had an effect on feed consumption, egg production (Hen Day Averag / HDA), yolk index and yolk brightness (yolk color), but had no effect on conversion. feed, Haugh unit and albumin index value.

Key words : probiotics, fermentation, carrot juice waste, production performance, egg quality

### **Introduction**

The development of poultry farming has led to a high demand for quality feed ingredients. The quality of feed ingredients greatly affects livestock productivity. The feed is said to be of good quality if it meets the requirements to meet the basic needs of life, growth and production. In livestock business, the factor of ration costs is the largest cost of the total production cost, namely 60-70%. For this reason, diversification of feed ingredients is an effort that must be taken at this time in an effort to overcome the scarcity of feed ingredients and reduce production costs of poultry farming. Utilization of waste that can reduce the use of conventional materials can be carried out as long as these materials still contain food substances that can be used by livestock for their survival. Wastes that have the prospect of being a mixture of animal feed are skin and

dregs from the manufacture of fruit juice drinks, among which fruit juice waste (LSB) is mostly found consisting of fruit waste; mango, avocado, melon, apple, orange, eggplant virus, and one type of tuber, namely carrots (*Daucus carotta* L).

Rizal et al. (2010) quoted by Andriani (2011) as reporting the results of the analysis of the content of nutrients and metabolic energy from LSB in dry matter: water 11.04%, protein 9.44%, fat 7.01%, crude fiber 19.22%, BETN 53.29%, Ca 0.10%, P 0.01% and metabolized energy 1744 Kcal / kg. besides that, LSB contains lots of vitamins such as: vitamins A, B, C and D which are needed by poultry for the continuity of their metabolic processes. Fruit juice waste can be used up to 20% in broiler rations or 40% in place of corn. Besides, the mixture of carrot and fruit juice waste contains 23.98 ppm carotenoid substances.

As one type of fruit juice waste (LSB), carrot juice waste can be used as an alternative mixed feed for poultry. Although there is no statistical data on availability, carrot juice waste can be obtained from home businesses that manufacture syrups and fruit juice counters. As waste, it is possible that this waste also contains potential nutrients such as carrots. Carrot vegetables have an important role for body health, this is due to the nutritional content of carrots, especially carotene, which is a source of provitamin A. Carotene compounds function as antioxidants in the body. These compounds are converted into vitamin A which plays a role in maintaining defense and immunity, maintaining healthy skin, intestinal organs, and helps the growth of new cells. Another function is as a component to form and care for skin, membrane membranes, bones, eyes and reproductive organs. (Rahman and Dian, 2014), besides that carrots can also help lower blood cholesterol (Samadi, 2014).

The problem in using carrot juice waste for poultry is the high content of crude fiber. Biological processing can be used to treat agricultural waste by fermentation. According to Buckle et al. (1987), fermentation generally results in the loss of carbohydrates from feed ingredients, but this loss is covered by the advantages obtained such as protein, fat, polysaccharides that can be hydrolyzed so that fermented materials often have high digestibility. Fermented feed usually has better nutritional value than the original material because microorganisms are catabolic or break down complex components into simpler substances so that they are easier to digest. In addition, microorganisms can also synthesize several vitamins such as riboflavin, vitamin B12, provitamin A and other growth factors.

Fermentation in this study uses one of the ingredients, namely SOC (Liquid Organic Supplement), there is no information about the results of using this supplement for the fermentation process of feed ingredients for poultry. The benefits and uses of SOC, among others, are to nourish livestock, increase antibodies in livestock, balance the microorganisms in the ingredients and increase appetite, and can enhance egg quality. The content of substances in SOC consists of N, P<sub>2</sub>O<sub>5</sub>, K<sub>2</sub>O, SO<sub>4</sub>, Mg, Chlorida, Mn, Na, Ca, Fe, Cu, Mo, Zn, C / N. Giving to poultry (chickens, ducks) can be given directly through drinking water.

The fermentation process of carrot juice waste (*Daucus carotta* L) using SOC, with the addition of molasses, bran and water can hydrolyze the fiber content in carrot juice waste and the fermented carrot juice waste has the potential to be used as a substitute for feed material (corn) in the ration of laying hens.

Based on the foregoing, this study aims to determine the level of use of FLSW in rations on the production performance and quality of eggs of laying hens.

The benefits of this research are as information material for the general public and the field of animal husbandry in particular about the use of carrot juice fermentation as an alternative feed ingredient for chicken feed mixtures.

### Materials and Methods

The research material of laying hens, Lohman Brown strain, age 27 weeks, had an average initial body weight of 1.69 kg, as many as 45 birds. Carrot juice waste fermentation (FLSW) using probiotic SOC (Liquid Organic Supplement) as much as 1 ml / kg LSW), drops (10 ml / kg LSW), bran (10% of the weight of the LSW and water (10 ml / kg LSW). Basal feed consisted of a mixture of maize (50%), CP 124 (35%) layer chicken concentrate, and bran (15%). 45 battery cages were equipped with a feed and drinking container. RAL). In the study, 45 laying hens were divided into 5 treatment groups, each treatment with 3 replications, each 3 chickens.

Fermentation of carrot juice waste is made in the following ways:

- Carrot juice waste (LSW) is flattened in a container (tampah), weighed to determine the weight of the LSW.
- Mixing Liquid Organic Supplement (SOC) with molasses and let stand for 15 minutes, with the aim of activating microorganisms in SOC. (SOC = 1 ml / kg of ingredients and drops = 10 ml / kg of ingredients).
- Sprinkle LSW with bran as much as 10% by weight of the ingredients, and the solution (SOC + drops) that has been prepared.
- Mix all ingredients evenly.
- Put in a container (plastic jar) and compacted then closed tightly (airtight) and let stand for two days.
- The FLSW results were ready to be given to the treated chickens.

The treatments given in this study are in full in table 1 and table 2 of the nutritional content of the feed ingredients used and table 3 is the nutrient content of the feed in each treatment.

Table 1. Treatment of FLSW Administration (%)

Ingredient	Treatment				
	T1	T2	T3	T4	T5
FLSW	0	2,5	5	7,5	10
Corn	50	47,5	45	42,5	40
Concentrat	35	35	35	35	35
Rice bran	15	15	15	15	15
Total	100	100	100	100	100

Table 2. Kinds of Feed Ingredients and Nutritional Content (% dry matter)

Nutrient content	FLSW <sup>*)</sup>	Corn <sup>**)</sup>	Bran <sup>**)</sup>	Concentrat <sup>***)</sup>
				%
Crude Protein	10.29	8	11.32	32
Crude Fiber	21.49	2.2	8	8
Energi (Kkal/kg)	3.963	3.300	3.100	2.390

Source: \*) Results of proximate analysis at the UGM PAU Lab (2016)

\*\*\*) Suci and Widya. (2012)

\*\*\*\*) PT. Charoen Pokpand Indonesia

Table 3. Nutritional Content of Feed for Each Treatment

Nutrient content	Treatment				
	T1	T2	T3	T4	T5
Crude protein(%)	16.9	16.96	17.02	17.07	17.13
Crude fiber(%)	5.1	5.59	6.07	6.55	7.03
Energi Metabolism (Kkal)	2,951.5	2,968.08	2,984.65	3,001.23	3,017.8
Ratio EM/Protein	174.64	175.01	175.36	175.82	176.17

The variables observed included production performance (daily feed consumption, egg production (% HDA), feed conversion) and egg quality (, yolk index, albumin index, Haugh unit and yolk brightness).The data obtained were analyzed using the SPSS Windows 21 program, the differences between treatments were tested by Duncan, and the percentage data were transformed using Arcus sinus (Srigandono, 1983).

## Results and Discussion

The results in the study included production performance (feed consumption, egg / HDA production and feed conversion, and egg quality variables (albumen index, yolk index, Haugh Unit, yolk color, white and yellow pH).

### Effect of Treatment on Production Performance

The effect of treatment on production performance results in data on: feed consumption, egg production (HDA), and feed conversion, as shown in Table 4 below.

Table 4 Effect of treatment on production performance

Performan produksi	Treatment				
	T1	T2	T3	T4	T5
Feed consumption (g/ekor/hari)	110.83 <sup>ab</sup>	105.49 <sup>a</sup>	106.93 <sup>ab</sup>	113.88 <sup>b</sup>	111.83 <sup>ab</sup>
HDA (%)	88.10 <sup>ab</sup>	81.75 <sup>a</sup>	88.10 <sup>ab</sup>	94.25 <sup>b</sup>	83.33 <sup>a</sup>
Coverision	2.04	2.10	1.96	1.95	2.13

Description: Different superscripts on the same line indicate significantly different.

### Effect of treatment on production performance

Based on the results of statistical tests showed that the treatment of FLSW up to a level of 10% in feed was significantly different (Sig.115) on feed consumption. This means that the provision of FLSW up to a level of 10% has an effect on feed consumption. Based on Table 4 it can be seen that the consecutive feed consumption from the lowest is in the T2 (105.49), T3 (106.93), T1 (110.83), T5 (111.83) treatment and the highest consumption is in the T4 treatment ( 113.88) g / head / day. The results of Duncan's continued test showed that T2 was significantly different from T4, while T1, T2, T3 and T5 were not significantly different, as well as the T1, T3, T4 and T5 treatments. In the T4 treatment, the provision of FLSW with a level of 7.5% had a higher feed consumption compared to the T1, T2, T3 and T5 treatments. This shows that the use of the feed mixture on T4 has a more palatable effect so that feed consumption increases and the average T4 feed consumption is not much different from the standards of Fadilah and Fatkhuroji (2013), that the consumption of layer chicken feed between the ages of 26 - 35 weeks is at range 108.3 - 114.6 g / head / day.

The increase in feed consumption at T4 was also followed by high egg production (HDA), the results showed that T4 produced the highest production, which was 94.25%, followed by treatment T3 = T1 which was 88.10%, T5 = 83.33% and the lowest at treatment T2 = 81.75%. Based on the results of the statistical test results showed that the treatment of FLSW up to a level of 10% in the feed was significantly different from egg production (HDA) (Sig. 0.063). This means that the provision of FLSW to a level of 10% in the feed has an effect on egg production (HDA). The results of the Duncan further test showed that the T2 treatment was significantly different from T4, while the T1, T2, T3 and T5 treatments were not significantly different as well as the T1, T3, T4, T5 treatments. The T4 treatment gave the highest yield, this is thought to be due to the effect of higher feed consumption compared to other treatments, so that the absorption of feed nutrients will also increase as a result of having an effect on increasing egg production (HDA). This is in accordance with the opinion of SCA (1983) cited by Mangisah et al. (2004) stated that physiological levels of protein and energy consumption will affect the number of eggs produced. Based on the research results, the consumption of nutrients (protein and energy) T4 is the highest compared to other treatments. Increased feed absorption can maximize production so that egg production can increase and produce optimally. Treatment T4 average protein consumption of 19.44 g / head / day and energy consumption of 341 kcal with the highest egg production (94.25%) and the lowest in T2 treatment with protein consumption of 17.89 g / head / day and energy consumption of 313 , 10 kcal and the lowest egg production was 81.75%, while the protein and energy consumption of treatment T5 = 19.16 and

337.48; T1 = 18.73 and 327.11; T3 = 18.20 g / head / day and 319.15 kcal. Factors that also influence differences in egg production are the age of the parent and the period of production. The T4 treatment turned out to have a production that was in accordance with the standards according to Fadillah and Fatkhuroji (2013), where laying hens aged 26 - 35 weeks of egg production reached 94.32%.

The average feed conversion of each treatment in this study ranged from 1.95 to 2.13 and was still in the range of feed conversion according to Fadillah and Fatkhuroji (2013) in layer chickens aged 26 - 35 weeks were 1.85-2.05. Based on the results of statistical tests showed that the treatment of FLSW up to a level of 10% in the feed was not significantly different (Sig.403) on feed conversion. This means that the treatment of FLSW up to a level of 10% in the feed has no effect on feed conversion. Egg production is directly related to feed conversion, the greater the egg production the smaller the feed conversion value. Although the feed conversion in this study was not influenced by treatment, egg production as indicated by the HDA value of T4 treatment resulted in the highest HDA value, namely 94.25% and the lowest conversion value, namely 1.95. This result is still better than the report of Cernigliis et al. (1984) quoted by Mangisah et al. (2004), reported that chickens aged 26 to 34 weeks had a range of feed conversion rates from 2.32 to 2.33, while according to Leeson and Summer (1991) quoted by Mangisah et al. (2004) for laying hens aged 28-30 weeks had a feed conversion standard of 2.25.

### Effect of treatment on egg quality

The effect of treatment on egg quality includes index albumen, yolk index, Haugh Unit, and yolk color are listed in table 5.

Table 5. Research data on egg quality

Egg Quality	Treatment				
	T1	T2	T3	T4	T5
Albumin indek	0,163	0,166	0,162	0,174	0,147
Yolk indek	0,522 <sup>a</sup>	0,480 <sup>b</sup>	0,529 <sup>a</sup>	0,502 <sup>ab</sup>	0,494 <sup>ab</sup>
Haugh Unit	102,76	104,71	102,54	105,33	98,64
Yolk colour	8,52 <sup>a</sup>	8,29 <sup>b</sup>	7,50 <sup>a</sup>	7,58 <sup>ab</sup>	7,00 <sup>ab</sup>

Description: Different superscripts on the same line indicate significantly different.

Based on table 5 the average albumin index in the treatment T1, T2, T3, T4 and T5 respectively 0.163; 0.166; 0.162; 0.174; and 0.147. The results of the statistical analysis of carrot extract fermentation (FLSW) up to a level of 10% in the ration showed no significant difference (Sig.522) on the albumin index. This means that the administration of FLSW up to a level of 10% does not affect the egg index albumin. The results obtained from this study are not much different from the opinion of Idris (1984) which states that the new fresh egg albumin index ranges from 0.050 to 0.174. The average albumin index in this study was still in the normal range, ranging from 0.147 to 0.174. According to Nesheim et al. (1979) quoted by Idris (1984) explained that ovomucin, which is the main albumen protein, determines the level of albumen. According to Setioko et al. (1994) quoted by Juliambarwati et al. (2012) the weight of

the egg parts follows the pattern of egg weight gain, so the egg parts also increase. In this study, the provision of FLSW in the ration of laying hens did not affect egg weight, so it did not give a real difference to the albumin index. This is because the minimum requirements for the necessary substances, especially the proteins that make up albumin, have been met. In the study, the minimum protein requirement for each treatment was met, ranging from 16.9 - 17.13% (Table 3).

The effect of FLSW administration on the yolk index value based on the results of statistical analysis showed that the treatment of FLSW in feed was significantly different (Sig.087) on the yolk index. This means that the FLSW treatment up to a level of 10% in the feed has an effect on the yolk index. The results of Duncan's continued test showed that T2 was significantly different from T1 and T3, while T1, T3, T4, and T5 showed insignificant differences. From the results of the study showed the highest value was in treatment T3 (0.529), followed by T1 (0.522), T4 (0.502), T5 (0.494), and the lowest value was in treatment T2 (0.480). Overall, the yolk index value in this study is still in the normal range, in line with the opinion of Buckle et al. (1987) stated that fresh eggs have a yolk index ranging from 0.330 to 0.510. Protein consumption can affect yolk height while the yolk index is influenced by yolk height (Stadellman and Cotterill, 1995 cited by Juliambawati et al., 2012). Australianingrum, (2005) quoted by Juliambawati et al., (2012) stated that the higher the protein and fat content in the ration, the higher the yolk index. This is in line with the opinion of Griant (1979) quoted by Mampioer (2008) that a decrease in the yolk index value can occur due to a decrease in protein content. According to Argo et al. (2013) quoted by Marwati et al. (2014) feed protein will affect egg viscosity which reflects the quality of the egg interior, furthermore it can affect the yolk index. In this study, the decrease in the yolk index value at T2 was thought to be due to lower protein consumption compared to the T1, T3, T4, and T5 treatments. The results of statistical tests showed that the treatment of FLSW had an effect on feed consumption, where the consumption at T2 was the lowest, namely 105.49 g / head / day compared to the consumption in treatment T3 (106.93), T1 (110.83), T5 (111 , 83) and T4 (113.86) g / head / day. This condition resulted in low protein consumption at T2, namely 17.89 g / head / day, followed by T3 (18.20), T1 (18.73), T5 (19.16), T4 (19.44) g / head / day.

The results of statistical analysis of FLSW up to 10% level in feed were not significantly different (Sig.259) on haugh units. This means that the treatment of FLSW has no effect on the value of HU. Based on Table 5, successively haugh egg units in the T1, T2, T3, T4 and T5 treatments were 102.760; 104,707; 102; 542; 105,333 and 98,64, and are classified as AA quality. According to the United State Department of Agriculture (USDA) standard, a HU value of more than 72 is classified as AA quality (Sudaryani and Santoso, 2012). Cotteril, (1995) quoted by Juliambawati et al. (2012) the factors that influence the value of HU are albumen height and egg weight, while albumen height is largely determined by albumen density. The albumen density itself is influenced by the protein content in the ration consumed. In this study, the use of carrot juice fermentation in the ration of laying hens did not affect egg weight and albumin index so that the HU value did not have a real effect.

The effect of treatment on yolk brightness (yolk color) shows a very significant effect (Sig. 000). Further test results The results showed that increasing the level of FLSW in the feed decreased the yolk color value. The highest value is shown in

treatment T1 (8.52) followed by T2 (8.29), T4 (7.58), T3 (7.56), the lowest value is in treatment T5 (7.00). The egg yolk color of the research results was in the range of 7.00 - 8.52 or with an average of 7.78 in the dark yellow color range. According to the Yolk Color Fan (Hoffman, 1985 cited by Mampioer et al. (2008) dark yellow yolk color ranges from 7-9. The decrease in egg yolk color may be caused by changes in corn content in the ration, where the use of corn decreases in line with the increase in FLSW use. and Marangos (1989) cited by Wahyuni (2011) that the pigment that plays a very large role in determining the color of egg yolk is xanthophyl, and until now the source of xanthophyl in chicken rations still depends on the presence of corn. Each of these feed treatments can affect the xanthophyl content in the feed, which in turn will affect the yolk color of the resulting egg yolk. The results of the study by Mampioer et al. (2008) state that the substitution of corn with cassava flour in the experimental ration has a very significant effect on egg yolk color. the resulting yolk color c enderung decreased in line with the increasing substitution of cassava flour with corn in the ration, with yields of egg yolk color ranging from 4 - 8, with an average of 6.125.

### **Conclusion**

The conclusion of the research showed that the use of fermented carrot juice waste (FLSW) in the feed of laying hens had an effect on feed consumption, egg production (Hen Day Average/HDA), yolk index and yolk brightness (yolk color), but had no effect on feed conversion, haugh unit and albumin index value.

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