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The appearance of rabbit skin tissue (*Oryctolagus cuniculus*) after supplementation of *Aloe vera* and *Spirulina fusiformis*

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Abstract. *Kuntana YP, Yurmiati H, Wulandari AP, Syafitri F, Partasasmita R. 2017. The appearance of rabbit skin tissue (*Oryctolagus cuniculus*) after supplementation of Aloe vera and* Spirulina fusiformis*. Nusantara Bioscience 9: 268-274.* The research is about the appearance of rabbit skin tissue (*Oryctolagus cuniculus* L.) after supplementation of *Aloe vera* L. and *Spirulina fusiformis* Vor. has been done. This study was carried out to find the most effective formulation ofsupplement of *A. vera* and *S. fusiformis* as a natural supplement that can generate the best appearance of rabbit skin tissue. The method in this research was a single Complete Random Design (CRD) on 28 male *New Zealand White* strains rabbits with the age of 16 weeks. The treatments were divided into seven groups with four replications, namely, P_0 (negative control), P_1(positive control, vitamin C19 mg/kg BW), P_2 (*A. vera* 74 mg/kg BW), P_3 (*S. fusiformis* 296 mg/kg BW), P_4 (*A. vera*: *S. fusiformis*, 74: 148 mg/kg BW), P_5 (*A. vera*: *S. fusiformis*, 74: 296 mg/kg BW), and P_6 (*A. vera*: *S. fusiformis*, 74: 593 mg/kg BW). The parameters observed were production aspect (hair texture, slaughter weight, skin width, and skin weight percentage) and histological aspect (thickness of skin tissue and the amount of hair follicle). All of the data was analyzed using ANOVA test (P > 95%) and Duncan test (P > 95%). The result showed that the giving of supplement with the basis of the formulation of *A. vera* 74 mg/kg bw and *S. fusiformis* 296 mg/kg bw was effective in generating the best appearance of rabbit skin tissue.

Keywords: *Aloe vera*, Appearance of skin tissue, Rabbit, *Spirulina fusiformis*

INTRODUCTION

The skin raw materials commonly used for various types of clothing and food products are derived from cattle, buffalo, sheep, and goats. The skin produced from cattle has good quality but, has relatively low reproductive rate and high production costs lead to limited provision. One attempt to solve this problem is to develop a type of livestock that has high reproduction and low production costs, such as rabbit. This time, the rabbit skin is just a waste of the ranch. The rabbit skin is one alternative that has great potential to be processed into useful products such as jackets, bags, carpets and toys, in addition, the hair fibers can be developed into wool.

The skin quality is closely related to feeding and enclosure management. The skin width covering the body surface will increase with weight gain. The increase of body volume will be followed by increasing of chest size circumference and body length so that it can affect the width and length of the skin (pelt). Pelt is a fresh skin tissue of furry animals that has been skinned. Pelt thickness is related to fat content, the layers of epidermis, dermis and connective tissue.

Food is needed by rabbit for the production of wool and pelts like Angora and Rex which need 120 g/day with 15% of crude protein. Nowadays, rabbit ranch uses expensive pellet with high protein (16%), thus it gives sufficient natural supplement for rabbits. Spirulina was chosen as one of the alternative natural supplement because it has several advantages such as high protein which is up to 60-70% of the entire dry weight, containing essential fatty acids, polysaccharides, carotenoids, vitamins, and minerals, especially vitamin B12 (Bourges et al. 1971; Anusuya et al. 1981; Kabinawa 2014; El-Tantawy 2015). The contents of minerals and vitamins in Spirulina are potassium (15,400 mg/kg), calcium (1,315 mg/kg), zinc (39 mg/kg), magnesium (1915 mg/kg), manganese (25 mg/kg), iron (580 mg/kg), selenium (0.40 ppm), phosphorus (8942 mg/kg), as well as vitamins A, B1 (thiamine), B2 (riboflavin), B3 (nicotinamide), B6 (pyridoxine), B9 (sour folate), B12, vitamin C, vitamin D and vitamin E. The complete and balanced of Spirulina nutritional content has been used optimally in some countries to overcome malnutrition and immune system. The supplementation of Spirulina dose of 800 mg/kg body weight (BW) of mice is proven to improve liver function and to repair kidney and testicular damage due to mercury exposition. The dosage is converted to rabbits consumption and it becomes 296 mg/kg BW (Hermosillo et al. 2011; Henrikson 2009; Susanna et al. 2007.

The plant of *A.vera* is one of the herbs. This plant contains two types of liquids, namely a clear liquid which

is jelly and a yellowish fluid which is aloin. Jelly contains antibacterial and antifungal agents stimulating the growth of fibroblast, which is a component of skin tissue functioning in the wound healing process. Aloin can act as a laxative. *A. vera* have 72 essential substances needed by body. 18 out of 72 substances are amino acids, carbohydrates, fats, water, vitamins (A, B1, B2, B3, B12, C, E), minerals (calcium (Ca), magnesium (Mg), potassium (K), sodium (Na), iron (Fe), zinc (Zn), chromium (Cr)) and enzymes. The *A. vera* has salicylate which is effective as an anti-inflammatory like aspirin. The folic acid is also useful for the regeneration of skin by producing new cells, whereas the inositol and chromium can reduce hair loss. The administration of *A. vera* in a dose of 200 mg/kg BW mice was proven to help prevent damage of hair follicles exposed to etoposide (Sandjaja et al. 2009; Tansar 2011; Yuliarti 2008).

Thus, the natural supplement of Spirulina and *A. vera* can improve the skin tissue appearance and keep the immunity of rabbit so as to reduce production costs such as vaccines and fodder. The study on the quality of the skin tissue of rabbits (*Oryctolagus cuniculus*) after supplementation of *A. vera* and *S. fusiformis* has not been widely reported, so that the study was conducted for further research.

MATERIALS AND METHODS

Research methods

The method is an experimental method with a completely randomized design (CRD) on single male rabbits aged 16 weeks. The test animals were randomly divided into seven treatments with four replications, namely: (i) P0: negative control, (ii) P1: positive control (vitamin C dose of 19 mg/kg BW rabbit), (iii) P2: *A. vera* dose of 74 mg/kg BW rabbit, (iv) P3: *S. fusiformis* dose of 296 mg/kg BW rabbit, (v) P4: *A. vera* dose of 74 mg/kg BW + *S. fusiformis* dose of 148 mg/kg BW, (vi) P5: *A. vera* dose of 74 mg/kg BW + *S. fusiformis* dose of 296 mg/kg BW, (vii) P6: *A. vera* dose of 74 mg/kg BW + *S. fusiformis* dose of 593 mg/kg BW.

The number of rabbits in this study was 28 with ± 1 kg bw. The parameters are aspects of livestock production (hair texture, slaughter weight, wide skin, and skin weight percentage) and aspects of histology (thickness of skin tissue and the amount of hair follicle). The collection of data on hair texture (smoothness and brightness of the hair) is performed at the Center for Textile Testing Laboratory and the Laboratory of Chemical Physics Bandung College of Textiles Textile Technology Bandung. The data of skin width is obtained using Hegenaur (1977). The percentage of Skin weight is calculated after the slaughter weight and skin weight is performed. The collection of data on thickness of skin and the amount of hair follicle is carried out under a lighted microscope using histological preparations with Haemotoxylin-eosin staining of paraffin method. All data were statistically tested using test Analysis of Variance (ANOVA) (P > 95%) and Duncan's Multiple Range Test (P > 95%).

Research procedure

Determination of dose

Aloe vera dose is based on Tansar (2011) research namely 200 mg/kg BW mice which is converted to 74 mg/kg BW rabbit. *S. fusiformis* with dose of 400 mg/kg BW, 800 mg/kg BW and 1600 mg/kg BW mice (Hermosillo et al., 2011) were converted to 148 mg/kg BW, 296 mg/kg BW and 593 mg/kg BW rabbit. The dose of vitamin C is 400 mg for men (Sandjaja A et al. 2009) and it is converted to 19 mg/kg BW rabbit.

Preparation of extract Aloe vera and Spirulina fusiformis

The meat of *A. vera* which has been cleared from exudate was cut into pieces and then crushed with a blender. Samples were put in macerator by maceration in 96% ethanol until they were completely submerged. This process is carried out for 3 × 24 hours and every 24 hours the macerator is fit into the bottle and a solution of ethanol is added to the macerator. The whole results from macerator is evaporated in an evaporator until all the solvent evaporates and resulting pasta of *A. vera*. After a week, the *S. fusiformis* culture in Zarrouk medium is filtered using Monel cloth and dried by a fan to obtain the dry weight. The dried *S. fusiformis* is pulverized to a powder and then is weighed to obtain the desired dose which is 148 mg, 296 mg, and 593 mg. This powder is dissolved in water for rabbits suited to their needs namely 150 ml per day (daily).

Preparation of animal test

A total of 28 male rabbits *New Zealand White* crossbreed of 12 weeks old were weighed and separated according to the normal distribution of data (coefficient of variation <10%), the rabbits were grouped into seven treatments with four replications. Cage habituation is done for one month. Slowly the rabbits are initially only given forage gradually replaced by pellets. Feed provided *ad-libitum*. Water was given twice daily (morning and evening) for total administration of 300 mL. The cage and eating, as well as drinking equipment, are cleaned every morning. The treatment has been given when the rabbit is 16 weeks old.

Experimental treatment

The treatment is given through drinking in every morning for four weeks. Rabbits of 20 weeks old were weighed after being put in 12 hours of fasting to calculate slaughter weight. The percentages of width and skin weight are calculated and skin tissue sections are taken a bit and stored in Bouin fixative solution for ± 24 hours for histological preparations.

Data analysis

Production aspects

Hair fineness (denier) is calculated after a few strands of hair are cut for as many as 225 pieces at ± 2cm long (SNI 08-1111-1989). The calculation of hair fineness (denier) is as follows: 9000 X (Weight A strand of hair (mg))/(A x B) where A = the number of hair and B = length of hair. The brightness of hair was tested using a

spectrophotometer SS6200. One bundle of hair is arranged in a spectrophotometer until it is dense and opaque. Hair brightness was measured at a wavelength of 650. The results are recorded as the value W = brightness hair.

The width of skin (cm 2) was calculated by the Hegenaur method (1977) by measuring the length of the skin from head to tail churned drawn vertically. The width of the skin was measured by an auxiliary line drawn from the tip of the left front part to right rear part. This line crosses the line of skin length, and it creates a meeting point. This meeting point is used as the basis for drawing a vertical line to show the width of the skin. At last, the number of skin length is multiplied by the number of skin width to determine the number of skin breadth (Figure 1).

The percentage of skin weight obtained from the calculation: (Weight Skin)/(Weight Cut) X 100%

Histological aspects

Observation of the thickness of the skin tissue was done under lighted microscope with 400X magnification. Measurement of tissue thickness uses a micrometer in the epidermis, dermis, and hypodermis.

The percentage calculation of hair follicles was measured by counting each visible follicle (primary follicles and secondary follicles) in the skin tissue area of the back (dorsal), calculated to reach the number 100. Each number of primary and secondary follicles is the percentage to the appropriate formula:

(primary follicles)/100 X 100%,

(secondary follicles)/100 X 100%

RESULTS AND DISCUSSION

Production aspect

The result of the analysis of variance (ANOVA) on the smoothness of hair show that the supplementation of *A. vera* and *S. fusiformis* affect the fineness of hair. Table 1 is the result of Duncan's Multiple Range Test.

Duncan's Multiple Range Test results show that the lowest value is in P5 treatment, i.e., 6.765 deniers but it is not significantly different from the treatment of P2 and P3. The values of P5 treatment is significantly different from the treatment of P0 (12.025 deniers) and P1 (8.985 deniers). From these data, the treatment of P5 has the highest level of refinement exceeding P1 as a positive control and P0 as a negative control. The lighter the weight of the hair, the more subtle the hair is. Treatment of P5 has the lowest fineness value among the other treatments, which means treatment of P5 brings on the smoothest hair among treatment.

Anova test results on the brightness of the hair show that the supplement administration of *A. vera* and *S. fusiformis* affects the brightness of rabbit hair. Table 2 is the result of Duncan's Multiple Range Test.

Duncan's Multiple Range Test results show that the treatment of P6 brings on the highest value, which is 88.458%. The Value of treatment of P6 is significantly different from P0 treatment (80.280%) and P1 treatment (80.025%). From these data, the treatment of P6 has the highest brightness value exceeding P1 as a positive control and P0 as a negative control.

The brightness of hair of rabbit is influenced by feeding and enclosure management. The good feed will affect the appearance of the brightness of hair. The proteins and essential fats will produce bright shiny hair. Thus the protein content in the *A. vera* and *S. fusiformis* can produce a good quality of hair brightness. Dirty hutch of rabbit will cause the hair to become dirty so the values of hair brightness will be low.

Anova test results to a slaughter weight of rabbits showed that the supplementation of *A. vera* and *S. fusiformis* affect rabbit slaughter weight. Table 3 is the result of Duncan Multiple Range Test.

Duncan's Multiple Range Test results show that the P5 treatment has the highest slaughter weight, which is 1769 grams and is not significantly different from P6 which is 1721.25-gram. The P5 and P6 treatment are significantly different from the treatment of P2, P3, P4, P0 and P1. From these data, the treatment of P5 has the highest slaughter weight exceeding P1 as a positive control and P0 as a negative control.

The average slaughter weight is obtained in accordance with the data of rabbits in West Java at age of 3-5 months, namely from 1.5 to 2.1 kg. *A. vera* and *S. fusiformis* as supplement contain amino acids. Amino acids are necessary to the principal needs in rabbit's life and growth. The intake of protein in the body is a source of energy and at a certain degree, it can increase body weight (Susanna 2007).

The results of the ANOVA test on the skin width of rabbit show that the supplement of *A. vera* and *S. fusiformis* affect the skin width of the rabbit. Table 4 is the result of Duncan Multiple Range Test.

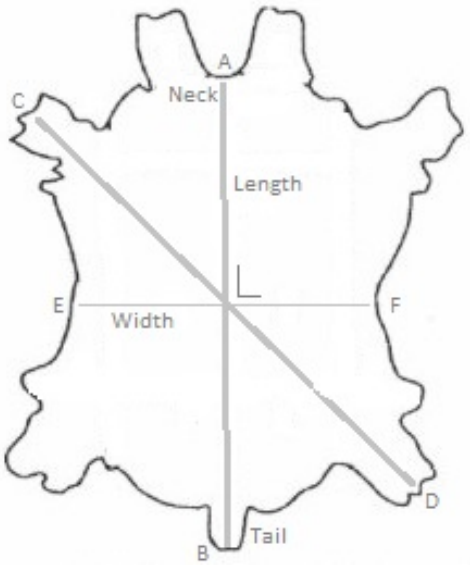

Figure 1. How to calculate the area of skin. Description: AB = length of the skin, EF = Width of the skin, CD = Lines aid to EF

Table 1. The average hair fineness of rabbit after administration of supplement of *A. vera* and *S. fusiformis*

Treat-ment	Replications				Hair fineness (denier) x ± SD*
	1	2	3	4	
P_0	10.52	10.26	9.38	11.48	10.50 ± 1.02^{cd}
P_1	10.36	7.20	11.68	6.70	8.985 ± 2.42^{bc}
P_2	6.9	8	6.48	7.9	7.32 ± 0.75^{ab}
P_3	8.14	8.64	6.84	7.78	7.85 ± 0.76^{ab}
P_4	10.38	11.38	11.5	14.84	12.025 ± 1.94^{d}
P_5	7.36	6.58	6.78	6.34	6.765 ± 0.44^{a}
P_6	11.16	9.36	10.16	11.16	10.46 ± 0.87^{cd}

Note: The different letters in the same column are indicating significant differences of Duncan test results (P> 95%)

Table 2. The average brightness of hair of rabbit after administration of supplement of *A. vera* and *S. fusiformis*

Treat-ment	Replications				Hair brightness x ± SD*
	1	2	3	4	
P_0	80.624	80.231	79.869	80.376	80.280 ± 0.32^{b}
P_1	81.015	78.37	80.73	79.985	80.025 ± 1.19^{b}
P_2	80.222	78.225	79.458	81.733	79.910 ± 1.47^{b}
P_3	73.162	76.679	75.632	74.358	74.958 ± 1.53^{a}
P_4	84.893	80.241	82.667	81.437	82.310 ± 1.99^{c}
P_5	80.465	82.214	82.712	81.305	81.674 ± 0.99^{bc}
P_6	87.834	89.6	88.956	87.443	88.458 ± 1.00^{d}

Note: The different letters in the same column are indicating significant differences of Duncan test results (P> 95%)

Table 3. The Average slaughter weight of rabbit after administration of supplement of *A. vera* and *S. fusiformis*

Treatment	Replication				Slaughter weight (gr) x ± SD*
	1	2	3	4	
P_0	1434	1745	1414	1648	$1560{,}25 \pm 162{,}44^{a}$
P_1	1414	1423	1629	1512	$1494{,}5 \pm 99{,}98^{a}$
P_2	1426	1482	1549	1457	$1478{,}5 \pm 52{,}28^{a}$
P_3	1635	1497	1544	1571	$1561{,}75 \pm 57{,}62^{a}$
P_4	1672	1524	1574	1483	$1563{,}25 \pm 81{,}49^{a}$
P_5	1780	1804	1794	1698	$1769 \pm 48{,}35^{b}$
P_6	1844	1708	1688	1647	$1721{,}75 \pm 85{,}36^{b}$

Note: The different letters in the same column are indicating significant differences of Duncan test results (P> 95%)

Table 4. The Average skin width of rabbit after the administration of Supplement of *A. vera* and *S.fusiformis*

Treat-ment	Replications				Skin width (cm^2) x ± SD*
	1	2	3	4	
P_0	1042.48	1171.74	1033.32	1142.25	$1097{,}45 \pm 69{,}93^{a}$
P_1	1025.88	1054.56	1087.56	1051.68	$1054{,}92 \pm 25{,}29^{a}$
P_2	1017.52	1046.4	1081.92	1152.54	$1074{,}60 \pm 58{,}26^{a}$
P_3	1481.61	1171.74	1285.2	1321.32	$1314{,}97 \pm 128{,}07^{b}$
P_4	1339.34	1272.08	1267.67	1356.32	$1308{,}85 \pm 45{,}57^{b}$
P_5	1426.36	1386.51	1216.44	1275.39	$1326{,}18 \pm 97{,}12^{b}$
P_6	1503.04	1346.63	1472.56	1283.81	$1401{,}51 \pm 103{,}63^{b}$

Note: The different letters in the same column are indicating significant differences of Duncan test results (P> 95%)

Table 5. The average skin weight percentage of rabbit after administration of supplement of *A. vera* and *S. fusiformis*

Treat-ment	Replications				Skin weight (%) x ± SD*
	1	2	3	4	
P_0	10.53	8.54	9.28	8.62	$9{,}24 \pm 0{,}92^{bc}$
P_1	9.05	8.85	8.04	8.53	$8{,}62 \pm 0{,}44^{b}$
P_2	6.94	6.48	6.07	7	$6{,}62 \pm 0{,}44^{a}$
P_3	8.93	9.28	7.84	8.08	$8{,}53 \pm 0{,}68^{b}$
P_4	9.45	9.05	9.4	8.77	$9{,}17 \pm 0{,}32^{bc}$
P_5	9.77	9.87	10.14	10.07	$9{,}96 \pm 0{,}17^{c}$
P^6	8.95	9.25	9.54	8.68	$9{,}11 \pm 0{,}37^{b}$

Note: The different letters in the same column are indicating significant differences of Duncan test results (P> 95%)

The P3, P4, P5 and P6 treatment have the average skin width of rabbit which are higher than the average of P0, P1, and P2 treatment. The P6 treatment provides the highest effect on the skin width of rabbit because it has the highest skin width, i.e., 1401.51 cm2. From these data, the treatment of P6 has exceeded the skin width of P1 as a positive control and P0 as a negative control.

Crude fiber and nutrients affects the skin width of rabbits. Nutrients in *A. vera* and *S. fusiformis* namely protein, vitamins, and minerals are good for the growth of rabbit. The process of growth is the increase in the number and size of the body cell. The process takes place in line with the age and condition of the rabbit. The increasing volume of the body can increase the skin width covering the surface of the body so that different weight will produce a different skin width (Sandjaja et al. 2009; Yuliarti 2008).

Anova test results to the skin weight percentage of rabbit show that the supplementation of *A. vera* and *S. fusiformis* affect skin weight percentage of the rabbit. Table 5 is the result of Duncan's Multiple Range Test.

The rabbits in P5 treatment have greater average skin weight percentage than the other treatments, i.e., 9.96%, but it is not significantly different from P0 which has an average of 9.24%. The lowest average of skin weight percentage is found in the treatment of P2 (6.62%). This value is below the average of the percentage of rabbits' skin weight in the treatment of P0 and P1 (9.24% and 8.62%). The results show that body weight has an influence on skin weight. The skin weight is 8-10% of body weight (Sandjaja et al. 2009; Yuliarti 2008). From these data, the P5 treatment has the highest skin weight percentage compared to P1 as a positive control.

Histologic aspect

The results of Anova test on the thickness of the skin tissue of rabbit show that the supplementation of *A. vera* and *S. fusiformis* affect the thickness of the skin tissue of rabbit. Table 6 is the result of Duncan's Multiple Range Test. The P4 treatment has the highest thickness of skin tissue, i.e., 1090.63 μm. It is significantly different from the negative control (P0) and the positive control (P1) which only has an average thickness of 575 μm and 631.25 μm. The P4 treatment does not differ significantly from P5 and P6 treatment. From these data, the P4 treatment has higher thickness of skin than the P1 treatment as a positive control.

Table 6. The average thickness skin of rabbit after administration of Supplement of *A. vera* and *S. fusiformis*

Treat-ment	Replications 1	2	3	4	Thickness skin tissue (µm) x ± SD*
P_0	481.25	818.75	443.75	556.25	575 ± 169,10^{ab}
P_1	743.75	481.25	637.5	662.5	631,25 ± 109,81^{ab}
P_2	493.75	325	612.5	431.25	465,625 ± 120,17^{a}
P_3	431.25	525	406.25	550	478,125 ± 70,06^{a}
P_4	756.25	1625	1156.25	825	1090,63 ± 396,75^{c}
P_5	637.5	512.5	1000	1100.25	812,563 ± 282,01^{abc}
P_6	981.25	668.75	718.75	1100	857,188 ± 207,06^{bc}

Note: The different letters in the same column are indicating significant differences of Duncan test results (P> 95%)

Table 7. The average percentage of total hair follicles of rabbit after administration of supplement of *A. vera* and *S. fusiformis*

Treatment	% Total primary follicles x ± SD*	% Total scondary follicles x ± SD*
P_0	11,17 ± 2,62^{cd}	88,83 ± 2,62^{ab}
P_1	11,75 ± 0,92^{d}	88,25 ± 0,92^{a}
P_2	9,04 ± 2,95^{c}	90,96 ± 2,95^{b}
P_3	5,75 ± 0,42^{b}	94,25 ± 0,42^{c}
P_4	3,665 ± 0,81^{ab}	96,335 ± 0,81^{cd}
P_5	2,3325 ± 0,27^{a}	97,6675 ± 0,27^{d}
P_6	5,415 ± 1,07^{b}	94,585 ± 1,07^{c}

Note: The different letters in the same column are indicating significant differences of Duncan test results (P> 95%)

The results of the study of the thickness of skin tissue range from 465.625 to 1090.63 µm. It was larger than the range of skin thickness of rabbit generally ranging from 380-840 µm. The thickness of skin is closely related to fat content, feed quality, and growth rate. Animals which were fed on low nutritious will produce the low quality of skin tissue (Wibowo 2008). Figure 2 is the preparation of histological thickness of skin tissue of rabbit after treatment.

The weight gain is closely related to the development of muscle that forms meat and skin tissue, through increasing the content of the subcutaneous fat tissue; therefore it contributes to the thickness of the skin. The thickness of skin is dominated more by the subcutaneous fat and has little relationship with the slaughter weight, as in the statement of Wibowo (2008), that the increase in the subcutaneous fat tissue will give rise to the thickness of subcutaneous layer.

Aloe vera or *S. fusiformis* contains vitamins A, C and E that are good for the skin. Vitamin A can stimulate the formation of collagen thus spurring the epithelialization. The function of vitamin C relates to the synthesis of collagen, a protein found in connective tissue. This tissue consists of insoluble collagen fibers that are stored in a matrix called the basic substance. This tissue is found in the skin, cartilage, tendons, ligaments, bones and blood vessels. Vitamin E is fat soluble and is absorbed by the skin efficacious as an antioxidant to suppress the formation of free radicals, preventing damage to skin cells (Bajwa et al. 2007; Widagdo 2004).

The results of Anova test on hair follicles show that the supplementation of *A. vera* and *S. fusiformis* affects the amount of hair follicles percentage of the rabbit. Table 7 is the result of Duncan Multiple Range Test.

The Duncan test result is about the average amount of hair follicles percentage of the rabbit after administration of supplement of *A. vera* and *S. fusiformis* showing that the percentage of primary rabbit hair follicle is inversely proportional to the percentage of secondary rabbit hair follicles. This is because the primary rabbit hair follicle is surrounded by several secondary hair follicles. Cheeke (1987) said the number of secondary hair follicles/unit area varies depending on the season. In the winter, the number of secondary hair follicles multiplies to produce thicker hair in order to maintain body heat. Conversely, in summer, the number of secondary hair follicles was reduced to allow heat dissipation mechanism of the body so that body heat balance is maintained.

The most average value of percentage secondary hair follicles is the treatment of P5, 97.67%, while the control has the lowest number of secondary hair follicles, which is 88.25% for P1 (positive control) and 88.83% for P0 (negative control). The study was conducted during the rainy season which has a low environmental temperature so that the number of secondary hair follicles of rabbit multiplies to maintain body heat. Thus, in addition to low temperatures, the supplement of *A. vera* and *S. fusiformis* also can spur the growth of fine hair (own hair) so the percentage of secondary rabbit hair follicles will be much more.

Tansar (2011) showed that *A. vera* potentially prevent damage of hair follicles of mice after the administration of etoposide. Mice given by *A. vera* with a dose of 200 mg/kg BW mice (74 mg/kg BW rabbits) have 41.31 hair follicles while apoptosis frequency is decreased by 90.94%. Substances of aloin in *A. vera* is used to treat hair loss and nourish hair. Vitamin E along with linoleic acid and arachidonic acid contained in Spirulina is a fatty acid which is important for maintaining healthy of hair, especially hair roots and for maintaining the integrity of overall hair. The observation of histological preparations of the rabbit hair follicles with HE staining can be seen in Figure 3.

The nutrition in *A. vera* and *S. fusiformis* such as protein is needed by rabbit for basic living needs and growth. Proteins that enter the body of the rabbit will be converted into amino acids and absorbed by the small intestine and carried by the blood throughout the body to form the body's tissues, especially muscle tissue. Muscle tissue/rabbit meat is a major component in the muscle tissue production. The more muscle tissues are formed, the production of the meat, the slaughter weight and also the production of skin will increase(Sandjaja et al. 2009; Wibowo 2008; Yuliarti 2008).

Rabbits have special characteristics in the efficiency of protein utilization for their lives. Rabbits need protein between 12-18%. In this study, the given ration already contains of 15% protein. An extra supplement containing high protein would make rabbits experience excess of protein. Excess of protein will be absorbed by the body for other production purposes, namely fur production (Cheeke 1987).

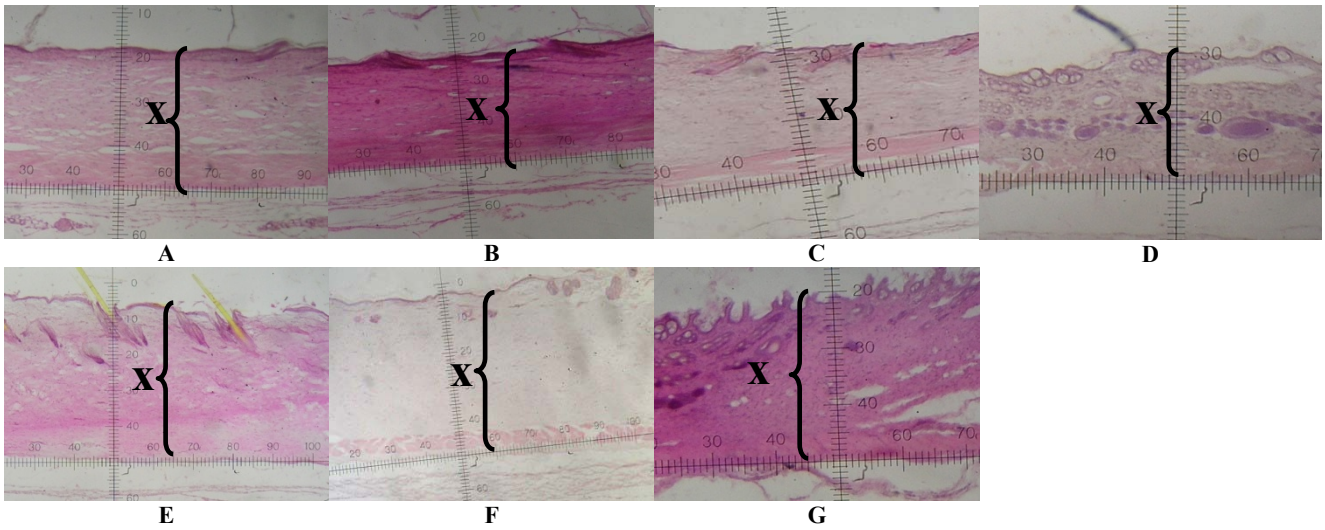

Figure 2. The preparation of histological thickness of skin tissue of rabbit after treatment, the incision in the lengthwise direction. Note: X: thick skin tissues of rabbits, lighted microscope, 400 × magnification, HE staining. A. P0 negative control, B. P1 positive control, C. P2A. vera 74 mg/kg BW, D. P3S. fusiformis 296 mg/kg BW, E, P4A. vera: S. fusiformis, 74 mg/kg BW: 148 mg/kg BW, F. P5A. vera: S. fusiformis, 74 mg/kg BW: 296 mg/kg BW, G. P6A. vera: S. fusiformis, 74 mg/kg BW: 593 mg/kg BW

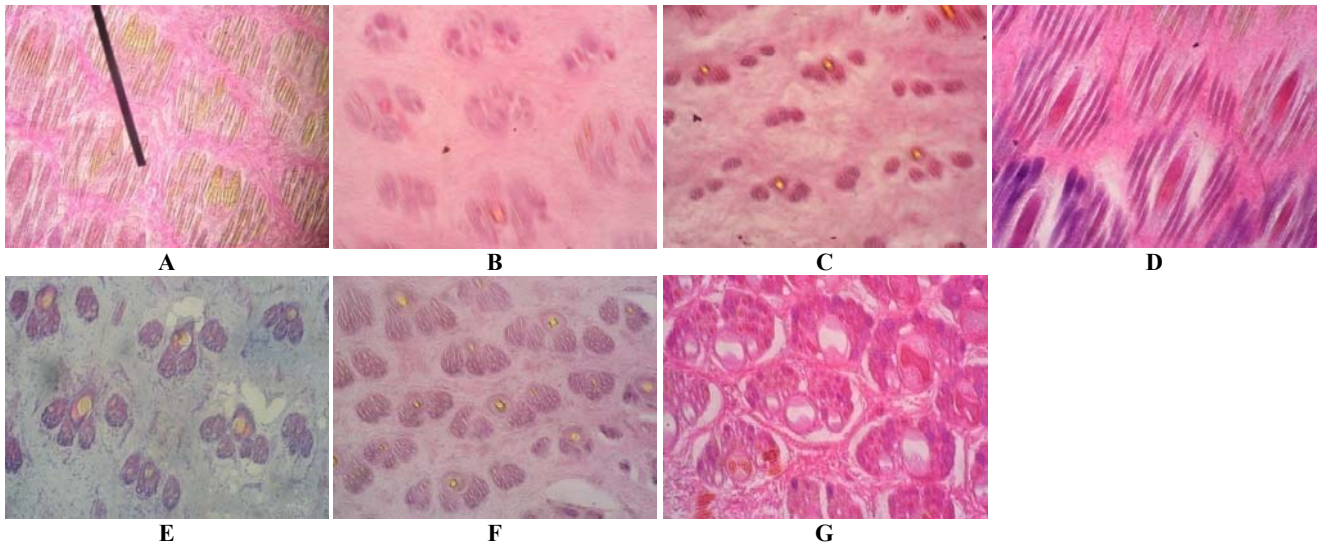

Figure 3. The histological preparations of rabbit hair follicles. Note: Lighted microscope, magnification 400X, HE Staining, direction transverse incision. A. P0 negative control, B. P1 positive control, C. P2A. vera 74 mg/kg BW, D. P3S. fusiformis 296 mg/kg BW, E, P4A. vera: S. fusiformis, 74 mg/kg BW: 148 mg/kg BW, F. P5A. vera: S. fusiformis, 74 mg/kg BW: 296 mg/kg BW, G. P6A. vera: S. fusiformis, 74 mg/kg BW: 593 mg/kg BW

The number of ration consumed depends on the animal concerned, ambient temperature, palpability ration, the ration of energy levels, the physical form of ration, the production function, and age of cattle. Feed consumption will be lower when the protein level is low so the unbalance metabolism of connective tissue will occur. Conversely, if the protein content of the ration is too high it will decrease digestibility of other food substances (Cheeke 1987). The rations in this study are so much that a number of nutrients are obtained from the same ration. The addition of supplement of *A. vera* and *S. fusiformis* increases the amount of protein digested. On the other hand, the shortage

and excess of protein are not good for the metabolism of the rabbit, so the proper dosage of formulations in supplements made from *A. vera* and *S. fusiformis* are indispensable.

Aloe vera or *S. fusiformis* contains vitamins A, C and E which are good for the skin. Vitamin A can stimulate the formation of collagen thus spurring epithelialization. The function of vitamin C relates to the synthesis of collagen, a protein found in connective tissue. This tissue consists of insoluble collagen fibers that are stored in a matrix called the basic substance. This tissue is found in the skin, cartilage, tendons, ligaments, bones and blood vessels. Vitamin E is fat-soluble, which is absorbed by the skin efficacious as an antioxidant useful to suppress the formation of free radicals and to prevent cell damage of the skin (Widagdo 2004).

The results show that in this research, the use of dose combination of *A. vera* with 74 mg/kg BW and *S. fusiformis* with 296 mg/kg BW (P5) is the appropriate dose for a supplement of the rabbit. The combination of two materials effectively generates the best appearance of skin tissue of 16-weeks-old *New Zealand White* rabbit. It can be seen from the improved production aspects such as hair texture, slaughter weight, skin width, and skin weight percentage and the improved histological aspect such as the thickness of skin tissue and the amount of hair follicle.

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