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GROWTH ACTIVITY TEST OF WHITE RAT HAIR COMBINATION OF CELERY (*Apium Graveolens*) LEAF EXTRACT AND GREEN GEDI *(Abelmoschus Manihot*) LEAF

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Abstract

Celery and Green Gedi leaves have been long considered traditional topical supplements to support hair growth. They contain flavanoids that are efficacious to induce keratinocyte proliferation. However, the research about whether the combination of celery and green gedi leaves can still provide an effect is limited. This current study aims to determine the effect of the combination of ethanol extracts of celery leaves and green gedi leaves on white rat hair growth. This is laboratory experimental research to compare the hair growth in three different groups with normal and positive control. Animals were randomly grouped (n=3 for each group) and then given a combination of leaf extracts and carbopol with a concentration of 17.5%:10%; 27.5%:15%;37.5%:20%. A normal control group was left untreated, while another group was treated with 2% minoxidil as positive control. The results of measuring fur weight on day 21 showed that the treatment group given the combination of extracts did affect the growth of rat hair. Statistical tests using one-way ANOVA showed a p-value of <0.001 which means there is a significant difference in the average hair weight of rats treated. LSD post hoc test showed that treatment with a 17.5%:10% concentration ratio was significantly different from the other treatments. It can be concluded that the combination of celery leaf extract and gedi leaf positively affects rat hair growth.

Key words:, celery leaves extract, gedi leaves extract, hair growth

INTRODUCTION

Along with the times, various cosmetic products have been developed to overcome the problem of baldness and hair loss, such as hair gel, shampoo, hair tonic, conditioner, and so on (Ayuningtyas, 2018). Many hair problems are experienced by adults, one of which is hair loss. Hair loss is a decrease in the number of hair strands on the scalp (Nurdianti, 2018). Hair loss can be caused by hormonal disorders, side effects of drugs, food consumed, and stress (Sari & Wibowo, 2016). Hair loss often ends with baldness that everyone is very worried about (Siti Hindun, 2017).

Gedi (*Abelmoschus manihot* L.) is a tropical plant of the Malvaceace family that is utilized as food by a small part of the Indonesian population. The people of North Sulawesi utilize gedi leaves as the

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main ingredient in making traditional tinutuan food (Taroreh, 2015). Gedi contains chemical compounds such as flavonoids, tannins, saponins, alkaloids, essential oils, triterpenoids, steroids, and glycosides (Pratiwi et al., 2022). Flavanoid compounds that act as antioxidants in gedi leaves can stimulate hair growth (Orin and Raden, 2018).

One another of the plants that can grow hair is celery. According to Dalimarta (2016), celery contains flavonoids, saponins, 1% tannins, apiin, 0.033% essential oil, apigenin, choline, vitamins A, B, C, asparagine bitter substances. Apigenin is the main chemical content in celery and is known to have activity as a vasodilator that can trigger hair growth (Hendrika et. al., 2017). Therefore, researchers are interested in combining celery leaves (Apium graveolens L) and green gedi leaves (Abelmoschus manihot) as hair growth.

RESEARCH METHODS

This study is a laboratory experimental study that will test the activity of a combination of celery leaf extract and green gedi leaves on white rat hair growth with 5 treatments in male white rats as test animals. The tools used in this study are rat cages, feed containers, drinking containers, analytical scales, scissors, razors, permanent markers, cutting boards, zipper lock bags, gloves, glass containers, blenders, ovens, filter paper, rotary evaporators, and cameras for documentation. The materials used in this study are celery leaf simplisia, green gedi leaves, 96% ethanol, distilled water, aluminum foil and carbopol 940.

Extraction

The extraction of celery leaves (Apium graveolens L.) and green gedi leaves (Abelmoschus manihot L) was carried out by maceration method. Each prepared simplisia was put in a glass container and soaked in 96% ethanol solvent for 24 hours, filtered then produced filtrate 1 and debris 1. Debris 1 was then remacerated again with 96% ethanol solvent until everything was submerged and left again for 24 hours, this was repeated until the extraction results became clear. Filtrate 1, 2 and 3 were mixed together and filtered, then evaporated using a rotary evaporator at 60 ^{o}C. Furthermore, the extract was weighed using analytical scales.

Preparation of 0.5% Carbopol Gel

A total of 0.125 grams of carbopol was weighed and then dispersed with 100 ml hot water and stirred until homogeneous.

Manufacturing Test Preparations

The test preparations were made in five groups of 25 grams, which differed in the concentration of celery leaf extract combined with green gedi leaf extract. Each preparation contains celery leaf extract combined with green gedi leaves at 7.5%:10%, 7.5%:15%, 7.5%:20% (Table 1).

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Table 1. Composition of Test Preparations

Ingerdients	Concentration (%)		
	A	B	C
Celery leaf extract	7,5	7,5	7,5
Gedi leaf extract	10	15	20
Carbopol Gel 0,5%	Ad 100	Ad 100	Ad 100

Description:

Group A: Celery leaf extract 7.5% combination of gedi leaf extract 10% plus gel base

Group B: 7.5% celery leaf extract combined with 15% gedi leaf extract plus gel base

Group C: 7.5% celery leaf extract combined with 20% gedi leaf extract plus gel base

Preparation of Test Animals

The test animals were 15 male white rats aged 2 to 3 months with a weight of 150-200 grams. White rats were obtained from a white rat farm. Before the study began, white rats were acclimatized so that white rats could adapt to their new environment. White rats were placed in rat cages. During the acclimatization process, white rats were given standard feed and sufficient drinking water.

Activity Test against Hair Growth

Before treatment, the hair on the back of white rats is shaved using scissors and razors as many as 3 locations with each location area of 2 cm x 1 cm and each location is spaced. The treatment locations were demarcated using a permanent marker to distinguish between one treatment location and another. The number of white rats needed for this study was 3 for each treatment, there were 5 treatments in this study, so 15 white rats were needed. The test preparation was applied to the back of white rats as much as 1 ml once a day for 3 weeks,S The test preparation was applied to the backs of white rats at a dosage 1 mL once daily for a duration of three weeks.

a. Treatment 1 The backs of white rats were smeared with celery leaf extract with a concentration of 7.5% combined with gedi leaf extract with a concentration of 10% (Group A).
b. Treatment 2 The backs of white rats were smeared with celery leaf extract with a concentration of 7.5% combined with gedi leaf extract with a concentration of 15% (Group B).
c. Treatment 3 The backs of white rats were smeared with celery leaf extract with a concentration of 7.5% combined with gedi leaf extract with a concentration of 20% (Group C).
d. Treatment 4 was smeared with aquadest as a normal control that did not contain celery leaf and gedi leaf extracts (Group D).
e. Treatment 5 was treated *hair tonic* containing minoxidil (Group E).

Every day the backs of white rats are smeared once in each treatment for 21 days by rinsing using distilled water first before smearing the extract so that no previous extracts are still attached.

Data Analysis

The data obtained were analyzed by statistical methods of measuring the hair weight of white rats using the SPSS (Statistical Package for the Social Sciences) application. Then tested for normality using the Shapiro-Wilk test, said to be distributed if (p> 0.05). Then proceed with the homogeneity test using the Levene Test, it can be said that the data is homogeneous if (p> 0.05). Then the data is continued with the One Way ANOVA (Analysis of Variance) test to see the real differences between treatments. If there is a difference, then further tests are carried out using the Post Hoc Test, namely LSD (<0.001).

RESULTS AND DISCUSSION

A. RESULTS

Table 2. Average Percentage of Rat Hair Weight Growth

Group	Research Days (gram)			Percentage Growth		
Group 1	Day 7	Day 14	Day 21	Day 7	Day 14	Day 21
Concentration 7,5% : 10%	1,1846	1,2019	1,2319			
	1,1857	1,2052	1,2350			
	1,1843	1,2081	1,2361			
Average	1,1848	1,2050	1,2343	0,11%	0,15%	0,21%
Group 2	1,1823	1,1994	1,2297			
Concentration 7,5% : 15%	1,1833	1,2041	1,2321			
	1,1838	1,2059	1,2323			
Average	1,1831	1,2031	1,2313	0,11%	0,15%	0,20%
Group 3	1,1816	1,1916	1,2130			
Concentration 7,5% : 20%	1,1827	1,1921	1,2131			
	1,1834	1,1926	1,2132			
Average	1,1825	1,1921	1,2131	0,11%	0,13%	0,17%
Group 4	1,1548	1,1563	1,2063			
Normal control	1,1195	1,1779	1,2066			
	1,0771	1,1669	1,2071			
Average	1,1171	1,1670	1,2066	0,01%	0,08%	0,15%
Group 5	1,1906	1,2187	1,2455			
Positive control	1,1899	1,2217	1,2397			
	1,1857	1,2297	1,2513			
Average	1,1887	1,2233	1,2385	0,12%	0,19%	0,21%

Description :
Treatment 1, 2 dan 3 : Combination of celery leaves extract and gedi leaves extract
Treatment 4 : Does not contain extract
Treatment 5 : Contains minoxidil

This study used the One Way ANOVA statistical test to determine significant mean differences between groups. Before One Way ANOVA test, the data must be tested for normality and homogeneity. The results of the normality test p> 0.05 indicate that all data are normally distributed. The homogeneity test results showed a value of p = 0.086. The results of the homogeneity test p> 0.05 indicate that the data is homogeneously distributed.

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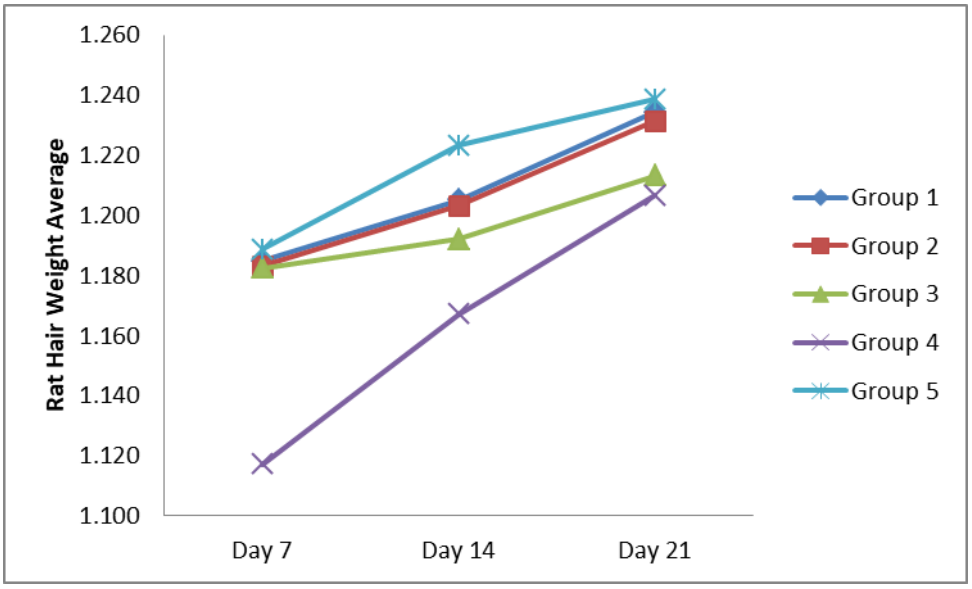

Figure 1. Rat Hair Weight Average Chart

Based on the results of the One Way ANOVA analysis in Table 3, the p value <0.001 indicates that there is a significant difference between treatment groups, so further tests are carried out using LSD (Least Significant Difference). LSD test is a further test to determine which treatment is significantly different if H0 is rejected. Where the LSD test is carried out to test more specifically the average difference from the treatment given.

Tabel 3. Test Results of *One Way* ANOVA Analysis

	Treatment Group	*p* Value
Weighted Value	Normal control Positive control Treatment 1 7,5% : 10% Treatment 2 7,5% : 15% Treatment 3 7,5% : 20%	<0,001

From the LSD test results (Table 4), normal control is significantly different from positive control (p <.001). Normal control with treatment group 1 was significantly different (p <.001), normal control with treatment group 2 was significantly different (p <.001) and normal control with treatment group 3 was not significantly different (p =.020). The positive control was significantly different from all treatments (p <.001). Treatment group 1 and treatment group 2 were not significantly different (p =.231), treatment group 1 and treatment group 3 were significantly different (p <.001). Treatment group 2 and treatment group 3 were significantly different (p <.001).

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Tabel 4. Test Results of LSD

Multiple Comparisons

Dependent Variable: Nilai Bobot
LSD

(I) Kelompok Perlakuan	(J) Kelompok Perlakuan	Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Perlakuan 1	Perlakuan 2	.0029667	.0023281	.231	-.002221	.008154
	Perlakuan 3	.0212333*	.0023281	<.001	.016046	.026421
	Perlakuan 4	.0276667*	.0023281	<.001	.022479	.032854
	Perlakuan 5	-.0111667*	.0023281	<.001	-.016354	-.005979
Perlakuan 2	Perlakuan 1	-.0029667	.0023281	.231	-.008154	.002221
	Perlakuan 3	.0182667*	.0023281	<.001	.013079	.023454
	Perlakuan 4	.0247000*	.0023281	<.001	.019513	.029887
	Perlakuan 5	-.0141333*	.0023281	<.001	-.019321	-.008946
Perlakuan 3	Perlakuan 1	-.0212333*	.0023281	<.001	-.026421	-.016046
	Perlakuan 2	-.0182667*	.0023281	<.001	-.023454	-.013079
	Perlakuan 4	.0064333*	.0023281	.020	.001246	.011621
	Perlakuan 5	-.0324000*	.0023281	<.001	-.037587	-.027213
Perlakuan 4	Perlakuan 1	-.0276667*	.0023281	<.001	-.032854	-.022479
	Perlakuan 2	-.0247000*	.0023281	<.001	-.029887	-.019513
	Perlakuan 3	-.0064333*	.0023281	.020	-.011621	-.001246
	Perlakuan 5	-.0388333*	.0023281	<.001	-.044021	-.033646
Perlakuan 5	Perlakuan 1	.0111667*	.0023281	<.001	.005979	.016354
	Perlakuan 2	.0141333*	.0023281	<.001	.008946	.019321
	Perlakuan 3	.0324000*	.0023281	<.001	.027213	.037587
	Perlakuan 4	.0388333*	.0023281	<.001	.033646	.044021

*. The mean difference is significant at the 0.05 level.

B. DISCUSSION

Based on Figure 1, it can be seen that the average increase in rat hair growth every day in each treatment group. Therefore, day 21 was used to test the data using one way anova. The results of One Way ANOVA analysis showed ($p < 0.001$) which means there is a significant difference between treatment groups and shows that the combination of celery leaf extract and gedi leaf has an effect on hair growth activity in white rats, where the combination of extracts with different concentration variations is able to make a significant difference to hair growth, so further analysis was carried out using the LSD test, with the aim of seeing specific average differences between treatments to determine which extract concentration comparison is better.

The results of testing the average hair weight on day 21 showed that the positive control containing minoxidil was higher than the other treatment groups. Statistically, the positive control and other treatment groups were significantly different ($p < 0.001$). This is because minoxidil which functions as a vasodilator has the ability to thicken hair by widening blood vessels and opening potassium bridges so that more oxygen, blood and nutrients to the hair follicles (Nurjanah et. al, 2014).

In addition, the results of statistical tests showed that treatment group 1 containing a combination of extracts with a concentration of 7.5% : 10% significantly different from treatment 3 containing extracts with a concentration of 7.5% : 20%, namely ($p < 0.001$). Based on research conducted by Anuar and

Levita (2018) celery leaves at a concentration of 7.5% can already trigger hair growth because it has activity as a vasodilator. Another study conducted by Runtuwene et. a., (2023) showed that flavonoids from gedi plant extracts were able to stimulate hair growth at low concentrations. Extracts with low concentrations are more easily absorbed by the skin so that they can be more effective in stimulating hair follicles (Ngelu et. al., 2022). In addition, Amalia et al., (2024) stated that gedi leaves contain polyphenolic compounds, namely tannins, which have antioxidant activity. Tannins are known to have the ability to bind to proteins, including keratin in hair to provide protection for hair health and support hair growth (Rori, 2016).

CONCLUSION

Based on the results of the research that has been done, it can be concluded that the combination of celery leaf extract and gedi leaf is able to affect hair growth in white rats. Treatment with low concentration has more effective hair growth activity than high concentration.

REFERENCE

Anuar, A. H. B. S., & Levita, J. (2018). Review: Seledri Apium Graveolens. Linn. Sebagai Tablet Anti-Inflamasi. *Jurnal Farmaka*, *16*(1), 72–82.

Ayuningtyas, D. & Linawati, M. (2018). *Peranan Follicular Unit Grafting Dalam Mengatasi Alopeca*. *Jurnal Media* Udayana, 2(8): 1365-1377

Sari, D. K., & Wibowo, A. (2016). Perawatan herbal pada rambut rontok. Medical Journal of Lampung University [MAJORITY], 5(5), 129-134.

Pratiwi, E. N. A., Putra, I. G. N. A. D., & Setyawan, E. I. (2022). Aktivitas analgesik tanaman gedi (Abelmoschus manihot L.) pada mencit (Mus musculus). Humantech: Jurnal Ilmiah Multidisiplin Indonesia, 2(3), 477-484.

Hendrika, G., Rahayu, A., & Mulyaningsih, Y. (2017). Pertumbuhan Tanaman Seledri (Apium graveolens L.) Pada Berbagai Komposisi Pupuk Organik Dan Sintetik. *Agroninda*, *3*((1)), 01–09.

Hindun, S., Akmal, A., Najihudin, A., Sari, N. (2017). Formulation of Hair Tonic Combination of Celery and Green Tea Leaves Ethanol Extract for Rabbit Hair Growth. *Jurnal Ilmiah Farmako Bahari*, *8*, 21–33.

Amalia, A. R., Nurrahman, A., Sari, D. W., & Firdaus, M. (2024). Potential of Ethanol Extract of Red Gedi Leaves (Abelmoschus manihot L. Medik) Against Endogenous Antioxidant Activity in Rat Model of Diabetes Mellitus. Eureka Herba Indonesia, 5(3), 470-480.

Ngelu, F. Y., Marbun, F. D., Sihombing, A. M., Manalu, Y., Ate, V. R. K. M., & Riswanto, F. D. O. (2022). Potensi Ekstrak Seledri (Apium graveolens L) Sebagai Antibakteri. Jurnal Jamu Kusuma, 2(1), 23-29. https:// doi.org/10.37341/jurnaljamukusuma.v2i1.22

Nurdianti, L., Azzahra, S. F., & Aji, N. (2017). Pengembangan formulasi sediaan gel rambut antiketombe ekstrak daun pandan wangi (Pandanus amaryllifolius Roxb.) dengan menggunakan viscolam

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sebagai gelling agent dan uji aktivitasnya terhadap jamur Pityrosporum ovale. Jurnal Kesehatan Bakti Tunas Husada, 17(2), 456-467

Nurjanah, & Krisnawati, M. (2014). Pengaruh Hair Tonic Lidah Mertua (Sanseviera Trifasciata Prain) dan Seledri (Apium Graveolens Linn) Untuk Mengurangi Rambut Rontok. *Journal of Beauty and Beauty Health Education*, *3*(1), 1–7.

Orin Tri Wulan, Raden B. (2018). Profil Fitokimia dan Aktivitas Farmakologi Gedi (Abelmoschus manihot (L.) Medik.). *Suplemen Volume 16 Nomor 2*.

Dalimarta, S. (2016). Atlas Tumbuhan Obat Indonesia (Vol.2). Jakarta: PT. Trubus Agriwidya

Rori, W. M. (2016). Formulasi dan evaluasi sediaan tablet ekstrak daun gedi hijau (Abelmoschus manihot) dengan metode granulasi basah. PHARMACON, 5(2).

Runtuwene, P. M., Winaya, K. K., & Dewi, N. N. A. (2023). Topical Administration of Red Gedi Leaves (Abelmoschus Manihot L. Medik) Gel Extract Increases Neovascularization, Number of Fibroblasts and Re-Epithelialization on Wounds in Diabetic Rats. International Journal of Scientific and Creative Innovations, 4(6), 998–1007.

Taroreh, M., Rahardjo, S., Hastuti, P., & Murdiati, A. (2015). Ekstraksi daun gedi (Abelmoschus Manihot L) secara sekuensial dan aktivitas antioksidannya. Agritech, 35(3), 280-287.