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COMPARISON OF THE CONCENTRATION OF YOUNG COCONUT AND OLD COCONUT WATER HYBRID ON THE GROWTH OF EXSPLANTS OF CHRYSANTHEMUM

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Abstract:
This study aimed to compare the growth of chrysanthemum explants from the concentration of Young Coconut Water and Old Coconut Water in vitro. This research was conducted at the Biotechnology Laboratory of Klabat Airmadidi University – Manado, North Sulawesi in February – May 2020. This study used a completely randomized design consisting of Young Coconut Water and Old Coconut Water, each with 3 treatments MS0 (as control), 15% and 30% so that 5 treatments were obtained and repeated 10 times. The statistics used are ANOVA and multiple distance difference test (Duncan). The results of the observational variables used were explant shoot height, 30% Young Coconut Water and 30% Old Coconut Water had an effect on explant shoot height at the age of 2 MSK, 4 MSK and 6 MSK. The explant shoot height data showed that Old Coconut Water was 30% better than Young Coconut Water 30%. The variable number of shoots treated with MSO (without coconut water treatment) greatly affected the number of shoots.

Keywords: Anova, Duncan, Young Coconut Water, Old Coconut Water.

INTRODUCTION

The chrysanthemum varieties, namely Kulo and Riri, have been cultivated by flower farmers in the City of Tomohon, North Sulawesi (North Sulawesi) from generation to generation since the Dutch Colonial period and have become a characteristic of Tomohon City which rarely grows in other areas in Indonesia and even in the world. In the Tombulu language, the chrysanthemum varieties are Kulo which means white and Riri which means Yellow; has been recognized for its excellence nationally and known by the world community. Kulo (white) means honesty and loyalty while Riri (yellow) means joy, cheerfulness, and optimism. Chrysanthemum flower or the scientific name Cryshantemum is a flower that is much favored by flower lovers. The flowers are not only beautiful but also superior to various colors, making them look more lively wherever these flowers are placed. The plus value of chrysanthemum flowers is their characteristic soft aroma, so they can be added to tea to make the tea taste more fragrant.

Chrysanthemum is a flowering plant of the Asteraceae tribe which consists of spray and standard chrysanthemums. The beauty of this chrysanthemum flower has attracted a lot of attention from big countries such as Japan, France, England, Singapore, China, Hong Kong, and others. The fact that there are chrysanthemums ranks second after roses, making this flower famous as one of the cut flowers. This beautiful chrysanthemum flower has benefits as a fungicide and vegetable insecticide. The flower hump has a pyrethrin compound, a compound that produces toxins and is repelling and killing mosquitoes, including other insects.

Propagation of chrysanthemum can be done using seedlings or shoot cuttings, but conventional vegetative propagation is still not effective in meeting the needs of seedlings with a high level of uniformity. In vitro culture can be used as an alternative to obtain seeds in large, uniform, virus-free and in a short time (Rukmana and Mulyana, 1997).

In vitro culture in agriculture, especially agronomy, has many benefits, among others, for propagation that will produce quality plants and plant improvement to produce new, superior species. In vitro culture applications, both in terms of plant propagation and plant improvement, have been widely used in horticultural crops, especially ornamental plants, plantation crops even forestry has used this technique, such as in oil palm, teak, sengon etc. (Mattjik, 2005). According to Suryowinoto (1996), in vitro culture processes of differentiation and dedifferentiation occur. Differentiation is the division of meristem cells, while dedifferentiation is adult tissue that is still alive and has had certain functions to become meristematic again. Dedifferentiation in plants is the basis for vegetative propagation, namely stem cuttings, grafts and in vitro culture.

Coconut water can be used as natural organic PGR in in vitro culture, coconut water contains nutrients and hormones needed for plant growth. The use of coconut water in in vitro culture as a substitute or additional component of PGR, in vitro culture plants that were given coconut water grew better, green plants, hard stems and roots, and coconut water used was very easy to obtain and the price was relatively affordable, especially the people of the city of Manado, North Sulawesi, so that it is dubbed the city of waving palm trees.

Coconut water contains a number of nutrients, namely 0.2% protein, 0.15% fat, 7.27% carbohydrates, sugar, vitamins, electrolytes and growth hormones. The maximum sugar content is 3 grams per 100 ml of coconut water. Types of sugar contained are sucrose, glucose, fructose and sorbitol. These sugars make young coconut water sweeter than older coconut water (Onifade, 2003 in Warisno, 2004).

Old coconut water only contains a few vitamins in small amounts, namely vitamin C content is only 0.7-3.7 mg/100 g coconut water, nicotinic acid 0.64 mg/100 ml, panthothenic acid 0.52 mg/100 ml , biotin 0.02 mg/100 ml, riboflavin 0.01 mg/100 ml and folic acid only 0.003 mg/100 ml (Pambayun, 2002).

The comparison of the nutritional value of old coconut water and young coconut can be seen in Table 1.

Table 1. Nutritional Value of Coconut Water

Nutrient content	Old Coconut	Young coconut
Proteins (%)	0.29	0.1
Fat (%)	0.15	<0.1
Carbohydrates (%)	7.29	4
Vitamin C (Mg/100 ml)	2.2 - 3.7	2.2 - 3.4
Water (%)	91.23	95.5
Ash (%)	1.06	0.4

Source: Grimwood, 1975 in Santoso (2003)

Old coconut water contains only a few vitamins in small amounts. Its vitamin C content is only 0.7-3.5 mg/100 mg fruit juice, 0.64 g/ml nicotinic acid, 0.52 g/ml panthothenic acid, 0.02 g/ml biotin, 0.01 riboflavin. g/ml, and folic acid is only 0.003 g/ml (Palunkun, 2003). According to Bey, Syafii, & Sutrisna (2006) coconut water treatment alone at a concentration of 250 ml/l was able to produce faster leaf and root formation in in vitro culture of orchids (Phalaenopsis amabilis BL). Coconut water promotes the growth of some plants in tissue culture. This is thought to be caused by (Mandang, 2013): 1) Coconut water contains almost the same components as MS media because it contains sugar, macro and micro nutrients, amino acids and organic acids: 2) Coconut water as a substitute MS medium: on chrysanthemum tissue culture, it was found that substitution of MS medium with coconut water up to 40% resulted in higher shoot wet weight compared to using 100% MS; 3) Coconut water as a complement to MS media means that it is added to media whose composition is complete (100%).

Based on the explanation above, the problems that can be formulated in this research are:

1. What is the effective concentration of Young Coconut Water and Old Coconut Water for the growth of chrysanthemum explants in vitro.
2. How does the growth of chrysanthemum explants compare with the concentration of Young Coconut Water and Old Coconut Water.

The purpose of this research is

To compare the growth of chrysanthemum explants from the concentration of Young Coconut Water and Old Coconut Water in vitro.

The benefits of this research are:

1. Obtaining chrysanthemum shoot propagation method in vitro.
2. Obtain the optimum concentration of Young Coconut Water and Old Coconut Water for the growth of Chrysanthemum shoots in vitro.
3. Provide basic information for the following researchers regarding in vitro culture studies on chrysanthemum plants using a more effective growth medium between Old Coconut Water and Young Coconut Water.

RESEARCH METHODS

The research entitled Comparison of Concentration of Young Coconut Water and Old Coconut Water of local varieties on the Growth of Chrysanthemum Expolants. This research was carried out at the Biotechnology Laboratory, Klabat University, Manado, North Sulawesi (February – May 2020) .

The materials used in this study include: chrysanthemum shoots, agar as a compactor, sucrose, young coconut water and old coconut water, 70% and 95% alcohol, sterile distilled water, and other materials that support this

research. The basic media used is MS media (Murashige and Skoog) plus several concentration ratios of Coconut Water

The tools used in this study were glassware (culture bottles, measuring cups, beaker glass, erlenmeyer, and petridish), analytical balance, pH meter, autoclave, *Laminar Air Flow* (LAF), dissection equipment (tweezers, scissors and scalpel), stirer, spirit lamp, culture rack with 40 watt lamp and other tools that support this research. This study used a completely randomized design , namely MS0 (as control) and Young Coconut Water treatment in 2 treatment levels (15% and 30%) and Old Coconut Water in 2 treatment levels (15% and 30%), so that 5 treatments were obtained and repeated 10 times.

For treatment the concentration of Young Coconut Water and Old Coconut Water are as follows:

MSO (control/without young coconut water and old coconut water)
AKM (Young Coconut Water) 15%
AKM (Young Coconut Water) 30%
AKT (Old Coconut Water) 15%
AKT (Old Coconut Water) 30%

Completely Randomized Design mathematical method as follows: $Y_{ij} = + i + ij$

Where:

Y_{ij} = Observation results on treatment i-th test
μ = General average
i = Treatment i
ij = Effect of error from treatment I-th replication
i = 1, 2, 3,...5
j = 1, 2, 3, 4,....10

The variables observed in this study were:

1. Shoot height of chrysanthemum explants at 2, 4 and 6 weeks after culture (MSK)
2. The number of shoots was counted 2 , 4 and 6 weeks after culture.

The study was analyzed using ANOVA (Analysis of Variance) followed by the multiple distance difference test (Duncan).

RESULTS AND DISCUSSION

Explant Shoot Height

Based on the results of analysis of variance at the age of 2 MSK (weeks after culture) showed that 30% Young Coconut Water and 30% Old Coconut Water had an effect on shoot height. The data shows that there is a difference between 30% Young Coconut Water with Old Coconut Water (30%) and MSO (control), but 30% AKT is not significantly different from 15% AKT and 15% AKM. The highest explant shoot height at the age of 2 MSK was at 30% AKM, namely 1.70 cm, followed by AKT 30% successively with a shoot height of 1.48 cm, young AKM 15% was 1.42 cm, AKT 15% was 1, 38 cm and the lowest MS0 is 1.25 cm

Table 2. At the age of 4 MSK, the results of the analysis of variance in AKT 30% differed from the AKM 15% but were not significantly different from the AKM 30% and AKT 15% treatments. The highest shoot height was at the age of 4 MSK at 30 % AMR, which was 2.10 cm, followed by 2.02 (30% AKM), 1.86 (15% AMT), and the lowest was 15% AKM, which was 1.79 cm. Similarly, at the age of 6 MSK, there is a difference between AKT 30% and AKM 15% but not different from AKM 30% and AKT 15%. The highest shoot height was at 30% AKT which was 2.67% followed by 2.51 (30% AKM), 2.47cm (MS0) and the lowest 15% AKM was 2.23 cm. It is suspected that coconut water with a higher concentration will accelerate the process of cell division in explant shoots because it contains sugar, macro and micro nutrients, amino acids and organic acids more than at low concentrations.

With 3 observations, the data showed 30% better AKT concentration.

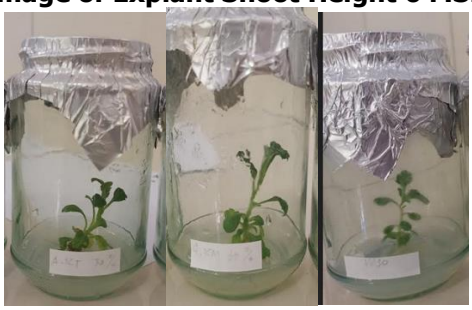
Table 2. Average Shoot Height (cm)

Treatment	2 MSK	4 MSK	6 MSK
MSO (control)	1.25 ^{a}	1.81 ^{a}	2.47 ^{ab}
AKM (15%)	1.42 ^{ab}	1.79 ^{a}	2.22 ^{a}
AKM (30%)	1.7 ^{c}	2.02 ^{ab}	2.51 ^{ab}
AKT (15%)	1.38 ^{ab}	1.86 ^{ab}	2.32 ^{ab}
AKT (30%)	1.48 ^{b}	2.1 ^{b}	2.67 ^{b}

2MSK Cryshantemun Explant Shoot Height Image

AKT 30% AKM 30% AKM 15%

Image of Explant Shoot Height 6 MSK



AKT 30% AKM 30% MS0

Number of Shoots

The results of the analysis of variance at the age of 2 MSK showed that without coconut water (MSO) it had an effect on the number of shoots, with the number of shoots being 2 shoots. At the age of 4 MSK, the results of the analysis showed that there was a significant difference between MS0 and AKM 15%, AKM 30% and AKT 30% but not different from AKT 15%. The data showed the highest number of shoots at MS0 was 8 shoots and followed by AKT 15% was 5 shoots.

At the age of 6 MSK, namely MS0 without coconut water treatment, it showed a very significant difference with all concentrations of Young Coconut Water and Old Coconut Water. The highest number of shoots was 17 shoots in MS0 treatment followed by 8 shoots (15% AKT), 5 shoots (30% AKM), 3 shoots (15% AKM) and the lowest was 30% AKT with 1 shoot.

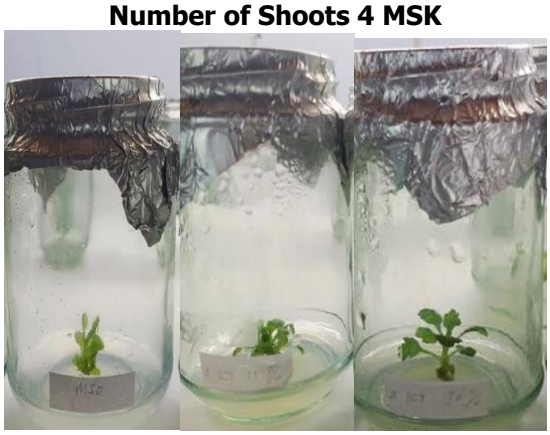
Table 3. Average Number of Shoots

Treatment	2 MSK	4 MSK	6 MSK
MSO	2 ^{b}	8 ^{b}	17 ^{b}
AKM 15%	0 ^{a}	1 ^{a}	3 ^{a}
AKM 30%	0 ^{a}	0 ^{a}	5 ^{a}
AKT 15%	0 ^{a}	5 ^{ab}	8 ^{a}
ACT 30%	0 ^{a}	0 ^{a}	1

From table 3. At the age of 4 MSK and 6 MSK the highest number of shoots was MS0 (without coconut water) while at the age of 2 MSK and 4 MSK the concentration of AKM 30% and AKT 30% no number of shoots appeared. However, at the age of 6 MSK AKM 30% showed a significant change with the number of shoots 5 shoots while AKT 30% only 1 shoot.

The data showed that MSO treatment at the age of 2, 4 and 6 MSK was the highest number of shoots. This is because explant shoots respond faster without using coconut water compared to using coconut water.

Number of Shoots 4 MSK



MSO AKT 15% ACT 30%

Number of Shoots 6 MSK

MS0 AKT 15% AKT 30%

CONCLUSIONS AND SUGGESTIONS

CONCLUSION

Based on the analysis that has been carried out, it shows that:

1. Giving 30% Young Coconut Water and 30% Old Coconut Water had an effect on explant shoot height.
2. The concentration of Old Coconut Water was 30% better than Young Coconut Water 30% in the explant shoot height.
3. The highest number of explant shoots was treated without coconut water (MSO) at the age of 2 MSK, 4 MSK and 6 MSK.
4. Provision of Young Coconut Water and Old Coconut Water did not affect the number of explant shoots.
5. The number of explant shoots with 15% Old Coconut Water was better than 15% Young Coconut Water.

SUGGESTION

The observation variables were added so that they could know more clearly which one is the best concentration treatment between Young Coconut Water and Old Coconut Water.

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