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# Effect of modified murashige and skoog medium on chrysanthemum tissue culture

R Firgiyanti<sup>1</sup>, H F Rohman<sup>1</sup>, M Azizah<sup>\*1</sup>, C Triwidiarto<sup>1</sup>, H Rizkiawan<sup>2</sup>

<sup>1</sup>Department of Agricultural Production, Politeknik Negeri Jember, Mastrip Street

<sup>2</sup> Department of Information Technology, Politeknik Negeri Jember, Mastrip Street

\*haniffaturrohman@polije.ac.id

## Abstract.

Propagation of chrysanthemum through tissue culture can produce superior plants in large and uniform quantities and sterile cultures (motherstock) can be obtained so that they can be used as material for further propagation. This research was carried out at the Jember State Polytechnic Tissue Culture Laboratory in April-November 2022. The research design used was a Factorial Completely Randomized Design (CRD). The first factor is the variety which consists of 3 varieties (Var. Maruta Agrihort, Var. Pinka Pinki and Var Sucione). The second factor was in vitro culture media consisting of 5 levels (control, MS+BA Media 2.0 mg/L and IAA 1.0 mg/L, MS+BA 1.0 mg/L and IAA 1.0 mg/L Media, MS+ Banana extract Media, MS+ Coconut Water Media). So there were 15 treatment combinations with 3 replications for a total of 45 experimental units. Parameters observed included plant height, the day the shoots appear, the day the roots appear, number of leaves and number of roots. The conclusion this research is addition of organic matter to MS media was able to increase the growth of explants compared to MS media with the addition of synthetic PGR and the combination of MS media + Coconut water had an average optimal growth yield on all parameters.

## 1. Introduction

Chrysanthemum is a popular flower commodity today, because it has advantages, among others, has a variety of shapes and types. Because the kris plant has a variety of flower shapes, sizes and colors. For the East Java region, chrysanthemum production centers located around Malang and Batu which produce most of the chrysanthemum in the East Java region with a total of 121,181,724 stalks in 2020 [1]. Along with the increase in population, the demand for chrysanthemum cut flowers is increasing every year, so agribusiness opportunities need to be developed. The main problem of chrysanthemum production in the Tefa Highlands is the supply of chrysanthemum vegetative seeds which still have to be imported from Malang and the adaptive chrysanthemum varieties are not known in the Polije Highlands Tefa. availability of seeds can be overcome by vegetative seed production by mass production of mother plant with in vitro culture propagated using stem cuttings method. Tissue culture is a propagation method that has the advantage that new plants are obtained in a fairly short time, in large quantities, uniform, free of pathogens and have the same properties as the parent. The use of appropriate culture media can streamline chrysanthemum culture. Some materials used in MS media to form tuna formation include the addition of growth regulators [2] [3], compound fertilizers [4], organic materials such as the addition of bananas [5] and coconut water [6].

In vitro culture media is a determining factor for the success of chrysanthemum culture. The basic medium used in the in vitro culture of chrysanthemum is MS medium. The use of MS media produced less tuna when compared to media that had been enriched with other ingredients. Materials used for

MS media include growth regulators, both inorganic and organic. The addition of organic matter containing growth regulators can also reduce production costs because the price of organic matter is cheaper. The use of alternative generative media (cheap media) needs to be developed to reduce the cost of producing chrysanthemum seeds because it can increase the cost efficiency of in vitro chrysanthemum seed production. Materials that are widely used for tissue culture media include organic bananas, coconut water, potatoes and sweet potatoes. So far, coconut water is the most widely used organic material as an add-on to tissue culture media. The use of coconut water as an additive in tissue culture has been carried out on potato plant tissue cultures [7], Cymbidium orchids [8], and Broccoli [9].

## 19 2. Material and Methods

### 2.1 Material

3 varieties of chrysanthemum, MS media, IAA, BAP, banana, coconut water, aquadest, spirtus, alcohol, oven, autoclave, laminar air flow, tissue culture planting tool set, stationery and ruler.

### 2 2.2 Methods

This study used a complete randomized block design (CRD)

Factor I : Chrysanthemum Varieties:

V1 : Maruta Agrihort Varieties

V2 : Pinka Pinki Varieties

V3 : Suciono Varieties

Factor II : In Vitro Culture Media

P1 : MS

P2 : MS + BAP 2 mg/liter + IAA 1 mg/liter

P3 : MS + BAP 2 mg/liter + IAA 1 mg/liter

P4 : MS + Banana Extract

P5 : MS + Coconut Water

## 3. Result and Discussion

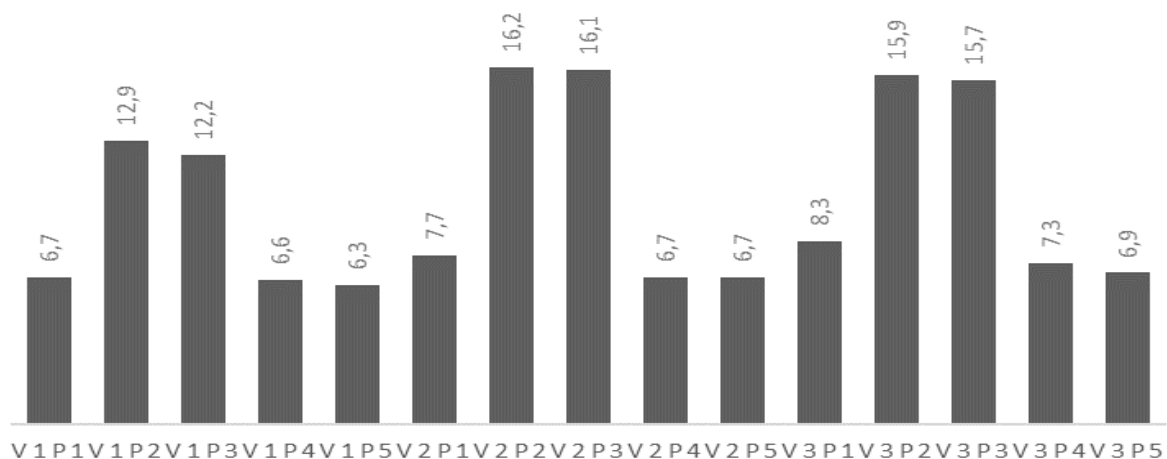
3 The results of the analysis of the various effects of culture media on the emergence of chrysanthemum buds showed that in vitro culture media was able to give different effects on the emergence of chrysanthemum cuttings. This is because the four in vitro culture media used contain different macro and micro nutrients.

**Table 1.** Effect of modification of MS medium on the growth of chrysanthemum tissue culture at 5 weeks

Treatment	Average				
	Shooting Time (days)	Root Emergence Time (days)	Plant Height (cm)	Number of Roots	Number of Leaves
V1P1	6,7 c	9,7	4,5	5,9	3,8
V1P2	12,9 ab	15,0	3,1	4,1	1,6
V1P3	12,2 ab	15,0	3,2	4,2	0,1
V1P4	6,6 c	9,0	5,2	6,8	4,7
V1P5	6,3 c	7,7	5,0	6,9	5,4
V2P1	7,7 bc	10,6	4,7	4,7	2,8
V2P2	16,2 a	16,3	3,8	4,0	0,8
V2P3	16,1 a	16,3	3,7	4,1	0,8
V2P4	6,7 c	8,8	6,7	6,4	5,6
V2P5	6,7 c	8,2	5,6	6,2	6,4
V3P1	8,3 b	10,7	4,9	5,7	2,8
V3P2	15,9 a	15,6	3,9	4,2	0,4
V3P3	15,7 a	15,6	4,2	4,4	1,0
V3P4	7,3 bc	8,3	6,6	6,7	5,1
V3P5	6,9 c	8,4	6,7	7,0	6,3
DMRT 5%	3,44	-	-	-	-

Note: numbers followed by the same letter are not significantly different at the 5% DMRT test level

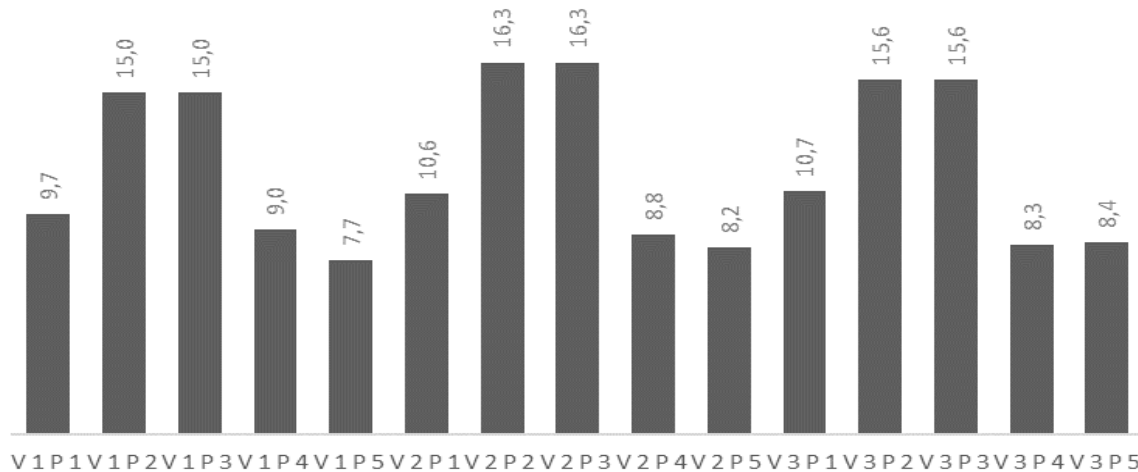
Based on Table 1 on the parameters of bud emergence time, it can be seen that the V1P5 treatment, the combination of maruta agrihort orchid variety and modified MS media + coconut water gave a very real effect, namely shoots appeared on day 6.3. This can happen because the application of coconut water on MS media can support shoot growth because coconut water contains cytokinins that can accelerate cell division and shoot development [10]. Cytokinins are very influential on metabolic processes, cytokinins play a role in the synthesis of amino acids, nucleic acids, and proteins [11].



**Figure 1.** Diagram of shooting time (days)

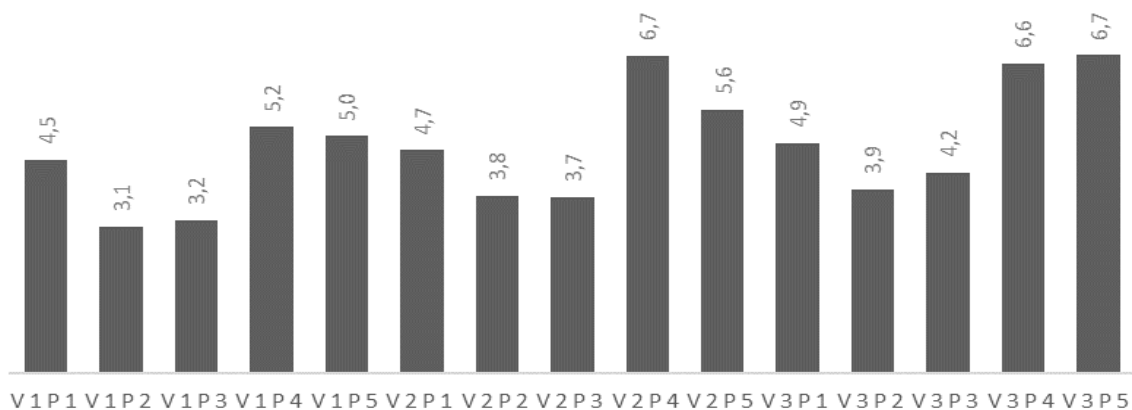
The parameters of root emergence, the treatment that gave the fastest root emergence was V2P5, the treatment of pinka pinki varieties and MS+coconut water media on day 8.2. Root growth

was strongly influenced by the optimal PGR in the media, and on modified media MS + coconut water was the right combination to meet the needs of explants to grow, especially to encourage root growth. Cytokinins and auxins contained in coconut water can play a role in the process of plant morphogenesis that stimulates the formation of roots and shoots if the media contains balanced cytokinins and auxins [12] as well as minerals and nutrients contained in MS media is a combination that is optimal enough to support growth. root.



**Figure 2.** Diagram of root emergence time

Parameters of plant height treatment with the best results were V2P4 the pinka pinki variety and MS media + Ambon banana extract and V3P5 namely the Suciono variety and MS media + coconut water, banana extract and coconut water had their respective advantages, banana extract contains thiamin which serves to Accelerate cell division in root meristems [13], the addition of coconut water on MS media can stimulate the growth of chrysanthemum explants due to the chemical content of coconut water. Cytokinins contained in coconut water will stimulate the cell division process to be faster, so that it will stimulate the plantlet growth process. The most characteristic property associated with cytokinins is the stimulation of cell division in plant tissue cultures. The discovery and separation of kinetin depends on this property and many studies on cytokinins emphasize this effect. Non-meristematic tissues separated from higher plants for in vitro growth require cytokinins [14].



**Figure 3.** Diagram of the plant height

The best root number parameters were obtained in the V3P5 treatment, the treatment of the Suciono variety and MS+coconut water media, coconut water contains growth regulators of the auxin group with concentrations that we cannot determine, several studies have shown that the use of coconut water in tissue culture tends to result in the formation of root organ and have a significant effect on the development of the root system by producing the longest root value [15].

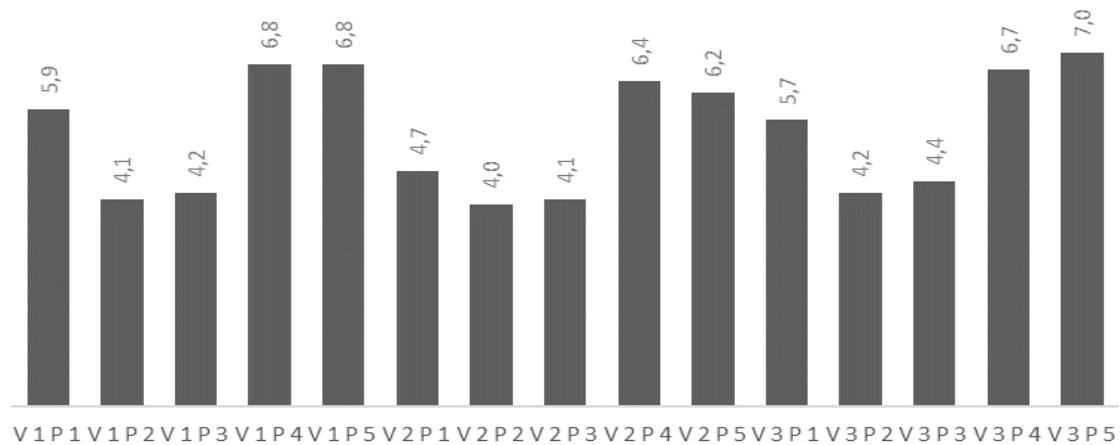


Figure 4. Diagram of the number of root

The best leaf count parameters were shown in the V2P5 treatment, namely the pinka pinki variety and MS+coconut water media. Explants grown on MS base media with the addition of coconut water and banana extract had higher better yields than explants grown on MS media without the addition of coconut water because coconut water contained carbohydrates, vitamins, minerals, and PGR such as auxins, cytokinins, and gibberellins which are useful as a driving force in tissue proliferation, facilitating metabolism and respiration. Coconut water also contains vitamin C which is useful in stimulating stem growth where there is a process of cell division, cell elongation, and new cell enlargement in plants [16].

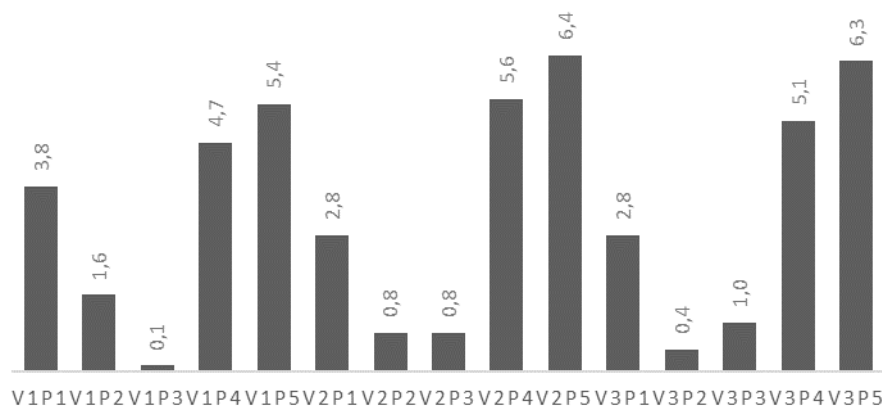


Figure 5. Diagram of the number of leaves

#### 4. Conclusion

Based on the results of the study, it can be concluded that the addition of organic matter to MS media was able to increase the growth of explants compared to MS media with the addition of synthetic PGR and the combination of MS media + Coconut water had an average optimal growth yield on all parameters.

## 7 Acknowledgment

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