ISBN : 978-602-72141-0-1

PROCEEDING

INTERNATIONAL SYMPOSIUM ON SUSTAINABILITY SCIENCE

UNDERSTANDING CLIMATE CHANGE PHENOMENA FOR HUMAN WELL BEING

BANDUNG, SEPT 8TH – 10TH '14

CAMPUS OF UNIVERSITAS PADJADJARAN

UNITED NATIONS UNIVERSITY

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Correct citation:
PSMIL (Postgraduate Programme on Environmental Studies). 2015. Proceeding of the International Symposium on Sustainability Science: Understanding Climate Change Phenomena for Human Well-Being, 8-9 September 2014, Universitas Padjadjaran, West Java, Indonesia.

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E-mail: insys2014@gmail.com

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Postgraduate Programme on Environmental Studies
Universitas Padjadjaran
2015

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PLENARY SESSION DISCUSSION NOTE

Date: 8th September, 2014

Keynote Speaker : Prof. Dr. P.K. Ramachandran Nair (University of Florida, USA)

Title : Sustainability Science: Beyond Environmental Sciences

Time of presentation : 10.30-11.00 WIB

Question and Answer

Titi (Social Department)
Q: Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs. Actually, what standards we use to define those needs? Because each country has different standards, how do we define equality of life or standard of living?

A: One size is not fit to all. That is hard for us to equalize living standards across the country. There are many standards, but equality is not the concept or goal of sustainable development. The important point is how to keep the quality of life is maintained.

Gunawan (Universitas Padjadjaran)
Q: Agroforestry is a traditional way in managing natural resources. In Indonesia, the management of technology often fail. Sometimes local knowledge become good solutions. Why technology and local knowledge is never in sync? In context of sustainable development, what exactly is the traditional solution? To change the use of technology or for conservation efforts?

A: There is confusion about the concept of technology. Technology is the application of science to improve the livelihood income. An example is the mobile phone. A technology usually created based on the suitability of human needs. The key to sustainable development is the concept of basic human needs and limitations that can be supported with technology.

Dede Tresna (Anthropology lecturer, Universitas Padjadjaran)
Q: How is your opinion of women role in meeting the needs of the household?

A: Women play an important role in various aspects, including in agroforestry. Sustainable land use systems, often played by women. Dependence and the role of women in the use of forest resources is greater than men. It is characterized by the increasing women workload around the forest, both in domestic work and management of forest resources.

Nurrohman (Institut Teknologi Bandung)
Q: How the implementation of agroforestry to sustainable development?

A: Agroforestry has close connection with climate change as it relates to economic, social and many other aspects. The most important thing is agroforestry produce agricultural products that can improve the quality of human life.

Keynote Speaker : Prof. Hans Bressers (Twente University, the Netherland)
Title : Sustainability Governance in a Glocalized World: Governance Qualities to meet the challenges
Time of presentation : 11.00-11.30 WIB

Question and Answer

Hertu (Ministry of Law and Human Rights)
Q: How we can use sustainable energy for transportation sector?

A: Energy which can be used for transportation is renewable energy. Nevertheless, it should be identified on the part of energy which are suitable for transportation.

Dede Tresna (Anthropology lecturer, Universitas Padjadjaran)
Q: How we can open their eyes about the effects when they cut down trees?

A: It is too naive if we blame them for cutting the trees. So we must thinking about issue of equality, we need to think about alternatives behavior, change their livelihood to support them and their families. The alternative plan is to meet the solution through the power of institutions, funding, policy and sustainable alternative. It is our collective responsibility to maintain the sustainability of forests.

Dara Manuruk (Universitas Indonesia)
Q: Base on your presentation about collaborative strategic, when it can be applicate?

A: The collaborative strategic can be applied in mitigation or prevention policies. Collaborative strategy is adaptation and prevention policies that can generate action or collaborative action.

Adela (Universitas Padjdjaran)
Q: What should we do if we want to do bottom-up or top down approach to people who are not educated such as farmer??

A: You can do the combination of it, so the local farmer not as an individual but groups that representing the local authorities. The important is to create not just policy document but also policy act as a complete of them.

Keynote Speaker : Prof. Takao Yoshimatsu (MIE University, Japan)
Title : Climate Change and Its Impact on Aquaculture
Time of presentation : 13.30-14.00 WIB

Question and Answer

A B Susanto (Universitas Diponegoro)
Q: Which one is the important issue? Aquaculture in Terrestrial or Seawater?

A: Both are important. For instance, a big storm coming in from the outside of the ocean can be caused by ocean acidification.

Juli (Universitas Padjadjaran)
Q: How the concept of aquaculture can avoid environmental degradation and extinction of several marine organisms?

A: Currently aquaculture research and development are very limited. Therefore, it is need more research and scientific reports.

Anwar Syarif
Q: Climate change can have a negative impact on aquaculture. What should we do besides reducing CO_2?

A: CO_2 is not a major problem. Climate change is a natural phenomenon that has lasted long time and the increasing of CO_2 caused by human activity. Therefore we need change the people to environment-friendly behavior.

Zahra
Q: Which is more important, the development of freshwater or marine aquaculture?

A: Both of them are important and need scientific report to conduct more detail.

Kamia Handayani (PT. PLN)
Q: Which one is more danger? Temperature rice or acidification?

A: Both are equally dangerous.

Date: 9th September, 2014

Keynote Speaker : Dr. Osamu Saito (United Nations University, Japan) Title : Sustainability Science in the Context of Biodiversity and Ecosystem Services Time of presentation : 09.00-09.20 WIB

Indra (Universitas Padjadjaran)
Q: What do you think about *pekarangan* which planted in monoculture?

A: Not good due to lack of diversity. It is better to have more different plants.

Elisabeth (RDI)
Q: Can Saotomi and Satoyama adapt to urban/city society?

A: Yes. It is a part of international agenda. .

Yeri(Universitas Padjadjaran)
Q: Which one is better, village sustainability or city sustainability?

A: Both were good. It necessary to evaluate dependency between town and country, because both are affect to each other.

Keynote Speaker : Parikesit Ph.D (Deprtment Biology & Graduate Programme on Environmental Studies, Universitas Padjadjaran)

Title : Towards a New Generation of Sustainability: The Needs for Trans-disciplinary Learning Process in Higher Education

Time of presentation : 09.20-09.55 WIB

Indra (Universitas Padjadjaran)
Q: How should education about sustainability science be taught? Teach it separately or integrated with existing studies?

A: Depending on the circumstances. In Unpad, incorporate with relevant discipline.

Muhammad (Universitas Padjadjaran)
Q: Do we have to distinguish between a generation and start sustainability science education on the next generation? Or we can start now?

A: Sustainability science should be taught in formal and informal education. Sustainability science should be part of our daily live.

Souphaline (Intitut Teknologi Bandung)
Q: Are organic farming and GMO was solution for sustainable agriculture?

A: Integrated sustainable agriculture in agricultural science is the key.

INDONESIAN *Phalaenopsis amabilis* POLIPLOIDIZATION USING COLCHICINE

Sandra Arifin Aziz[1], Dewi Sukma[1], Tubagus Kiki Kawakibi Azmi[1]and Eka Martha Della Rahayu[2]

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Abstract **– The potted or cut *Phalaenopsis* sp. has high economic value. The size, stalk length and flower number, colour, shelf life and pest resistant determined the plant quality. For Indonesia new varieties development is important, since most of the *Phalaenopsis* hybrids in the market were introduced. On the other hand orchid is suffering from uncertain future through over exploitation, habitat loss through human activities and impact of climate change. In nature endopolyploidy occurs to cope with environment changes, such as increasing temperature, drought and high radiation caused by global warming. This research was aimed to find new varieties of Indonesian *Phalaenopsis amabilis* from poliploidization using colchicine. The first experiment used flower, bud, and spike with 0, 50, 500, 1000 and 2000 mg l^{-1} in colchicine for 3 and 5 days arranged in Randomized Complete Block Design. The second experiments were in vitro experiments in half strength of Murashige-Skoog (1/2 MS) liquid media, using: (a) protocorms immersed with 0, 0.5, 5, 25, 50, and 75 mg l^{-1} colchicine arranged in Randomized Complete Block Design, (b) plantlets immersed with 0, 1000, 2000, 3000, 4000, and 5000 mg l^{-1} colchicine arranged in Randomized Complete Block Design. Both experiments produced polyploid plants.**

Keywords **–*Colchicine, global warming, Indonesia, Phalaenopsis amabilis, variety.***

I. INTRODUCTION

The potted or cut *Phalaenopsis* sp. has high economic value. The size, stalk length and flower number, colour, shelf life and pest resistant determined the plant quality. For Indonesia new varieties development is important, since most of the *Phalaenopsis* hybrids in the market were introduced. Orchid is suffering from uncertain future through over exploitation, habitat loss through human activities and impact of climate change. Climate change as abiotic factor affected most plant, and especially *Phalaenopsis* sp. as one of orchid species through increased global temperature. In Asia, climate change occours rapidly due to compound pressures on natural resources and the environment associated with rapid urbanization, industrialization and economic development (Barman and Nevadas, 2013). Plant responses to water stress is becoming increasingly important. On global basis, drought in soil and/or atmospheric water deficit, in conjunction with coincident high temperature and radiation, poses as the most important environmental constrains to plant survival and crop productivity. The importance of time in shaping may change dramatically according to genotypes and environment. Long time responses to low humidity, high temperature, and high light were shoot growth inhibition, reduce transpiration area, gene responses, metabolic acclimatization in the shoot region, and turgor maintenance, sustained root growth, increased root/shoot, and increase absobtion area in the root region. In the case of rapid dehydration, plants reacts by minimising water loss or exhibiting metabolic protection (induced or constitutive) against the damaging effect of dehydration or co-developing oxidative stress. Other the plastic adaptation of photosynthesis to drought occurs in inducible CAM plants (Chaves et al. 2003).

In *Phalaenopsis amabilis* var. *Formosa* young leaves or leaves from small juvenile plants had higher day time CO2 fixation compared to mature leaves or large plants, suggesting that leaves progressed from C3-CAM to CAM during the course of maturation (Guo and Lee 2006). CAM plant has developed strategy to fix carbon dioxide for sugar production with minimum loss of water, with some of the characteristics are stomata are opened in the night, growth impaired and plants reduce their foliar area to limit evaporation, and has spongy tissues acting as reservoirs (Xoconostle-Cazares et al. 2011).

In nature endopolyploidy occurs to cope with environment changes, such as increasing temperature, drought and high radiation caused by global warming. Endopolyploidy could boost plant metabolism, with the result that improve yield and plant quality (Comai 2005), accelerate growth and encourage physiological function (Barow 2006). Endopolyploidy reported on some orchid species and hybrids, such as *Dendrobium* spp. (Jones and Kuehnle 1998), *Phalaenopsis* spp. (Lin et al. 2001). On *Phalaenopsis equestris* different level of nucleus polyploidy found on many tissue, such as in flower, leaf and root (Tang and Chen 2007). Chen et al. (2011) also reported endopolyploidy mostly found on mature tissue than younger tissue, in greenhouse plants than in in vitro culture, and in diploid plants than the tetraploid ones. Tetraploids on *Phal. amabilis* found in 1930 (Vaughn and Vaughn 1973). Many efforts performed to find new polyploid orchids, some researchers used colchicines. Griesbach (1985) reported polyploid induction on orchid PLB using 0.5 mg l^{-1} on MS medium put in dark condition for 10 days. Burun and Emiroglou (2008) found 29.7% polyploid from tobacco anther culture immersed in 0.4% colchicines for 6 hours, and 60% polyploid from embryoids immersed in 0.2% colchicines for 3 hours.In this research, new *Phalaenopsis* hybrids being made to be able to cope with this global warming challenges and has big flower from polyploidization. The purpose of this research is to find new varieties of Indonesian *Phalaenopsis amabilis* from poliploidization using colchicines.

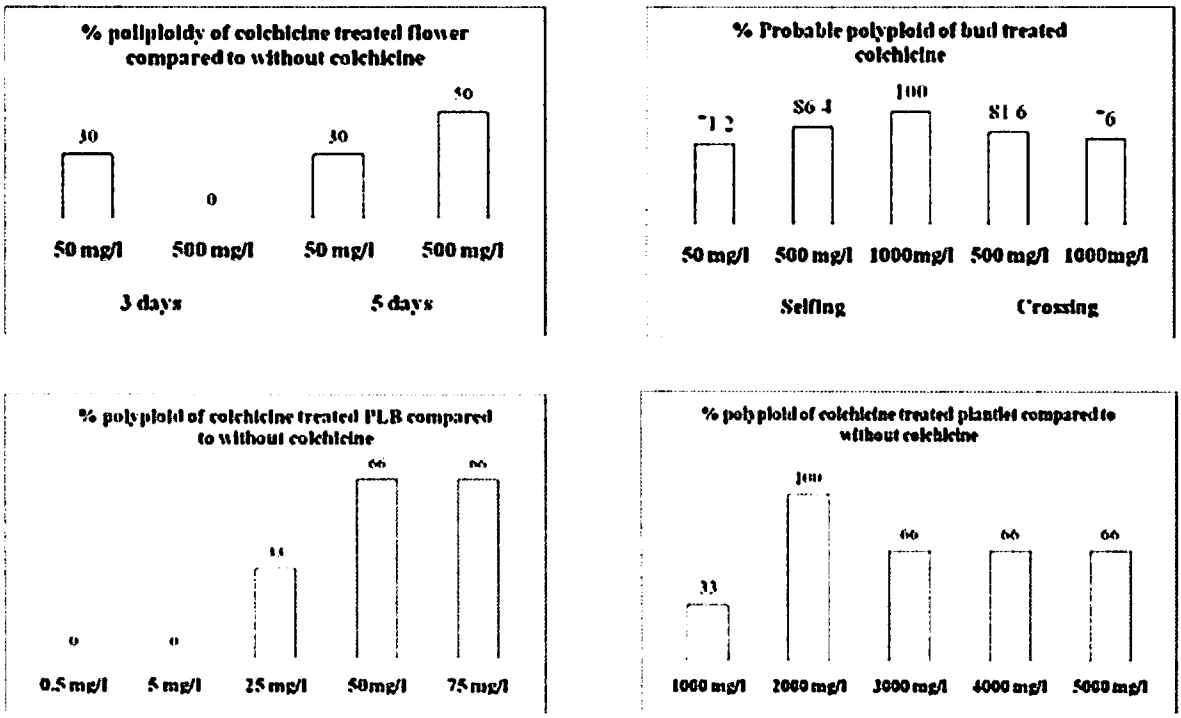

Figure 1. % polyploid of colchicine treated flower, bud, PLB, and planlet compared to without colchicine

II. Materials and Methods

The first experiment used flower, bud, and spike with 0, 50, 500, 1000 and 2000 mg l^{-1} treated with colchicine for 3 and 5 days arranged in Randomized Complete Block Design. Pod produced germinated in Knudson C media. Selfing and crossing with untreated flower performed on flower from bud treated with colchicine. The second experiments were in vitro experiments in half strength of Murashige-Skoog (1/2 MS) liquid media, using: (a) protocorm like bodies (PLB) immersed with 0, 0.5, 5, 25, 50, and 75 mg l^{-1} colchicine arranged in Randomized Complete Block Design, (b) plantlets immersed with 0, 1000, 2000, 3000, 4000, and 5000 mg l^{-1} colchicine arranged in Randomized Complete Block Design. Cytological chromosome counting observed at the end of each experiment, except for bud using % probable polyploidy based on shortened and thickened root observed.

% probable polyploid bud treated with colchicine = number of probable polyploid plantlet/25 x 100%

III. Results

Both experiments produced polyploid plants. Only flower and bud treated with colchicine produced polyploid plants in the first experiment. Percentage of pod formed from flower treated with colchicine was 71.42-20.00% (3 days treatment) and 85.71-0% (5 days treatment). Number of pod formed decline with higher colchicine concentration. Flower treated with colchicine 500 mg l^{-1} for 3 days, 1000, and 2000 mg l^{-1} produced pod with seeds that not germinated (Figure 1). Spike treated with colchicine produced new lateral spike with flowers, but not in the treated ones.

PLBs and plantlets treated with colchicine produced polypoid plants. Percentage of polyploid from colchicine treated flower, bud, PLB, and planlet compared to without colchicine can be seen in Figure 1. Reduction of life percentage, number of roots, leaf and shoot, shortened and thickened root, and smaller plantlet height were observed in polyploid plants (Table 1).

Table 1. Reduction of Morphological Characteristics

Reduction in	Propagules Treated with Colchicine			
	PLB	Plantlet	Flower	Bud
Life percentage (%)	0-13	7-80	0-57.14	0-28.8
Root number	1.67-2.06	0.82-2.12	-	-
Leaf number	1.67-2.03	0.43-1.6	-	-
Shoot number	0-4.41	0.16-2.47	-	-
Root length (cm)	-	-	0.93-1.12	-
Root width (mm)	-	-	-(0.07-0.37)	-

- Not observed

IV. Discussion

Many plant physiologists and morphologists found the inseparable relationship between form and function (Kaplan 2001). Morphological changes observed in two experiments in all parameters. The thickening and shortening of plantlets caused by colchicine application brought on some questions of plant mechanism to overcome higher temperature and drought. In *Cattleya walkeriana* and *Oncidium* 'Aloha' water availability modulated CAM expression in organ-compartmented manner (Rodrigues et al. 2013). The photosynthetic characteristic of tropical Orchidaceae with leaf thickness < 1 mm typically perform C3 fixation, while those with thicker leaves usually perform crassulacean acid metabolism (CAM) (Neals and Hew 1975). *Phalaenopsis* that has thick leaves with large vacuole in the parenchyma cells is expected to exhibit CAM photosynthesis (Hew and Young 2004, Silvera et al. 2005) as observed in several hybrids (Ota et al. 1991). The

photosynthetic specialization of CAM has evolved many times in response to selective pressures imposed by water limitation (Borland et al. 2011).

Endopolyploidy caused by colchicine application, produced thickened and shortened plantlets, also probable CAM plantlets that has ability overcome global warming. Further study need to be established to prove that polyploids *Phalaenopsis* produced in this research is CAM plants.

V. CONCLUSION

Both experiments produced polyploid plants that produced thickened and shortened plantlets.

ACKNOWLEDGEMENT

This research funded by Leading University Research 2013-2014, Ministry of Education Indonesia.

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