International Journal of Agriculture and Environmental Research

ISSN: 2455-6939

Volume:03, Issue:01

DORMANCY BREAKING OF PORANG'S (*Amorphophallus muelleri* Blume) BULBIL BY PHOTOPERIOD TREATMENT

[1]Serafinah Indriyani, [1]Wahyu Widoretno

[1]Department of Biology, Faculty of Mathematics and Natural Sciences, University of Brawijaya
Jl. Veteran Malang 65145 Malang Indonesia

ABSTRACT

The objective of the research was to obtain the method of porang's bulbil dormancy breaking. The source of porang's bulbils were gained from Dusun Krajan Desa Rejosari Kecamatan Bantur Kabupaten Malang. The diameter and weight of porang's bulbils were 2-3 cm and 3-5 g respectively. The research design was Completely Randomized Design. Porang's bulbils were storaged in the photoperiod cabinet during one month. The levels of photoperiod were 0, 8, 12, 16, 20, and 24 hours/day. The light intensity of TL lamp was 400 lux. As a control it was used porang's bulbils that it was placed in the dark cabinet without light. The treatments were conducted during one month. Repetition was four times. The success of dormancy breaking was observed through the bulbil capasity to grow that it was identified by bud emerged. Data were analyzed by ANOVA and were continued by Duncan test ($\alpha = 0.05$). The results showed that photoperiod 8, 12, 16, 20, and 24 hours/day during one month could stimulate porang bulbil dormancy breaking. Photoperiod 24 hours/day emerged buds of porang 8.83 ± 3.07. Photoperiod 20 hours/day emerged the height of buds 3.42 ± 1.57 mm and the diameter of buds 3.75 ± 1.35 mm. Photoperiod treatment promote breaking of porang's bulbil dormancy.

Keywords: Amorphophallus muelleri, bulbil, dormancy, photoperiod, bud

INTRODUCTION

Porang (*Amorphophallus muelleri*) or iles-iles is a herb and an annually plant that is grouped in Araceae. False stem is an upright, soft, smooth, green color and white spot. In fact false stem is petiole that is divided in three parts and again it is divided become leaflets's petioles. At the junction of false stem or petiole, appears brownish bulbils as a vegetative reproduction of porang (Anonymous, 2001; Jansen *et al.*, 1996; Pitojo, 2007).

ISSN: 2455-6939

Volume:03, Issue:01

Porang bulbs has high economic value due to its glucomannan, it is exported to Japan. In Indonesia porang wild growing in forest, in East-Java porang are cultivated in Klangon Village, Saradan District, Madiun Regency and also in Nganjuk Regency. The price of porang's bulbs is around Rp500/kg, but in Japan it is very expensive that can reach Rp60.000/kg. Porang's bulbs in Japan are processed to food such as nutritious noodle and gelatin. Based on researchs, porang's bulbs contain highly fiber, glucomannan (substance which is derived from carbohydrate/polysaccharide) 20-65% whish is very good to dietary health (Anonymous, 2001; Anonymous, 2002).

The demand of porang's bulbs is high but it does not followed by availability of porang's germs including seeds, bulbil, and bulbs. The problem is the dormancy phenomenon or rest phase in porang's seeds, bulbils, and bulbs. After harvesting, porang's bulbs can not grow emerging shoot immediately, it need 5-6 months after dormant to grow new shoot (Sumarwoto, 2004, 2005; Indriyani, 2011).

Dormant phase in porang is a problem of porang cultivation, and cause low porang's bulbs production. Bulbs or bulbils or seeds can grow after they pass the certain season. Some of environmental factors such as photoperiod can break dormancy of bulbs, bulbils, and seeds, also plant's growth. Some researchs showed that photoperiod treatment promote sprouting in bulbs of onion and potato.

Dormancy phase is caused by the physiology of porang that prevent to form new shoot. Breaking dormancy of grain is the effort to short the juvenile phase in plant through low temperature treatment (vernalization), light intensity, and light day duration (photoperiod). According to Amasino (2010), the signal of photoperiod transfer to *Shoot Apical Meristem* (SAM) and it is responded as a florigen. So, the analogy is the photoperiod can use to break dormancy of porang's bulbils.

Hope, the application of light's day duration to porang's bulbil can break porang's dormant phase. Then, porang's bulbils can planted continously without dormant phase, and there is a guarantee of availability of porang's bulbils. As a results, the cultivation of porang will rise and the production of porang's bulbs will optimal.

MATERIALS AND METHODS

The experimental design was conducted by Completely Randomized Design, repetition was four times. Porang's bulbils was treated by storage them in photoperiod cabinet. The photoperiod treatments were 0, 8, 12, 16, 20, 24 hours/day, light intensity was 400 lux, distance light source from research object was 50 cm, and it was carried out during 1 month. As a control

ISSN: 2455-6939

Volume:03, Issue:01

(photoperiod treatment 0 hours/day), it was used porang's bubils that were storaged in the dark cabinet. Growth variables including number, height, and diameter of bud. Measuring height and diameter by using digital calyper at the end of observation. Data were analyzed by ANOVA and were continued by Duncan test (α = 0.05).

RESULTS AND DISCUSSION

Effect of Photoperiod to Number of Bud

Duration series of photoperiod can break dormancy of porang's bulbils. Although the number of bud varies among duration of photoperiod treatments, but it was not significantly different. The treatment of photoperiod 24 hour/day emerged the most number of bud, it was 8.83 ± 3.07 buds. The treatment of photoperiod 8, 12, 16, and 20 hour/day emerged 4.33 ± 1.78; 4.08 ± 2.07; 5.08 ± 3.23; and 4.18 ± 2.23 buds respectively. The number of bud that emerged from porang's bulbil always more than one bud, it is contrast in porang's bulbs that emerge only one bud. So, all of the duration of photoperiod treatment can promote dormancy breaking of porang's bulbil (Figure 1, 2).

Figure 1. Dormancy breaking of porang's bulbils on several duration of photoperiod treatment

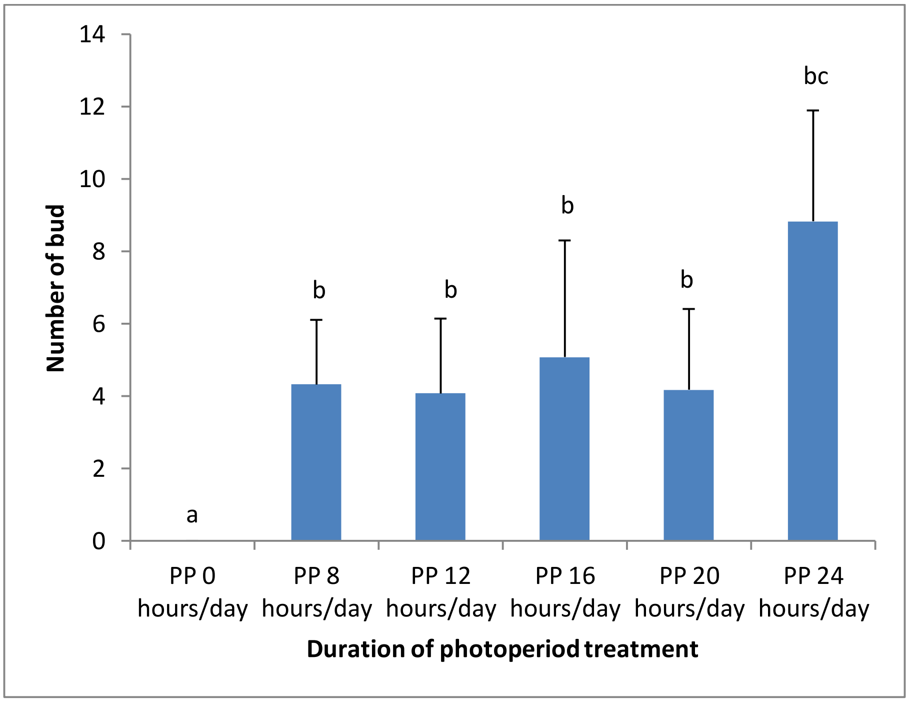

Figure 2. The number of bud as a respond of dormancy breaking of porang's bulbil on several duration of photoperiod treatment. Note: same alphabetic notation letter shows no significantly different based on Duncan test (α=0.05)

Effect of Photoperiod to Height and Diameter of Bud

Although the height and diameter of bud varies among duration of photoperiod treatments, but it was not significantly different. The treatment of photoperiod 20 hour/day emerged the highest of bud, it was 3.43 ± 1.57 mm. The treatment of photoperiod 8, 12, 16, and 24 hour/day emerged height 1.93 ± 0. 6; 2.43 ± 0.97; 2.63 ± 0.91; and 2.36 ± 0.57 mm respectively. The treatment of photoperiod 20 hour/day emerged the widest diameter of bud, it was 3.75 ± 1.37 mm. The treatment of photoperiod 8, 12, 16, and 24 hour/day emerged diameter 2.67 ± 0.60; 3.19 ± 1.16; 3.30 ± 1.10; and 2.63 ± 0.42 mm respectively (Figure 3).

ISSN: 2455-6939

Volume:03, Issue:01

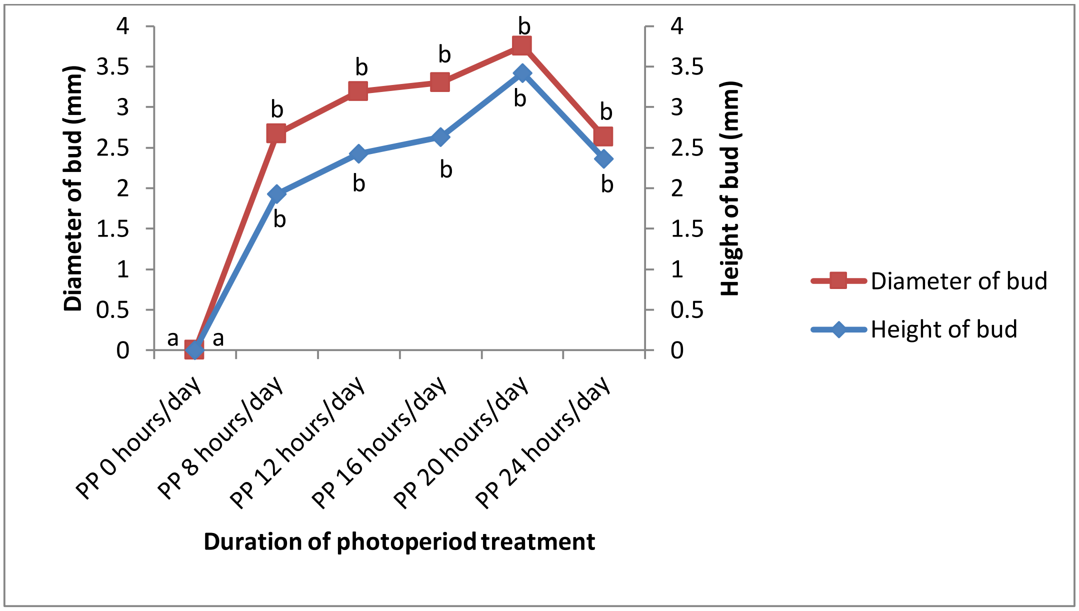

Figure 3. The height and diameter of bud as a respond of dormancy breaking of porang's bulbil on several duration of photoperiod treatment. Note: same alphabetic notation letter shows no significantly different based on Duncan test (α=0.05)

Photoperiod influence vegetative grow of plant, such as bulb formation, root branch formation, leaf shape, pigment formation, epidermal hair formation, root development, seed dormancy, and senescence ((Stirling et al., 2002). In plant's organ there is phytochrome, it is protein which capture light called photoreceptor. Sun light which is absorbed by phytochrome is red (De Jong et al., 1981). Then, application of photoperiod by using TL lamp in this research capable to activate phytochrome inside the plant's organ and it is influence bulb physiological process. This process stimulates the activation of related enzymes to break porang's bulbil dormancy as a consequence bulbil grow to form buds. Amylase hydrolyze amylum as food source in bulbil to simple substance such as sugar which is used meristematic tissues to form bud.

CONCLUSION

The treatment of photoperiod 8, 12, 16, 20, and 24 hours/day during one month capable to promote dormancy breaking of porang's bulbil, so it can reduce dormancy phase of porang's bulbil. The treatment of photoperiod 24 hours/day during one month to porang's bulbil emerged 8.83 ± 3.07 buds. The treatment of photoperiod 20 hours/day during one month to porang's bulbil emerged height of bud 3.42 ± 1.57 mm and diameter of bud 3.75 ± 1.35 mm.

ACKNOWLEDGEMENT

Research was funded by DP2M Dirjenbelmawa Kemenristekdikti. We thank to Rikza Hakin for helping in the field and laboratory work.

REFERENCES

Anonymous, 2001. High export value of iles-iles plant. Suara Merdeka. 22 November 2001.

Anonymous, 2002. Porang plant cause everlasting forest. Pikiran Rakyat. 22 July 2002.

Anonymous, 2007. Baoji Konjac Chemical Co., Ltd. http://www.konjacbaoji.com/company.htm. 10 November 2007.

Amasino R. 2010. Seasonal and developmental timing of flowering. *Plant Biotech. J.* 33: 45-51.

De Jong, JD. 1981. Flower initiation of *Chrysanthemum* seedlings grown continously in short days at four levels of irradiance. Scientia Horticulturae. Vol. 14. Issue 3. Pages 277-284.

Indriyani S, Arisoesilaningsih E, Wardiyati T, Purnobasuki H, 2011. A model of relationship between climate and soil factors related to oxalate content in porang (*Amorphophallus muelleri* Blume) corm. *Biodiversitas* 12 (1): 45-51.

Jansen PCM, van der Wilk C, Hetterscheid WLA, 1996. Amorphophallus Blume ex Decaisne. *In*: Flach M dan F. Rumawas (eds.). Plant Resources of South-East Asia 9: Plants yielding non-seed carbohydrates. Prosea Foundation. Bogor.

Pitojo S, 2007. Cultivation series: Suweg: alternative food ingredient, low calory. Kanisius Publisher. Yogyakarta.

Stirling, KJ, RJ Clark, PH Brown, SJ Wilson. 2002. Effect of photoperiode on flower bud initiation and development in Myoga (*Zingiber mioga* Roscoe). Scientia Horticulturae. Vol. 95. Issue 3. Pages 261-268.

Sumarwoto, 2004. Some agronomical aspects of iles-iles (*Amorphophallus muelleri* Blume). Disertasi. Sekolah Pascasarjana Institut Pertanian Bogor. Bogor.

Sumarwoto, 2005. Iles-iles (*Amorphophallus muelleri* Blume); description and other characteristics. *Biodiversitas* 6 (3): 185-190.

