ACCLIMATIZATION AND PRESERVATION OF SEAWEED Kappaphycus alvarezii AS PRODUCT OF PaCS (Cystathionase) TRANSFORMATION FOR ENHANCED RESISTANCE TO ENVIRONMENTAL STRESS IN FLOATING NET CAGE IN PANGKEP WATER

ABSTRACT

PaCS (cystathionase synthase) gene transformation in seaweed K. alvarezii has been successfully performed in vitro with the aim to improve resistance to environmental stress, especially extreme environmental changes causing death and damage to the tissue cultivated seaweed. Nevertheless, the death often occurs during the regeneration of the tissue cultures and acclimatization in the culture chamber. Therefore, it is required an effort to improve the survival rate of gene PaCS (cystathionase synthase) transformed seaweed K. alvarezii synthesized, inserted, and transformed through the regeneration using the flasks cultures continued with acclimatization and rearing of gene PaCS transformed seaweed on floating net cage, which is done in stages, namely: (1) the transformation of gene PaCS (cystathionase synthase) into seaweed K. alvarezii isolated synthesized, inserted, and transformed through the regeneration using the flask culture continued with acclimatization and rearing of gene PaCS transformed seaweed K. alvarezii isolated synthesized, inserted, and transformed through the regeneration using the flask culture continued with acclimatization and rearing of gene PaCS transformed seaweed on floating net cage, which is done in stages, namely: (2) acclimatization in callus on a net green (mesh size of 100) with the size of 50 cm x 50 cm, and immersed for 1 week of the cage, and reared for 2 weeks, the explants were then transferred after acclimatization to the net float cage with the net cage (100 cm x 100 cm) in the laboratory. (3) acclimatization in callus on a net green (mesh size of 100) with the size of 50 cm x 50 cm, and immersed for 1 week of the cage, and reared for 2 weeks, the explants were then transferred after acclimatization to the net float cage with the net cage (100 cm x 100 cm) in the laboratory. (4) acclimatization in callus on a net green (mesh size of 100) with the size of 50 cm x 50 cm, and immersed for 1 week of the cage, and reared for 2 weeks, the explants were then transferred after acclimatization to the net float cage with the net cage (100 cm x 100 cm) in the laboratory. (5) acclimatization in callus on a net green (mesh size of 100) with the size of 50 cm x 50 cm, and immersed for 1 week of the cage, and reared for 2 weeks, the explants were then transferred after acclimatization to the net float cage with the net cage (100 cm x 100 cm) in the laboratory.

Keywords: acclimatization, Kappaphycus alvarezii, floating net cage, long line, growth rate, gene PaCS (Cystathionase synthase)

INTRODUCTION

One of the efforts to improve the seaweed resilience against ice-ice disease is through technology approach using genetic manipulation with transformation of potential genes that can increase the resistance and improve sea weed genes (Varaprasad 2006). K. alvarezii and/or Ulva pertusa are the kinds of algae which is able to absorb heavy metals (Danthanarat et al. 2008) but at the certain concentration, these algae tissue are not capable of survive. Toxicity of heavy metals such as AI can cause the change of cell structure which can reduce starch (starch granules) inside in plastids, elongated cell nucleus, the presence of chloroplasts condensation in nucleus, and the damage in plastids membrane (Nayak et al., 2004). Toxicity of AI results in the integrity loss of plastid membranes (Yarimazono et al., 2011). As the result of heavy metal toxicity, tissue will not absorb nutrients and water, causing the deficiency of nutrients needed for the growth. To overcome this problem is by the increasing of seaweed yield that reduces heavy metal toxicity through the increasing of cystathionase synthase production in K. alvarezii. Cystathionase synthase gene sizing of 128 bp and expressed using a GUS marker enzyme. The GUS gene is derived from Monosodium aminopeptidase (PaCS) and successfully introduced into plant Nicotiana tabacum 'Samsun'. Nicotiana tabacum containing PaCS genes were proved more biogenesis than non-transformed Nicotiana tabacum after being challenged by H2O2 toxicity (Yarimazono et al., 2012).

Several researchers such as Cheng et al. (2011) and David et al. (2013) have also done the transformation of Cystine synthase gene into microalgae using A. thaliana, Syringa vulgaris and Ulva pertusa (2009) have successfully carried out the transformation of Cystine synthase gene into K. alvarezii by the shoots produced from transgenic K. alvarezii have not resulted in the optimum number and growth. The success of gene transformation in vitro in the laboratory can not be applied in the field without going through the stages of acclimatization in the laboratory and in the field. The acclimatization of seaweed K. alvarezii transgenic genes Meta-allothrin (Suryati et al, 2014) and acclimatization of transgenic seaweed K. alvarezii (Suryati et al., 2016) has been carried out. Nevertheless, there is still no obstacle facing the acclimatization in the laboratory, such as low growth, low survival, frequent death due to deficiency of nutrients as well as disease infection. Study aims to acclimatize seaweed resulted of the transformation of gene PaCS (Cystathionase synthase) using cage net and long line method.

AIM

The purpose of this research is to get the technique of acclimatization and preservation of seaweed transgenic PaCS

MATERIALS AND METHODS

Transformation of the gene PaCS (Cystathionase synthase) in the seaweed

Doble culture 2 days Washing with cellotexine

Regeneration of seaweed gene PaCS (Cystathionase synthase) transgenic in liquid medium on

RESULT AND DISCUSSION

Regeneration of Transgenic Seaweed PaCS (Cystathionase synthase) in culture chamber

Figure 1. Acclimatization and Regeneration of Transgenic Seaweed on seeded bottom completed by aerator cultured in Culture chamber at temperature of 20°C

Figure 2. The daily growth rate (DGR) of Transgenic Seaweed PaCS (Cystathionase synthase) weight and bud length in green net cage (A), DGR in blue net cage (B), and a long line method (C)

CONCLUSIONS

The DGR of putative shoot in culture chamber was 0.11-0.84%/day

The DGR of weight of transgenic was 0.82-3.35%/day in green net, 1.38-2.18%/day in blue net, and 1.23-4.30%/day in long line culture.

The DGR of bud length of transgenic seaweed was 1.7-5.3%/day in green net, and 5.3-9%/day in long line culture.

ACKNOWLEDGMENTS

The Authors thank the government of the Republic of Indonesia for funding the research through APBP 2016. Many thanks to the staff of Research Institute for Coastal Aquaculture (RICA), Research and Development Institute of Seaweed Culture (RDSIC) Gorontalo and Department of Marine Science, Faculty of Science and Technology, State University of Gorontalo. Research and Development, Hasanuddin University.

REFERENCES


Poster Presented in Asian-Pacific Aquaculture 24-27 July 2017, Putra World Trade Center, Kuala Lumpur, Malaysia

Emma Suryati 1,2, Rosiliani 1 & Rohama Daud 1,2 Research Institute for Coastal Aquaculture and Fisheries Extension Center of Excellence of Science and Technology Seaweed Research and Development, Hasanuddin University J. Makmur Daun Utara No. 1-78, Moran, South Sulawesi, 90111 Phone: 0411-371544, Fax: 0411-371545 Email: