I. INTRODUCTION

1.1 Background

Plants in the Orchidaceae family are unique and ornamentally valuable that globally distributed, including in Indonesia. Orchids are one of the most striking decorative plants all over the world. The world has 17.000-35.000 species of orchids (Destri *et al.*, 2015). Besides their high ornamental values, orchids are considerable importance in medicines because they have rich contents of alkaloids, glycerides and other useful phytochemicals (Pant, 2011). Indonesia is a country that potentially for orchid growth due to its environmental factors (Darmono, 2003). According to Wihermanto and Hartini (2013), There are around 5000 orchid species in Indonesia. One of the popular orchids is *Cymbidium dayanum* Rchb.f..

C. dayanum is a popular orchid in the floriculture market due to its beautiful and attractive flowers (Nahar *et al.*, 2011). The problem of *C. Dayanum* is difficult to cultivate. This was happened because the germination only has less than 1% in nature. *C. dayanum* is at high risk of extinction due to unregulated collection, illegal hunting, and habitat destruction. Loss of habitat due to human activities and natural disasters has greatly impacted *C. dayanum* population (Nongdam and Chongtham, 2012). Therefore, a conservation program for *C. dayanum* must be urgently considered.

Plant propagation through plant tissue culture is a method that has been widely used for increasing the population of many orchid species. In a conventional technique, orchids can be propagated vegetatively or generatively. There is still a problem with orchid propagation using conventional generative techniques. The problem happened

because orchid seeds are very small and do not have endosperm (Hartati *et al.*, 2016). The endosperm in orchid seeds serves as a food source for the embryos (Gunawan, 2005). Despite orchid seeds germinating in nature, they need mychorrhizal to provide nutrients for germination (Yam *et al.*, 2009). It takes up to two years for an orchid seedling to become a plant using traditional generative propagation (Utami *et al.*, 2017). According to Wirmansari and Isda (2019), Plant tissue culture is a promising way to germinate orchid seeds. Plant tissue culture of some orchid species has been reported in several publications. However, propagation through *in vitro* seed culture of *C. dayanum* is very poorly documented in the literature (Nahar *et al.*, 2017).

Orchid propagation through *in vitro* seed germination influenced by several factors. Environmental conditions, culture media composition, and sugar content as sources of energy for orchid seeds to germinate and grow into seedlings (Yusnita, 2015). *In vitro* seed germination and development of orchids are impacted by several factors, including the nutritional composition of the culture medium, which is not yet fully understood. The three most commonly used basal medium for orchid germination are Vacin and Went (VW), Knudson C (KC) and Murashige and Skoog (MS) (Nurfadilah, 2016).

The *C. Dayanum* orchid is an epiphytic plant. Epiphytic is a plant that lives by attaching to other plants. Epiphytic plants are not parasites since they do not consume the host's food. Termites or other insects carry dust and garbage that this plant feeds on, so its nutritional needs are not as high as those of plants growing in soil (Sadili and Royyani, 2018). For certain orchid species, medium with complex content can cause protocorm browning. MS is a medium that has the most complex nutritional content

compared to VW and KC. Some of orchid species will germinate in less complex nutrients (Arditti and Yam, 2017).

In the study of Pradhan *et al.*, (2013) who had germinated *Cymbidium alloifolium* seeds on half-strength MS and quarter-strength MS, the percentage of half-strength MS was higher at 87,5% while in quarter-strength MS media it was 82.5%. Based on the research of Suriya *et al.*, (2017) showed that germination of *Cymbidium alloifolium* (L.) Sw. Orchid seeds, the best result is KC media with a germination percentage 90% on day 30. Based on the research of Utami and Hariyanto (2019), showed that the best media for seed germination and plantlet development of *Phalaenopsis ambionensis* was VW media with 90,7% percentage germination. Based on the research by Nongdam and Chongtham (2012), only 30% of seeds have been successfully germinated of *Cymbidium dayanum* that were grown on basal MS.

Based on the explanation, there is modification of culture medium used for the *in vitro* seed germination of orchid, but a specific medium for *C. Dayanum* has not yet been achieved. Seed germination and protocorm development of *Cymbidium dayanum* Rchb.f. on several modification of basal medium are needed to be observed to complete data related to medium and strength composition of this species.

1.2 Problem Formulation

Based on the description above, the formulation of problems in this research were:

1. Which medium and strengths of MS, VW and KC are fastest to form protocorm *C. Dayanum*?
2. Which medium and strengths of MS, VW and KC are suitable for embryo development of *C. Dayanum?*

1.3 Research Objectives

The objectives of the research were:

1. To evaluate the influence of different strengths of MS, VW and KC medium on protocorm formation of *C. dayanum*.
2. To evaluate the influence of different strengths of MS, VW and KC medium on embryo development of *C. dayanum*.

1.4 Research Benefits

The research benefits provides scientific information regarding the type and strength of basal medium for seed germination and protocorm development of orchid *Cymbidium dayanum*.