

*ECOLEAF: Eco-friendly Slow Release Hydrogel Fertilizer from Organic Waste with Encapsulation Technology to Accelerate Vegetative Phase in Selop Orchids (Paphiopedilum glaucophyllum J.J.Sm. var. glaucophyllum)*

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## **ABSTRACT**

The objectives of this research were (1) to determine the potential of organic waste to be used as a slow-release hydrogel fertilizer as well as antibacterial and antifungal through the in-silico test, (2) to determine the effect of the concentration factor in the study, and (3) to determine the best ECOLEAF sample. This research method is an experiment with an in-silico, qualitative and quantitative approach. The research design uses 2 factors, namely the concentration of aking rice starch (3%, 5%, 7%) and the concentration of Organic Liquid Fertilizer (OLF) from orange peel waste and banana weevil (10 %, 15%, 20%) with 3 repetitions to get valid data. Based on the results of the study, it was found that (1) waste of orange peel, banana weevil, and aking rice starch has the potential as a slow-release hydrogel fertilizer based on the results of testing the characteristics and effects on the growth of the Selop Orchid. In addition, it has the potential as an antibacterial against the bacteria *Erwinia amylovora* and antifungal against *Phytophthora cactorum* and *Fusarium oxysporum* based on the results of the in silico test. (2) The two research factors affect the characteristics of ECOLEAF fertilizer, and (3) the best sample is S3F3 (7% aking rice starch, 20% OLF) which has characteristics with the highest value on the absorption parameter, which is 39.734%, biodegradation of 16.50 % and effectiveness on the growth of the Slipper Orchid with an average leaf elongation of 29 mm and a leaf width of 3 mm. Based on these results, ECOLEAF has a 2 times better increase in leaf length effectiveness and 3 times better leaf width compared to the control sample (+). Therefore, ECOLEAF has the potential as an alternative to chemical fertilizers and can help the growth of the Selop Orchid plant in the vegetative phase, as well as being more environmentally friendly and economical at an affordable price of Rp. 16,500/100 gr.

**Keywords:** *Antibacterial, Antifungal, Organic Waste, Slipper Orchid, Slow Release Hydrogel Fertilizer*

## **ABSTRAK**

Tujuan penelitian ini adalah (1) mengetahui potensi limbah organik untuk dimanfaatkan sebagai pupuk hidrogel *slow release* serta sebagai antibakteri dan antifungi melalui uji *in-silico*, (2) mengetahui pengaruh faktor konsentrasi penelitian, dan (3) menentukan sampel ECOLEAF terbaik. Metode penelitian ini adalah eksperimen dengan pendekatan *in-silico*, kualitatif dan kuantitatif. Rancangan penelitian ini menggunakan 2 faktor penelitian yaitu konsentrasi pati nasi aking (3%, 5%, 7%) dan konsentrasi pupuk cair organik (PCO) dari limbah kulit jeruk dan bonggol pisang (10%, 15%, 20%) dengan 3 pengulangan untuk mendapatkan data yang valid. Berdasarkan hasil penelitian ditemukan bahwa, (1) limbah kulit jeruk, bonggol pisang dan pati nasi aking berpotensi sebagai pupuk hidrogel *slow release* berdasarkan hasil pengujian karakteristik dan efektivitas terhadap pertumbuhan Anggrek Selop. Selain itu, berpotensi sebagai antibakteri terhadap bakteri *Erwinia amylovora* dan antifungi terhadap *Phytophthora cactorum* dan *Fusarium oxysporum* berdasarkan hasil uji *in silico*. (2) Kedua faktor penelitian berpengaruh terhadap karakteristik pupuk ECOLEAF, dan (3) sampel terbaik adalah S3F3 (pati nasi aking 7%, PCO 20%) yang memiliki karakteristik dengan nilai tertinggi pada parameter daya serap yaitu 39,734%, biodegradasi sebesar 16,50% serta efektifitas terhadap pertumbuhan Anggrek Selop dengan nilai rata – rata pemanjangan daun sebanyak 29 mm dan lebar daun sebesar 3 mm. Berdasarkan hasil tersebut, ECOLEAF memiliki efektifitas pemanjangan daun 2 kali lebih baik dan lebar daun 3 kali lebih baik dibandingkan dengan sampel kontrol (+). Oleh karena itu, ECOLEAF berpotensi sebagai alternatif pupuk kimia dan dapat membantu pertumbuhan tanaman Anggrek Selop pada fase vegetatif, serta lebih ramah lingkungan dan ekonomis dengan harga terjangkau yaitu Rp.16.500/100 gr.

**Kata Kunci:** *Anggrek Selop, Antibakteri, Antifungi, Limbah organik, Pupuk Hidrogel Slow Release*