PROTONATED CRAB SHELL WASTE AS FUNGAL INHIBITOR

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1. Introduction

Fungal contamination is a serious issue in most tropical countries. Indonesia, one of the largest tropical regions, is suffering from fungal contamination in various sectors which may damage the development of the whole nation. In counteracting this problem, chemicals have been used to inhibit the growth of various fungi due to their compatibility. However, these chemicals are composed of harmful and toxic compounds that may not only eliminate fungi but also risk human health. Indonesia is also a country which is rich of marine life and abundant in sea resources. Wastes from these sea resources may become a potential source in solving fungal contamination and reducing unnecessary wastes caused by the consumption of these resources. Therefore, the aim of this research is to utilize crab shell waste as an alternative to inhibit the contamination and growth of *Aspergillus niger*

2. Research method

Chitosan was extracted directly from crab shell waste. The procedure for the extraction of chitosan is by deproteination, demineralization and decolorization [1].

Agar diffusion test was conducted multiple times to determine the best dose on inhibiting the growth of *Aspergillus niger*. Each petri dish was composed of the isolated *Aspergillus niger* and sufficient amount of agar. To observe the inhibition zone, petri dishes were incubated for 24 hours.

Five samples of 1% chitosan solution were composed of different acetic acid concentration and chitosan. At the same time, pure acetic acid of different concentrations were also tested to observe the effect of chitosan in different acetic acid concentration in inhibiting the growth of *Aspergillus niger.*

The ideal concentration of acetic acid was then used for the variation of chitosan in determining the most effective chitosan concentration in inhibiting the growth of *Aspergillus niger*. Concentrations of chitosan included, 2%, 1%, 0.5%, 0.25% and 0.125% (w/v). At the same time, non-protonated chitosan solution with the same concentration was also tested for comparison. The diameter of the inhibition zones were measured by using a vernier caliper. Each agar diffusion test was conducted repeatedly. Results were then arranged in a stasticial way for analysis.

3. Results

The Figure 1 displays the comparison between different concentrations of acetic acid and samples of 1% chitosan solution with different acetic acid concentration.

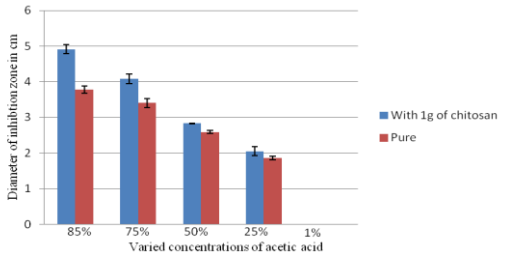

Figure 1 – Different concentrations of acetic acid against Aspergillus niger

The comparison shows that 85% acetic acid had the most effective result. This was due to the protonation reactions of the 85% acetic acid with the chitosan.

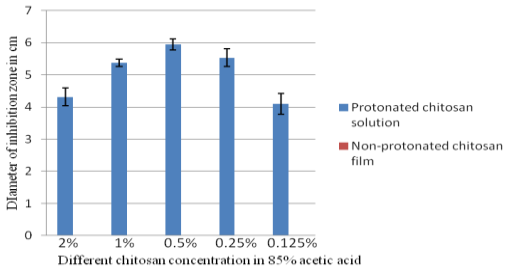

Figure 2 – Concentrations of chitosan in inhibiting Aspergillus niger

The sample of protonated 0.5% chitosan shows the most effective inhibition effect. However, non-protonated chitosan solutions failed to display any inhibition effect. This was due to the absence of protonation reactions. The amount of chitosan and the protonation reactions are the main factors affecting the inhibition effect.

4. Conclusion

While other concentrations may also show inhibiting effect, protonation was optimum in 0.5% chitosan solution. Therefore, chitosan solution of 0.5% has proven to be the best dose in inhibiting the growth of *Aspergillus niger.*

5. References

[1] Burrows, Felicity, et al. “Extraction and Evaluation of Chitosan from Crab Exoskeleton as a Seed Fungicide and Plant Growth Enhancer, (2007)”

[2] Fang Li, et al. *“Effects of Molecular Weight and Concentration of Chitosan on Antifungal Activity Against Aspergillus Niger, (2008)”*