

Antibacterial Activity of Watercress (*Nasturtium Officinale*) against *Staphylococcus Aureus*

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Abstract: The aim of the study was to investigate the potential of leaf ethanol extract of watercress (*Nasturtium officinale*) against *Staphylococcus aureus*. The air-dried of watercress were ground and extracted using ethanol 70% and stored for 3 days. The macerate then was filtered and evaporated at 50°C until thick paste extract was obtained. Extract was made several concentration by dimethyl sulfoxide 10%. The concentration used was 0, 60, 75, and 100%. As much as 0.1 ml bacterial suspension (10^8 colony forming unit/ml) was cultured in 15 ml mueller hinton agar (MHA) in petri dish (9 cm in diameter) and paper disc (0.5 mm in diameter) was soaked by extract and placed on the surface of the MHA medium. Blank paper disc soaked with distilled water and chloramphenicol as negative and positive control respectively. Three replicates for each treatment. All plates were incubated at 37°C for 24 h. The presence of clear zone surrounding paper disc was observed. The minimum inhibitory concentration (MIC) was determined based on the clear zone on each extract concentration. Results showed that inhibition occurred at extract concentration 100% (4.5 mm) and MIC at 90% (2.42 mm).

1 INTRODUCTION

Watercress (*Nasturtium officinale* R.Br.) is an annual plant (Family Brassicaceae). This plant is easy to grown and grow wildly an and around water at a small creek, pond or shallow lake. This native plant is from western Asia, India, Europe and Africa (Cruz et al. 2008). This leafy plant used as vegetable and can be used as traditional medicine for physiology and microbiological diseases (Pandey et al. 2018; Zeb and Murkovic 2011). Extract of *N. officinale* is potential and effective as antimicrobial agents (Freitas et al. 2013; Ahmad et al. 2016).

In vitro culture biomass of *N. officinale* is potential as antifungal and antibacteria (Klimek-Szczykutowicz et al. (2020). Mahdavi et al. (2019) reported that essential oil of *N. officinale* effective in inhibiting *Bacillus cereus* ATCC 11778, whereas, the ethanolic extract begin to inhibit *Staphylococcus aureus* PTCC 1112 at 25 and 50%. Derhami et al. (2016) used alcohol and aqueous extract and stated that *N. officinale* is more effective as antibacteria on gram positive than that of gram negative. However, screening biological activity methanol extract of leaf, root and seeds of *N. officinale* was high activity

against *Klebsiella pneumoniae* and *Shigella* spp. (Iseri et al. (2014). The purpose of the current study was to investigate the potential ethanolic extract of *Nasturtium officinale* against *Staphylococcus aureus*.

2 MATERIALS AND METHOD

2.1 Preparation of Ethanol Extract

After collecting *N. officinale* from local traditional market in Medan, five kilogram of the fresh plant was air-dried, powdered, and 300 of simplicia was extracted using ethanol 70%, stored for 3 d, homogenized, filtered and evaporated at 50°C. Extract concentration, 0, 60, 75 and 100% was made using dimethyl sulfoxide 10%.

2.2 Preparation of Bacterial Suspension

Staphylococcus aureus used was culture collection of Laboratory Microbiology, Pharmacy Department, Universitas Sumatera Utara. As much as 0.1 ml

bacterial suspension (10^8 cfu/ml) in petri dish (9 cm in diameter) was pourplated by 15 ml mueller hinton agar (MHA), shaken to homogenize. Paper disc (0.5 mm in diameter) was soaked by plant extract concentration and placed on the surface on the MHA plate. Blank paper disc soaked by distilled water and chloramphenicol used as negative and positive control respectively. All cultures were incubated at 37°C for 24 h. Three replicates were made for each treatment.

2.3 Determination of Minimum Inhibitory Concentration (MIC)

The minimum inhibitory concentration was determined based on the lowest clear zone at extract concentration. The range of the extract were made. Distilled water and chloramphenicol were used as negative and positive control successively.. All culture were incubated at 37°C for 24 h. Three replicates were made for each treatments.

3 RESULTS AND DISCUSSION

3.1 Antibacterial Activity of Ethanolic Extract of *N. officinale*

Ethanolic extract of *N. officinale* inhibit the growth of *Staphylococcus aureus*. (Figure 1). However no inhibition was found at concentration 60 and 75%. The inhibition occurred at extract 100%. Our result was in similar to Al-Histawi (2017) that used *N. officinale* seeds ethanol extract againts *S. aureus* at had no activity.

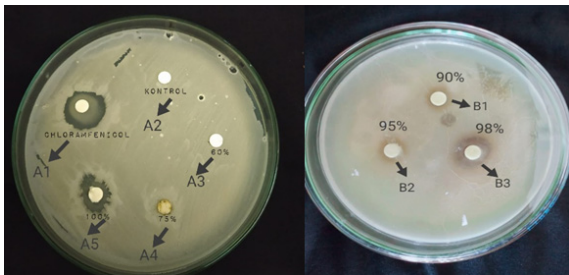


Figure 1: Left, Activity ethanolic extract of of *N. officinale* againts *S. aureus* on muellen hinton agar (MHA) after 24 h incubation (37°C). A2 = negative control (no extract), A3 = 60% extract, A4 = 75% extract, A5 = 100% extract, A7 = positive control (chloramphenicol). Right, Minimum inhibitory extract concentration 90, 95 and 98%.

As shown in Figure 1 extract concentration 100% (inhibition zone 11.2 mm) (Table 1) only concentration that the inhibition can be seen clearly.

Therefore, based on 100% extract concentration, range of concentration such as 90, 95, 98% showed that the minimum inhibitory concentration occurred at 90% (4.85 mm). (Table 2). Previous study the effect of nano particle extract of *N. officinale* by Oraibi et al. (2016) stated that *Staphylococcus aureus* was the most sensitive to the extract. Based on the Table 1, range of 100% extract concentration was made (Table 2) to determine minimum inhibitory concentration.

Table 1: Inhibition ethanolic extract of *N. officinale* againts *Staphylococcus. aureus*

Extract concentration (%)	Inhibition zone (mm)
negative control (no extract)	0
Positive control (chloramphenicol)	19.18
60	0
75	0
100	11.2

Table 2: Minimum inhibition concentration ethanolic extract of *N. officinale* againts *Staphylococcus aureus*

Extract concentration (%)	Inhibition zone (mm)
negative control (no extract)	0
positive control (chloramphenicol)	19.18
90	4.85
95	6.30
98	6.99

Ethanolic extract *N. officinale* inhibit the grow of *S. aureus* at concentration between 90 and 100%. However, results of the current study showed that the concentration is lower than that our study. The differences in antimicrobial activity might be caused by the site that plant growth and age the plant.

4 CONCLUSION

As medicinal plant, watercress (*Nasturtium officinale*) is potential to inhibit *Staphylococcus aureus*.

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