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# POTENTIAL BENEFIT OF PURSLANE HERBS (*PORTULACA GRANDIFLORA*) EXTRACT IN WOUND HEALING

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**Abstract:**
Chronic wound infection is a global problem, especially in developing countries with limited health access. Medicinal plants are materials that are affordable and safe for wound care from natural sources. Several plants have been studied for their benefits in wound healing and one of them is purslane (*Portulaca grandilfora*). In various studies, the purslane extract concentration in wound healing activity is not fully understood. This research aimed to determine wound healing effective dose of purslane herbs (*Portulaca grandilfora*) magenta flower variety extract on rabbit's skin. This was experimental research that used wound-induced rabbits. Wounds were grouped into 5 groups such as negative (aqua destilata) (K-) and positive (betadine solution) (K+) control groups, 25% (D1), 50% (D2), and 75% (D3) extract concentration dosage form groups. The result showed that all extract-treated groups wound healed faster than the negative control group. Purslane herbs (*Portulaca grandilfora*) magenta flower variety 50% and 75% concentration dose showed wound healing activity which significantly differents from negative control on day-11 and day-12 for 25% concentration dose. Based on the research results, purslane extract *(Portulaca grandiflora*) has potential benefits in wound healing. The 50% concentration of extract of puslane (*Portulaca grandiflora*) is the effective concentration dosage form in wound healing activity.

**Keywords:** Herbs; purslane (*Portulaca grandiflora*); magenta flower variety; dose; wound healing.

## 1. INTRODUCTION

Skin is the outermost barrier in the human body to protect it from infection. Skin consists of three layers as epidermis, dermis, and subcutaneous. The epidermis's outer layer is the stratum corneum which is known as the brick wall for its protective function [1]. Under normal conditions, the skin surface contains various kinds of microbes [2]. When skin is injured, microbes migrate from the skin surface to the open wound. If the microbial is too much to handle, it will lead to chronic infection.

Wound chronic infection is a condition that can be explained in four stages [3]. The homeostasis stage starts when the skin gets injured and an open wound occurs [4]. The blood will flow into wound site and granulation aggregation stops the blood from overflowing. The inflammation stage is marked by inflammation agent migration to the wound site. Monocytes, neutrophils, and endothelial cells which are inflammatory cells, form protection to decontaminate the wound from microbial invasion [5]. The proliferation stage starts all over the wound healing process in the background. The fibroblast will start to produce new collagen and glycosaminoglycan which stabilize the wound and lead to reepithelization [6]. The last stage is remodeling which is also called as maturation phase. In this stage, the excess collagen will degrade, and the wound start contracting to form a scar [7].

Chronic wound infection is a global problem, especially in developing countries with limited health access [8]. Untreated chronic wound infection will cause a scar that causes functional abnormality and discomfort [9]. Wound care is sometimes too expensive and unaffordable for people with low incomes who live in a developing country. Inexpensive and safe wound care is needed in such living conditions.

Medicinal plants are materials that are affordable and safe for wound care from natural sources. Several plants have been studied for their benefits in wound healing and one of them is purslane (*Portulaca grandilfora*) [8]. Purslane (*Portulaca grandiflora*) is a tropical plant that is widely known as a "vegetable for long live" because of its health benefits. Several studies showed that purslane has antioxidant, antimicrobial [10], immunomodulator, and anti-inflammation activity. The wound healing activity of purslane (*Portulaca grandiflora*) has been studied in recent research [8]. Purslane's active metabolite is suggested to have an important role in such activities and has a potency to be developed as topical wound care.

Purslane (*Portulaca grandiflora*) contains flavonoids, alkaloids, terpenoids, and steroids [11]. Flavonoid is an antioxidant that could work as an immunomodulator that helps accelerate the wound healing process [12]. The action mechanism of flavonoids in wound healing is not fully understood yet. But recent studies explained that flavonoids work as an antioxidant to prevent oxidative stress, an antimicrobial agent to prevent infection, and an anti-inflammatory agent [13]. The concentration of medicinal plant extract correlates with the active metabolite amount contained in it and affects its pharmacological activity. In various studies, the purslane extract concentration in wound healing activity is not fully understood [8]. This leads to researcher curiosity to establish which concentration of purslane extract gives the higher wound healing activity.

## 2. MATERIALS AND METHODS

### 2.1 Materials

This research used an oven, beaker glass, erlenmeyer, vacuum rotary evaporator, biopsy punch 8 mm in diameter, a disposible syringe of 1 ml, surgical scissors, anatomical forceps, and vernier calipers. Purslane (*Portulaca grandiflora*) magenta flower variety herbs from Madiun City, East Java, Indonesia were used as samples. Ethanol 70%, lidocaine injection, betadine solution, and five male New Zealand strain Rabbits were used to conduct this research.

### 2.2 Methods

Purslane herbs (*Portulaca grandiflora*) magenta flower variety herbs were dried, grinded, and extracted (maceration) using ethanol 70% 1:7 in simplicia:solvent ratio for 5 days. The solid residue was extracted one more time using the same amount of solvent and period. The first and second macerates were mixed and evaporated with a vacuum rotary evaporator to get the thick extract. The thick extract dissolved in aqua destilata to get 25%, 50%, and 75% concentration dosage form.

Wound healing activity test ethical clearance was obtained from Health Research Ethics Committee Faculty of Medicine, Muhammadiyah Surakarta University, Indonesia. Rabbit's back part hair was shaved and anesthized with lidocaine injection sub cutan (0.0125-0.76 ml/kg BW). Eight wounds excision was induced on the back part of the rabbit. The wounds were grouped into 5 groups such as negative (aqua destilata) (K-) and positive (betadine solution) (K+) control groups, 25% (D1), 50% (D2), and 75% (D3) extract concentration dosage form groups. The wounds were treated twice a day for 14 days. The wound condition and diameter were observed and measured daily for 14 days.

### 2.3 Data Analysis

The wound healing activity test data result was analyzed statistically using One Way ANOVA ($\alpha$ = 0,05) and followed with a post hoc test.

## 3. RESULTS AND DISCUSSION

The extraction yield of purslane herbs (*Portulaca grandiflora*) magenta flower variety using maceration method and ethanol 70% solvent is 10.66%. The simplicia powder homogeneity may influence the yield obtained.

The wound induction on day-0 showed 9.60±0.37 mm in average diameter. The wounds were treated as it's group treatment twice a day.

**Table 1**. The wound diameter (mm) average ± SD

| Group | Day | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **0** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **11** | **12** | **13** | **14** |
| K(-) | 8,97 ± 0,75 | 9,65 ± 0,83 | 8,63 ± 1,27 | 7,53 ± 0,65 | 7,39 ± 1,19 | 7,03 ± 0,70 | 7,29 ± 1,71 | 6,38 ± 0,29 | 5,82 ± 0,57 | 5,13 ± 1,11 | 2,56 ± 0,54 | 1,57 ± 0,77 | 1,43 ± 0,84 | 0,60 ± 1,03 | 0,00 ± 0,00 |
| K(+) | 9,64 ± 0,51 | 7,98 ± 1,01 | 8,37 ± 1,10 | 7,21 ± 1,05 | 6,68 ± 0,86 | 6,62 ± 1,18 | 6,25 ± 1,14 | 5,11 ± 1,77 | 3,92 ± 2,87 | 2,61 ± 2,33 | 1,22 ± 0,40 | 0,22 ± 0,39* | 0,00 ± 0,00* | - | - |
| D1 | 9,97 ± 0,32 | 8,57 ± 1,12 | 7,13 ± 1,17 | 6,06 ± 0,44 | 5,96 ± 0,69 | 6,01 ± 0,35 | 5,76 ± 0,74 | 5,17 ± 2,07 | 2,56 ± 0,70 | 2,71 ± 0,80 | 1,21 ± 0,22 | 0,62 ± 0,43 | 0,00 ± 0,00* | - | - |
| D2 | 9,77 ± 0,30 | 8,73 ± 1,20 | 7,79 ± 0,93 | 6,98 ± 0,33 | 6,19 ± 0,38 | 6,19 ± 0,58 | 5,44 ± 0,19 | 4,25 ± 1,43 | 4,19 ± 2,29 | 2,23 ± 0,78 | 1,12 ± 0,20 | 0,00 ± 0,00* | - | - | - |

| | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| D3 | 9,64 ± 0,18 | 8,83 ± 0,82 | 7,44 ± 1,17 | 7,10 ± 0,59 | 6,62 ± 1,29 | 6,78 ± 0,64 | 5,76 ± 0,80 | 5,01 ± 0,55 | 2,56 ± 1,25 | 1,87 ± 0,40 | 0,51 ± 0,88 | 0,04 ± 0,06* | 0,00 ± 0,00* | - | - |

Notes: *Significantly different (P<0.05) from the negative control group

Statistical analysis results showed no significant difference among treatment groups from day-0 until day-10 (Table 1). On day-11, positive control, purslane herbs (*Portulaca grandiflora*) magenta flower extract 50% and 75% concentration dosage form the treated group showed a significant difference from the negative control treated group. The purslane herbs (*Portulaca grandiflora*) magenta flower extract 25% concentration treated group showed a significant difference with the negative control treated group on day-12. On the same day, the wounds treated with 50% extract dosage form were fully closed. The other wounds treated groups were healed on day-13. The same result was shown by the positive control (betadine solution) group treated wounds. Different results were shown by the wounds treated by negative control (aqua destilata) which fully closed on day-14 (Figure 1).

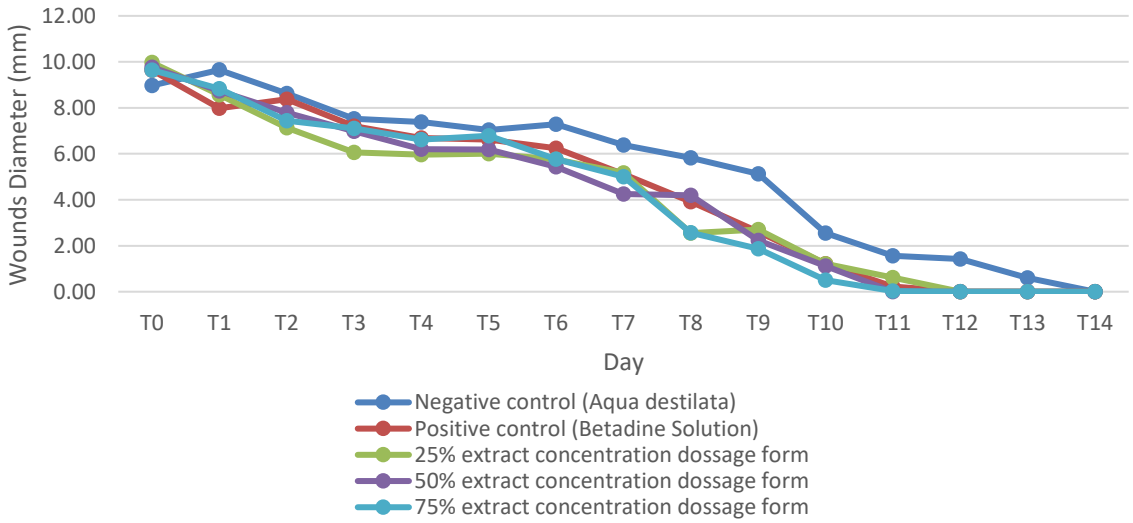


**Figure 1**. Wound healing process from day-0 to day-14

The wounds treated with aqua destilata showed slower healing speed compared to another treatment group. Based on Grada *et al* (2018), wounds normally heal from day-13 to day-16 or longer depending on the wound's width and depth [14]. Wounds healed in four stages such as hemostasis, inflammation, proliferation, and remodeling [3]. When wounds occur, blood will flow to the wound site. The inflammation agent such as neutrophil, macrophage, monocytes, and Reactive Oxygen Species (ROS) will produce to prevent infection [15]. In this stage, oxidative stress condition will lead to a longer inflammation process when ROS overproduced [16]. In the proliferation stage, oxidative stress conditions also disturbs collagen production [7].

Betadine solution composed of povidone iodine is an antiseptic with oxidation of key proteins, nucleotides, and fat acids that leads to microbial death [17]. This mechanism explained the wound healing activity of betadine solution as a protection to prevent infection in the wound site.

Purslane herbs (*Portulaca grandiflora*) magenta flower variety contains flavonoids, alkaloids, terpenoids, saponins, and tannins [11]. Flavonoids have a main role in wound healing as antibacterial and antioxidant [12]. Flavonoids have been known for their properties to prevent the bacteria membrane cell walls and inhibit nucleic acid synthesis on the bacteria DNA production and inhibiting ATP generation that could kill the bacteria [18]. The same mechanism may be shown by saponin that disturbs bacteria cell membrane permeability and causes bacteria to lysis. Flavonoids as an antioxidant that scavenge the ROS will prevent oxidative stress from progressing and accelerate the wound healing process [19]. Tannin also has antibacterial properties that help the wound healing process [20].

Based on the wound healing activity test result, the 25% and 75% concentration dosage form treatment groups showed a slower healing process compared to the 50% concentration dosage form treatment group. This showed that the 50% concentration of extract of puslane herbs (*Portulaca grandiflora*) is the most effective concentration in wound healing activity.

## 4. CONCLUSION

Based on the research results, purslane herbs (*Portulaca grandiflora*) extract has potential benefits in wound healing. The 50% concentration of extract of puslane herbs (*Portulaca grandiflora*) is the most effective concentration dosage form in wound healing activity.

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