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# Potential Use of Purslane (*Portulaca oleracea* L.) as Alternative Wound Healing Therapy

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Semarang, Indonesia**ABSTRACT**

*Portulaca oleraceae* (Indonesian name: Krokot) is a herbaceous succulent annual plant, distributed in tropical region. Chemical constituents such as flavonoids, alkaloids, fatty acids, terpenoids, polysaccharides, vitamins, sterols, proteins, and minerals have been isolated from this plant. The pharmacological properties, based on scientific research, are claimed as anti-bacterial, anti-ulcerogenic, anti-inflammatory, anti-oxidant, and especially for wound-healing. Triterpenoids and flavonoids play an important role, promotes wound contraction and increases epithelialization rate in the wound-healing process.

**Keywords:** Epithelialization, flavonoid, *Portulaca oleracea*, terpenoid, wound healing

**ABSTRAK**

*Portulaca oleraceae* (nama Indonesia: Krokot) adalah tumbuhan perdu sepanjang musim, tersebar di daerah tropis. Senyawa kimia seperti flavonoid, alkaloid, asam lemak, terpenoid, polisakarida, vitamin, sterol, protein, dan mineral telah diisolasi dari tanaman ini. Aktivitas farmakologis, berdasarkan hasil penelitian, dilaporkan sebagai anti-bakteri, anti-ulkus, anti-inflamasi, anti-oksidan, dan terutama untuk penyembuhan luka. Triterpenoid dan flavonoid memiliki peran penting, yakni menstimulasi penyempitan bekas luka dan mempercepat penutupan luka. **Hanny Setyowati. Potensi Krokot (*Portulaca oleracea* L.) untuk Terapi Penyembuhan Luka**

**Kata kunci:** Epitelisasi, flavonoid, penyembuh luka bakar, *Portulaca oleracea*, terpenoid

**INTRODUCTION**

Ethnomedical knowledge, based on natural product, can serve as an innovative and powerful discovery method for newer, safer, and affordable medicines. In the last few decades, there has been an increasing interest in the ethno-pharmacological studies on medicinal plants, evident by numerous publications and reports; one example is on Purslane (*Portulaca oleracea* L.).<sup>1</sup>

*Portulaca oleracea* L. is a warm-climate, herbaceous succulent annual plant, belongs to the Portulacaceae family with a cosmopolitan distribution (Table). It is commonly known as Purslane (USA and Australia), Rigla (Egypt), Pigweed (England), Pourpier (France), Ma-Chi-Xian (China), and Krokot (Indonesia).<sup>2</sup> Many constituents of *Portulaca oleracea* have been isolated, including flavonoids, alkaloids, fatty

acids, terpenoids, polysaccharides, vitamins, sterols, proteins, and minerals.<sup>3</sup> This plant has been used as a folk medicine, acting as anti-bacterial, anti-ulcerogenic, anti-inflammatory, anti-oxidant, and wound-healing properties.<sup>4</sup>

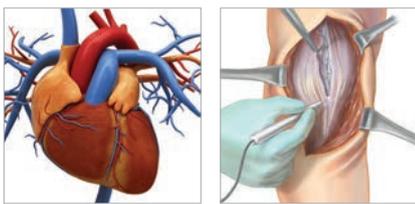
Wound healing activity consists of progression of events to re-establish the integrity of damaged tissue.<sup>5</sup> Many drugs currently used for wound treatment are not only expensive but also pose problems such as allergy, drug resistance etc,<sup>6</sup> and alternative drugs are needed. *Portulaca* is claimed to be useful for wound healing though their active components.<sup>7</sup>

This review attempt to compile the exhaustive literature on *Portulaca oleracea*, to highlight, analyzes, and critically assesses the wound healing activity of this plant.

***Portulaca oleracea* L.**

Figure 1. *Portulaca oleracea* L. plant

The name *Portulaca* is thought to be derived from the Latin "porto" meaning "to carry" and "lac" meaning milk, since the plant contains a milky juice; *oleracea* from Latin, meaning "pertaining to kitchen gardens", referring to



its use as a vegetable. The use of this plant as a vegetable, spice, and medicine has been known since the times of the ancient Egyptians and was popular in England during the Middle Ages.<sup>8</sup>

Table. Classification of *Portulaca oleracea* L.<sup>8</sup>

Kingdom	Plantae
Subkingdom	Tracheobionta
Superdivision	Spermatophyta
Division	Magnoliopsida
Subclass	Caryophyllidae
Order	Caryophyllales
Family	Portulacaceae
Genus	Portulaca
Species	<i>Portulaca oleracea</i> L.

**Wound Healing**

Wound healing is the process of repair that follows injury to the skin and other soft tissues. Following injury, an inflammatory response occurs and the cells below dermis (the deepest skin layer) begin to increase collagen (connective tissue) production. Later, epithelial tissue (outer skin) is regenerated.<sup>9</sup> Three stages of wound healing process are: inflammation, proliferation, and contraction of collagen lattice (remodeling) (Figure 2).<sup>10</sup>

Pain, reddening, and edema of the surrounding tissue indicated the inflammation stages; these are caused by the release of neutrophils, macrophages, lymphocytes, and of reactive oxygen species (ROS). After the initial rally of neutrophils to a wound site, several other types of cell are recruited to carry forward the processes of repair. These include monocytes and, more importantly, fibroblasts which are attracted into the site to initiate the proliferative phase of repair.<sup>11</sup> The proliferative phase is characterized by angiogenesis, collagen deposition, granulation tissue formation, epithelialization, and wound contraction. Angiogenesis involves new blood vessel growth from endothelial cells. In fibroplasia and granulation tissue formation, fibroblasts excrete collagen and fibronectin to form a new, provisional extracellular matrix. Subsequently, epithelial cells crawl across the wound bed to cover it and the wound is contracted by myofibroblasts, grip the wound edges and undergo contraction using a mechanism similar to smooth muscle cells' action.<sup>12</sup>

The preliminary wound healing activity of *P. oleracea* was studied using *Mus musculus* JVI-

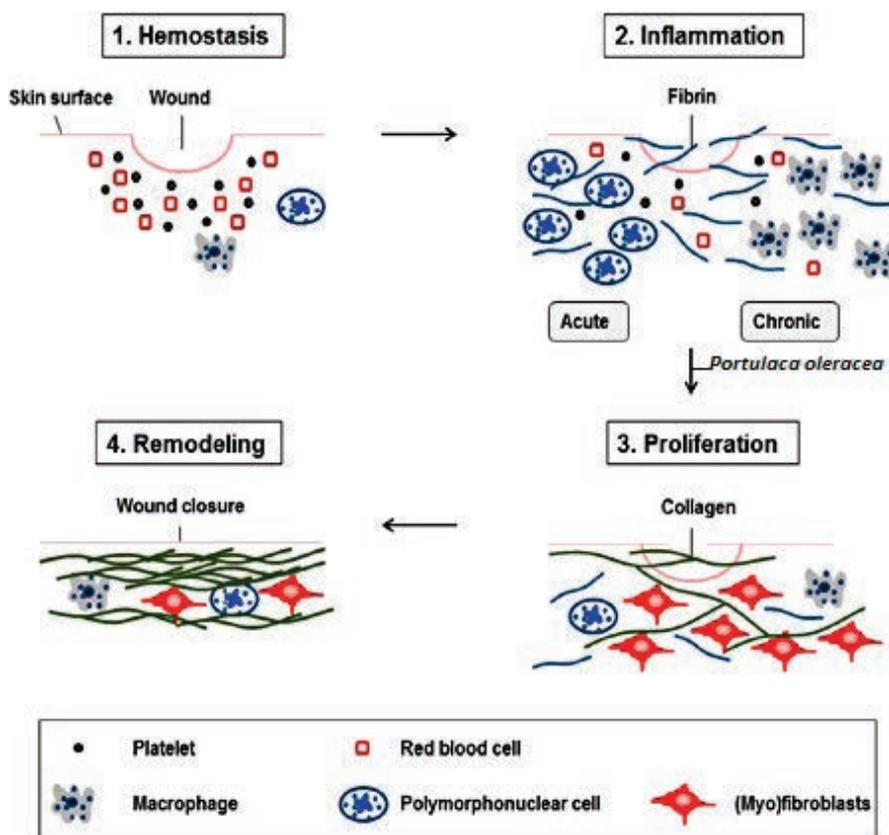


Figure 2. Schematic representation of wound-healing activity and the possible effect of *Portulaca oleracea*

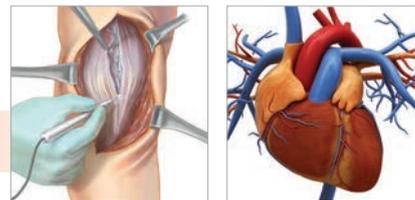
1. Fresh homogenized crude aerial parts of *P. oleracea* were applied topically on the excision wound surface as single and two doses. Wound contraction and tensile strength measurements were used to evaluate the effect. The results indicated that *P. oleracea* accelerates the wound healing process by decreasing surface area of the wound and increasing tensile strength. The greatest contraction was obtained at a single dose of 50 mg and the second greatest by two doses of 25 mg.<sup>13</sup> Purslane ethanolic extract also play an important role on accelerating diabetic wound healing; this extract significantly stimulated wound contraction, accelerating granulation and organization formation of the treated excision wounds compared with the other groups.<sup>14</sup> It has also protective effect against the oxidative effect of STZ on liver.<sup>15</sup> These findings could justify the inclusion of this plant in the alternative management of wound healing.

**Regenerative Therapies for Skin Wound Management**

Skin wound therapies are categorized as either conventional or regenerative. Conventional

skin wound management includes debridement of necrotized tissue followed by topical use of different types of wound dressings, ensuring sufficient tissue perfusion, limiting wound pressure, and reducing infection. Wounds healed by conventional therapy are characterized by scar formation with cosmetic and possible functional impairment. Regenerative medicine is defined as a novel and fast growing field of biomedical research that focuses on replacing, restoring, and regenerating damaged cells, tissues, and organs.<sup>16</sup> This can potentially be accomplished using the process of dedifferentiation (involves terminally differentiated cells reverting back to a less differentiated stage), trans-differentiation (a process which takes dedifferentiation a step further and cells differentiate into a cell type of another lineage) and reprogramming (to induce differentiated cells into a pluripotent state).<sup>16</sup>

The active components of *Portulaca oleracea*, like terpenoids and flavonoids have contributed for skin regeneration.<sup>17</sup> Triterpenoids and flavonoids are active in the wound-healing process mainly due to their



astrigent and anti-microbial property, which seems to be responsible for wound contraction and increased rate of epithelialization.<sup>18</sup> The presence of vitamin A in *Portulaca* extract may play important role during wound healing, as vitamin A reverses the corticosteroid-induced inhibition of cutaneous and fascial wound

healing, modulating collagenase activity, supporting epithelial cell differentiation and improving localization and stimulation of the immune response.<sup>19</sup>

#### CONCLUSION

*Portulaca oleracea* possesses a wide spectrum

of pharmacological properties, especially for wound management. Their active components, like terpenoids, flavonoids, and vitamins promote epithelialization and contribute to the skin regeneration. Further evaluations are needed to explore the practical clinical applications.

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