



Wound healing acceleration effect of endemic *Ononis* species growing in Turkey

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ABSTRACT

Aim of the study: *Ononis* L. species have been used for healing of wounds, eczema and rheumatic complaints, against skin cancer and lesions and topically used as antiseptic and antimicrobial agent in folk medicine. In the present study, the aqueous and methanolic extracts of three endemic *Ononis* species growing in Turkey, including *Ononis sessilifolia* Bornm., *Ononis basiadnata* Hub.–Mor. and *Ononis macrosperma* Hub.–Mor. were assessed for their *in vivo* wound healing and anti-inflammatory activities.

Materials and methods: *In vivo* wound healing activities of the plants were evaluated by using linear incision and circular excision experimental models subsequently histopathological analysis. The healing potential was comparatively assessed with a reference ointment Madecassol®, which contains 1% extract of *Centella asiatica*. *In vivo* inhibitory effect of the extracts on acetic acid-induced increase in capillary permeability was studied for the assessment of anti-inflammatory activity.

Results: The aqueous and ethanolic extracts of the aerial parts of *O. macrosperma* demonstrated the highest activity in both wound models and significant anti-inflammatory activity in acetic acid-induced increase in capillary permeability test. Furthermore, ethanolic extract of the aerial parts of *O. sessilifolia* showed anti-inflammatory effect but was devoid of wound healing activity. The rest of the species did not show remarkable wound healing effect. Ethyl acetate fraction of *O. macrosperma* ethanolic extract demonstrated significant but reduced wound healing activity, which revealed a possible combined effect. The results of histopathological examination supported the outcome of linear incision and circular excision wound models.

Conclusion: The experimental study revealed that the aerial parts of *O. macrosperma* display remarkable wound healing and anti-inflammatory activities.

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1. Introduction

Ononis genus, which comprises of 75 species, belongs to the family Fabaceae and is widespread from Europe to Central Asia (Evans, 2002; Wollenweber et al., 2003). This genus is represented by 18 species and 4 taxons are endemic to Turkey (Davis, 1970; Davis et al., 1988). *Ononis* species are called as “kayışkıran, kayık çiçeği, yandak, yandukta or yantak” in Turkey (Baytop, 1999; Şöhretoğlu, 2007).

Members of the *Ononis* genus have been shown to possess antibiotic, antipyretic, anti-inflammatory, antifungal and antiseptic activities. *Ononis* decoctions are reported to be used in the treatment of skin and rheumatic diseases as well as gout (Liebezeit, 2008).

Ononis spinosa L. has been used in Turkish folk medicine for the treatment of inflammatory diseases of the lower urinary tract and

kidney stones. It was reported to possess pharmacological activities due to its aperient, diuretic, antibacterial, analgesic, antiviral, cytotoxic and antifungal effects (Erdemgil et al., 2002). Externally it is used for the healing of wounds, eczema, the other skin disorders and gout (Yılmaz et al., 2006; PDR for Herbal Medicines, 2004). Spiny Rest Harrow (*Ononidis radix*, dried roots and rhizomes of *O. spinosa*) with other some drugs, are sold abroad in the form of various preparations as diuretic and antidiabetic (Şöhretoğlu, 2007).

The aerial parts of *Ononis arvensis* L. have been used in traditional medicine to treat urinary tract infections and skin diseases (Erdemgil et al., 2002).

In Jordanian folk medicine the aerial parts of *Ononis sicula* Desf. and *Ononis hirta* L. have been used against skin cancer and lesions (Talib and Mahasneh, 2010).

A survey of the published literatures revealed that anti-inflammatory and wound healing properties of *Ononis basiadnata* Hub. & Mor., *Ononis sessilifolia* Bornm. and *Ononis macrosperma* Hub. & Mor. have not been subjected to *in vivo* investigation so far. The aim of the present study was to investigate the wound healing and anti-inflammatory activities of three endemic *Ononis* species

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Table 1The collection sites and herbarium numbers of the *Ononis* species.

Plant name and authors	Collection site	Herbarium number
<i>O. sessilifolia</i> Bornm.	Niğde, Çamardı, Demirkazık, Narpızlı plateau, channel around, rocky slopes, alt.2073 m	AEF 23979
<i>O. basiadnata</i> Hub. & Mor.	İçel, Gülnar-Mut way, exit of Gülnar, fields, among maquis, alt.1140 m	AEF 23968
	İçel, Gülnar-Mut way, Çukurasma village, Anay quarter, fields, alt.900 m	AEF 25523
<i>O. macrosperma</i> Hub. & Mor.	Antalya, Elmalı, Çıglıkara, entrance of Sinekçibeli, rocky slopes, <i>Cedrus libani</i> forest, alt.1684 m	AEF 24698

alt.: altitude.

**Fig. 1.** Linear incision wound model.

by using incision and excision wound models and Whittle Method, which is based on inhibition of acetic acid-induced increase in capillary permeability.

2. Materials and methods

2.1. Plant material

Plant materials were collected from different localities in 2007 and 2008 in Turkey. Voucher specimens were authenticated by Prof. Dr. Mehmet Koyuncu and Ayşe Baldemir (Ankara University, Faculty of Pharmacy, Tandoğan, Ankara, Turkey), Prof. Dr. Hayri Duman and Prof. Dr. Zeki Aytaç (Gazi University, Faculty of Science, Etiler, Ankara, Turkey) and were deposited at the Herbarium of the Faculty of Pharmacy, Ankara University (AEF), Ankara, Turkey. Collection sites and herbarium numbers of the *Ononis* species used in the present study are listed in Table 1.

Table 2Effects of the aqueous extracts of *Ononis* species on linear incision wound model.

Material	Parts used	Statistical mean $\pm$ S.E.M.	Tensile strength (%)
Vehicle	–	15.39 $\pm$ 1.17	7.8
Negative Control	–	14.28 $\pm$ 0.78	–
<i>O. basiadnata</i>	Herba	16.12 $\pm$ 1.64	10.4
	Radix	16.99 $\pm$ 1.03	4.7
<i>O. sessilifolia</i>	Herba	17.79 $\pm$ 0.95	15.6
	Radix	16.65 $\pm$ 1.91	8.2
<i>O. macrosperma</i>	Herba	21.65 $\pm$ 0.66	40.7**
Madecassol®	–	22.96 $\pm$ 0.84	49.2***

S.E.M.: standart error of the mean percentage of tensile strength values; vehicle group was compared to negative control group; extracts were compared to vehicle group.

** $p < 0.01$.

*** $p < 0.001$.

**Fig. 2.** Circular excision wound model.

2.2. Preparation of plant extracts

In the present study, aqueous and ethanolic extracts of the aerial parts and roots of *O. basiadnata* and *O. sessilifolia* and the aerial parts of *O. macrosperma* were tested.

50 g of powdered aerial parts and roots were extracted with 500 ml of water for 5 h at 60 °C using magnetic stirrer (Velp Scientifica C15). Afterwards the plant extracts were filtered, frozen

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