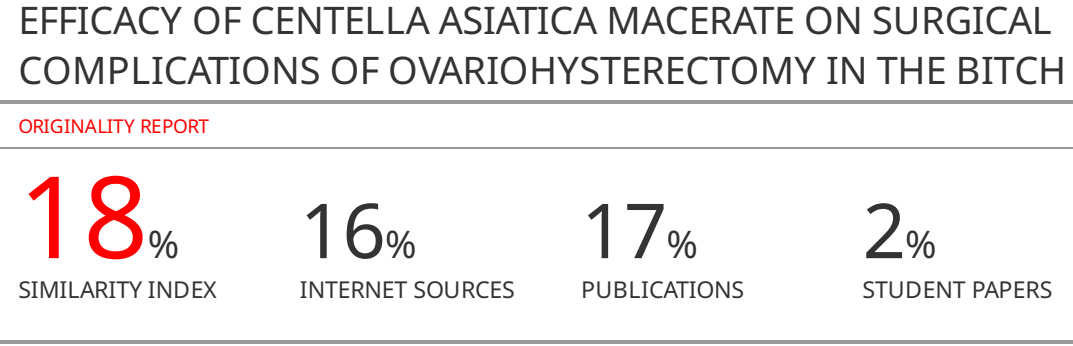
**Reviewer’s Comments**

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**EFFICACY OF *CENTELLA ASIATICA* MACERATE ON SURGICAL COMPLICATIONS OF OVARIOHYSTERECTOMY IN THE BITCH**

**ABSTRACT:**

**Background and objectives**: The management of post-operative complications such as severe inflammatory reactions, suture dehiscence and abdominal hernia in farm animals calls for a variety of practices, including the use of plant resources. The aim of this study is to explore practices for managing surgical complications in bitches and the healing properties of *Centella asiatica*.

**Methods**: We discussed with bitch owners regarding the practice of ovario-hysterectomy and its importance for the well-being of the animals and their owners. The harvested plant was then prepared and the resulting crushed material was macerated, followed by the addition of drinking water. The subjects were divided into two batches of 6 animals: the control batch (batch 1) and the extract batch (batch 2). Before applying the macerate, the wounds were cleaned with distilled water and then an absorbent paper towel was used to dry them.

**Results** : Application of *Centella asiatica* macerate to post-operative wounds in female dogs showed good clinical applicability, with anti-inflammatory and wound-healing accelerating activity. The medicinal efficacy of the plant is mainly attributed to the most prominent bioactive constituents.

**Conclusion** : The study argues that *Centella asiatica* could be a better alternative for surgical wound closure, helping breeders to minimize intervention costs.

**Keywords:** Postoperative complications, bitches, *Centella asiatica*, healing properties

**INTRODUCTION**

*[Centella asiatica](https://www.sciencedirect.com/topics/medicine-and-dentistry/centella-asiatica" \o "Learn more about Centella asiatica from ScienceDirect's AI-generated Topic Pages)* Linn Urban is a traditional Chinese medicine, a common edible plant that has been used in traditional medicine in Asia for thousands of years1 ([Diwan, 1991](https://www.sciencedirect.com/science/article/pii/S2667031322001828#bib0005)). It is a medicinal plant belonging to the Apiaceae family and major ingredient in nutraceutical products in Southeast Asian countries. The plant has been known to be rich in the flavonoid quercetin and no significant problems arose from either the topical application or the oral administration of its extract2-5 (Lee Y et al., 2020; Lokanathan, Y et al., 2016 ; Hashim, P et al., 2011 ; Lee, H.N et al.,2018). For its therapeutics properties, this herb is well-known for its wound healing, anti-inflammatory, antinociceptive, and antioxidative effects, as well as improving and slowing memory impairment in humans and animals6 ([Gohil et al., 2010](https://www.sciencedirect.com/science/article/pii/S2667031322001828#bib0009)). *Centella asiatica* is one of the oldest remedies for the treatment and healing of wounds. Its use, either alone or in combination with other plants, has produced very appreciable results for wound healing in a large number of patients. It is naturally distributed in Guinea, in humid and aerated environments.

The major constraints of livestock farming require their owners to carry out surgical procedures. Ovariectomy has become a standard surgical procedure, performed almost routinely in all veterinary practices. It is considered to be a well-controlled procedure. Despite this fact, complications can occur: strong inflammatory reactions, suture dehiscence, abdominal hernia. These complications may be related to the animal's behavior towards its injury, but they may also be the result of surgical mistakes or incorrect treatment techniques7 (Julie D et al., 2012). In this study, carried out at the Institute of Science and Veterinary Medicine in Dalaba, we investigated the therapeutic use of *Centella asiatica* macerate in the treatment and healing of surgical injuries caused by this type of surgery on dogs in the urban district of Dalaba.

**MATERIALS AND METHODS**

**A- MATERIAL**

1. **Geographical location and population**

Dalaba is one of the three (3) Prefectures belonging to the Administrative Region of Mamou. It is located between 45' and 11°35' north latitude and between 10°21' and 12°16' west longitude, at an altitude ranging from 600 to 1,425m. Its surface area is 5,750 km2 with a population of 133,677; a density of 23.25 inhabitants per km2 (RGPH3/2014).

It is bounded:

-To the east by the Mamou and Tougué Prefectures;

-To the west by the Prefecture of Pita;

-To the north by the Prefecture of Labé;

-To the south by the Prefecture of Kindia

## Survey of managers and analysis of archives :

This survey was carried out by contacting a number of local executives. These exchanges were devoted to the recognition and existence of *Centella asiatica* in the locality and its level of use by the actors; finally the analysis of the archives was carried out in order to obtain numerical data relating to the subject.

## Survey of pet owners :

We discussed with the bitch breeders about the practice of ovario-hysterectomy and its importance for the lives of the animals and their owners.

1. **Harvesting the *Centella asiatica* plant *:***

The harvest was carried out in the morning at the *Centella asiatica* site*.* The crop was harvested and placed in a plastic bag. The material was weighed in the preparation room using a Roberval balance.

1. **Preparation of the galenic form (macerate) of *Centella asiatica :***

The maceration was carried out immediately after harvesting, by disinfecting the preparation instruments, mondoning and disinfecting the leaves and stems with chlorinated water, then proceeding to rough division followed by grinding. The resulting grind was macerated in a plastic container, followed by the addition of drinking water and a 3-day incubation period at room temperature. Filtration was then carried out using a 2mm mesh sieve over a 0.5mm special funnel. The resulting product was stored at room temperature.

### Establishing the experimental nucleus

### Subjects were then divided into two batches of 6 animals: batch 1 served as control and batch 2 was treated with the extract.

### Practice of ovariohysterectomy

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The operation was carried out using the method described by Axel Schönfelder al. 20068.

1. **Application of the macerate to the surgical wound**

The macerate was applied at a dose of 10 drops, twice a day for 2 weeks.

Before applying the macerate, the wounds were cleaned with distilled water and then dried with absorbent paper.

**Statistical analysis**

**RESULTS**

#### Survey of managers and analysis of archives

A survey of managers revealed that Centella asiatican can be found in the Urban Commune of Dalaba, but has never been studied in the locality. Some actors reported that it has many therapeutic properties (pro-healing of wounds and burns, antiseptic and for animals).

#### Survey of traditional therapists

According to these traditional practitioners, the use of the plant's leaves and stems as an aqueous macerate or poultice on surgical wounds and burns is an excellent healing agent. They have also found it to be an effective remedy for gastritis and gynaecological infections.

#### Farmers' survey

In order to assess the use of *Centella asiatica* and the practice of ovario hysterectomy on bitches, we carried out surveys in the various localities where the breeders are located. The results show that, of the 10 breeders surveyed, (7) are well informed about the plant and its therapeutic properties, while (2) have no knowledge of it. Only one (1) breeder was aware of the practice of ovariohysterectomy.

#### Application of Centella asiatica macerate and speed of wound healing

The aqueous maceration extract is made and obtained to enable the extraction of water-soluble principles such as tannins and most of the flavonoids contained in *Centella asiatica*. The healing rate of wounds treated with the extract is shown in Figure 1.

### Figure 1: Healing speed of wounds treated with the extract

### DISCUSSION :

In this study, we evaluated the healing activity of *Centella asiatica* in bitches on which we performed ovariohysterectomy. Our work shows that ovariohysterectomy is a very widespread surgical procedure in veterinary medicine in the urban district of Dalaba. Nevertheless, it is sometimes accompanied by intra- and post-operative complications.

The major active constituents of *Centella asiatica* are [triterpene](https://www.sciencedirect.com/topics/medicine-and-dentistry/triterpene)[saponins](https://www.sciencedirect.com/topics/medicine-and-dentistry/saponin)mainly [asiaticoside](https://www.sciencedirect.com/topics/medicine-and-dentistry/asiaticoside), [asiatic acid](https://www.sciencedirect.com/topics/medicine-and-dentistry/asiatic-acid) (ASA), madecassoside, and [madecassic acid](https://www.sciencedirect.com/topics/medicine-and-dentistry/madecassic-acid)9-11 ([Hamid et al., 2016](https://www.sciencedirect.com/science/article/pii/S2667031322001828#bib0011); [Hashim et al., 2011](https://www.sciencedirect.com/science/article/pii/S2667031322001828#bib0012); [Sultan et al., 2014](https://www.sciencedirect.com/science/article/pii/S2667031322001828#bib0027)). Several studies have explored the anti-inflammatory and antinociceptive activity of the plant in rodent models12-14 (Xiao Y et al. 2023 ; [Huang SS et al.,2011](https://www.sciencedirect.com/science/article/pii/S2667031322001828#bib0020); [Rotpenpian et al., 2021](https://www.sciencedirect.com/science/article/pii/S2667031322001828#bib0021)). Evaluation of the effects of the plant in the present study revealed that the plant possesses healing activity. This was reflected not only in a reduction in the duration of the inflammatory phase of the wound but also, macroscopically, in the formation of thick crusts in the treated subjects resulting from the formation of clots. In practice, these tissues, formed of a stratified layer that restores the barrier function of the epithelium, protect the wound against attacks from external agents.

### *Centella asiatica* contains many phenolic constituents, including flavonoids, such as catechin, epicatechin, kaempferol, quercetin and related glycosides. It is also rich in chlorogenic acids, a diverse group of compounds formed by quinic acid esterified to cinnamic acid derivatives15 ([Ncube et al. 2016](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6857646/#R115)). Flavonoids esterified to hydroxycinnamic derivatives, such as castilliferol (kaempferol-3-p-coumarate) and castillicetin (quercetin-3-caffeate), have been isolated from the aqueous methanol extracts of *Centella asiatica16*([Subban et al. 2008](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6857646/#R151)). In view of its constituents, the anti-inflammatory activity of the extract observed by the reduction in the duration of inflammation in treated wounds could be due to the presence of flavonoids in the extract. The most prevalent pentacyclic triterpenoids, asiaticoside and madecassoside, as well as their corresponding madecassic acid and asiatic acid, and aglycones have all undergone substantial research and are now recognised as the main active ingredients of Centella asiatica17 (Agarwal, 1999). The presence of these constituents and others not yet mentioned in the study could also play an important role in this repair activity.Nevertheless, an in vivo study is also required to assess the efficacy of the macerate in other animal species.

**Limitations of the study**

### CONCLUSION :

The application of *Centella asiatica* macerate to post-operative wounds in bitches has shown good clinical applicability, with anti-inflammatory activity and accelerated healing. The medicinal efficacy of the plant is mainly attributed to the most prominent bioactive constituents. The study argues that *Centella asiatica* could be a better alternative for surgical wound closure.

### CONFLICT OF INTEREST :

Regarding this study, there is no conflict of interest.

**Acknowledgements**

### AUTHOR'S CONTRIBUTION :

All authors have worked equally in this study.

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