



Phytochemical Study of the Species *Ridolfia segetum* and *Zizyphus lotus*.

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Abstract:

This study focused on the valorization of two wild plant species growing naturally in the northwest of Algeria. The wild jujube (*Zizyphus lotus* L), a dicotyledonous plant from the Rhamnaceae family, is locally known as "Sedra." It is a shrub forming a bush that does not exceed 2.5 meters, with flexible branches. *Ridolfia segetum*, a dicotyledonous plant from the Apiaceae family, is locally called "Tebech" and is widely spread in North Africa, especially in Algeria.

Our experimental work focused on analyzing the primary and secondary metabolites of these species, including the extraction of essential oils from *Ridolfia segetum*, phytochemical screening, and spectrophotometric dosage methods for both plants. The phytochemical screening results revealed that both species are rich in secondary metabolites (saponins, tannins, flavonoids, etc.) compared to primary metabolites. Finally, spectrophotometric assays of sugars, proteins, and chlorophyll pigments highlighted the richness of the leaves in these compounds. The results are encouraging and pave the way for in-depth research into the therapeutic potential of these plants.

Introduction:

The knowledge of the medicinal properties of plants is a universal human heritage. The joy of searching, gathering, and identifying, classifying, and using plants is a shared experience [1].

Medicinal plants contain substances that can be used for therapeutic purposes and are precursors in the synthesis of useful drugs. Today, a majority of the world's population, especially in developing countries, relies exclusively on traditional herbal medicine [2].

In the context of preserving Algerian flora, this study focuses on two medicinal plants used in Mediterranean countries:

- The wild jujube (*Zizyphus lotus* L), locally called "Sedra" [3,4], is a thorny, zigzag-branched shrub, not exceeding 2.5 meters, with small leaves that bloom in June[5].
- Dill (*Ridolfia segetum*), known as "Tebech", is a herbaceous medicinal plant that grows in autumn and blooms in June. Its yellow flowers lack involucre, and its 2 mm long oblong fruits are brown and smooth [6].

Essential oils are aromatic, volatile liquids obtained by hydrodistillation, steam distillation, or other methods [7]. They are stored in plant secretory structures (glandular hairs, cavities, ducts, etc.) and play important roles in the food, cosmetic, and pharmaceutical industries [8,9].

Objectives :

- Phytochemical study of *Ridolfia segetum* and *Zizyphus lotus* L
- Extraction of essential oils from *Ridolfia segetum*

- Spectrophotometric quantification of sugars, proteins, and chlorophyll pigments in both species

Essential oils contain complex mixtures of terpenoids and aromatic compounds [10].. Recent research has focused on their antioxidant properties. Oxidative stress, linked to diseases like Alzheimer's [11], atherosclerosis, and cancer, can be mitigated by antioxidants such as vitamin C, alpha-tocopherol, and BHT [12, 13]. Essential oils from spices like cinnamon, nutmeg, clove, basil, coriander, oregano, and thyme are rich in powerful antioxidants (e.g., thymol and carvacrol) [14].

II. Materials and Methods

II.1. Plant Materials:

Collected from El Tarf (eastern Algeria). Only leaves of both species were used.

II.2. Phytochemical Screening Tests:

- **Alkaloids:** Powdered sample + 5% HCl → filtration + Mayer's reagent → yellowish-white precipitate
- **Saponins (Foam Test):** Powder + water → boil 5 min → foam indicates presence
- **Flavonoids:** Powder + 1% HCl → filtrate + NH_4OH → yellow color = flavonoids
- **Tannins:** Powder + 80% methanol → FeCl_3 test → blue/green color
- **Volatile Oils:** Powder + water → NaOH + HCl → white precipitate
- **Anthocyanins:** pH change (HCl then NH_4OH) → color shift
- **Leuco-anthocyanins:** Heated ethanol/HCl extract → cherry red color
- **Quinones:** Petroleum ether extract + NaOH → yellow-red or violet color

III. Chemical Parameters:

- **Water Content:**

$$\text{Moisture \%} = (\text{FreshWeight} - \text{DryWeight}) / \text{FreshWeight} \quad (\text{Fresh Weight} - \text{Dry Weight}) / \text{Fresh Weight} \quad (\text{FreshWeight} - \text{DryWeight}) / \text{FreshWeight} \times 100$$

- **Essential Oil Yield:**

$$R (\%) = (\text{Weight of oil} / \text{Weight of plant material}) \times 100$$

- **Ash Content and Organic Matter:**

$$\text{Organic Matter (\%)} = (M_1 - M_2) / P \quad (M_1 - M_2) / P \quad (M_1 - M_2) / P \times 100$$

$$\text{Ash (\%)} = 100 - \text{Organic Matter}$$

- **Chlorophyll Quantification (Arnon and McKinney):**

Extract with 80% acetone, measure OD at 663, 645, and 460 nm

$$\text{Chl a} = (0.0127 \times \text{OD}_{663}) - (0.00269 \times \text{OD}_{645})$$

$$\text{Chl b} = (0.0229 \times \text{OD}_{645}) - (0.00468 \times \text{OD}_{663})$$

$$\text{Total Chl} = \text{Chl a} + \text{Chl b}$$

- **Soluble Sugars (Anthrone Method):**

Extract with 80% ethanol, evaporate, react with anthrone → read at 585 nm

Results expressed as g/100g dry matter

- **Protein Content (Bradford Method):**

1g sample + water → 200 µL extract + Bradford reagent → OD at 595 nm
Results in g/100g dry product

IV. Results and Discussion

IV.1. Essential Oil Extraction

After 2 hours and 30 minutes of distillation, two distinct layers were observed based on their densities: essential oil and floral water.

Yield: The essential oil yield is calculated as:

$$R = \left(\frac{Ph}{Pv} \right) \times 100$$

R = yield (%)

Ph = weight of extracted oil (g)

Pv = weight of plant material (g)

For 80 g of *Ridolfia segetum*, the oil yield was 0.625% (single extraction). According to Adamou, the oil yield can reach 1.12%.

IV.2. Phytochemical Screening Results :

Metabolites	<i>Zizyphus lotus</i>	<i>Ridolfia segetum</i>
Alkaloids	–	+
Saponins	+++	+
Flavonoids	+++	++
Tannins	+	+
Volatile oils	–	+
Anthocyanins	+	+
Leuco-Anthocyanins	+	+
Quinones	+	+

(+++) abundantly present, (++) significantly present, (+) present, (–) absent

Observations :

- ✓ *Zizyphus lotus* has an abundance of saponins, followed by flavonoids, anthocyanins, leuco-anthocyanins, and quinones.
- ✓ *Ridolfia segetum* is especially rich in flavonoids, known for improving brain function and reducing the risk of cardiovascular diseases, strokes, and certain cancers.

IV.3. Moisture, Ash, and Organic Matter Content

For *Ridolfia segetum*:

Organic matter : 85.95 ± 1.75 %

Moisture : 42.44 ± 2.22 %

Ash : 14.04 ± 1.75 %

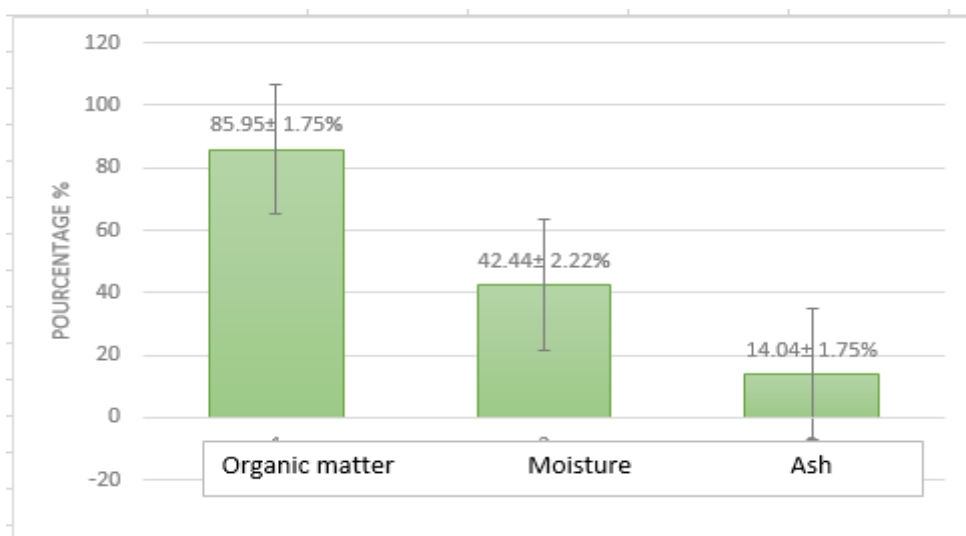


Fig 01: Moisture, Ash, and Organic Matter Content

Indicates high organic content and low mineral concentration. These

findings confirm its medicinal value.

IV.4. Chlorophyll Content – *Ridolfia segetum*

- Chlorophyll *a*: 0.63 ± 0.21 mg/g FM
- Chlorophyll *b*: 1.19 ± 0.55 mg/g FM
- Total chlorophyll: 1.82 ± 0.75 mg/g FM

Chlorophyll *b* helps absorb blue light, while chlorophyll *a* is the main pigment for photosynthesis. Shade-grown plants tend to produce more chlorophyll *b*.

IV.5. Sugar and Protein Content – *Ridolfia segetum*

- Total Sugars : 13.33 ± 0.08 mg/g
- Proteins : 1.28 ± 0.00 mg/g

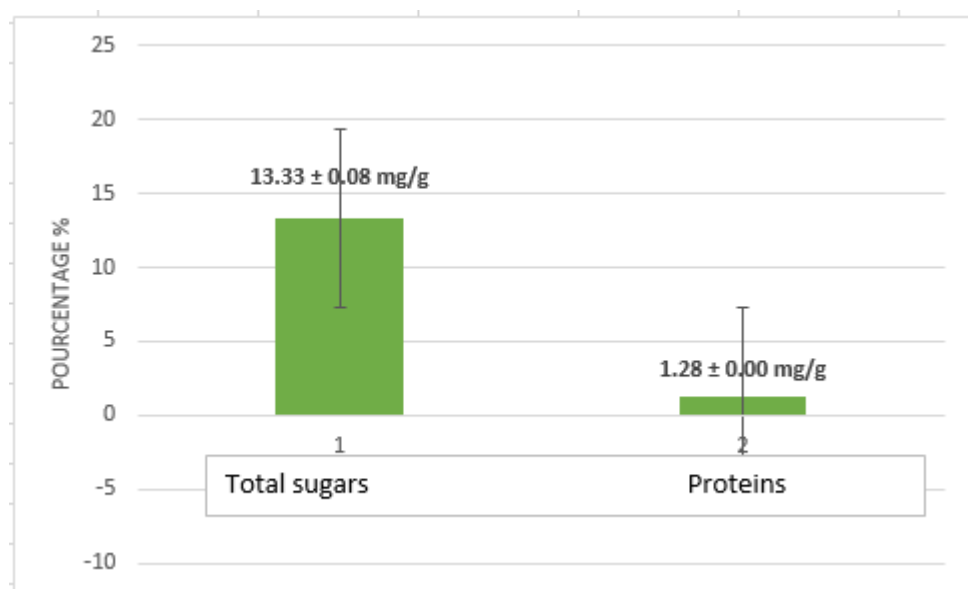


Fig 02: Sugar and Protein Content – *Ridolfia segetum*

Sugars dominate, confirming the plant's carbohydrate-rich nature.

IV.6. Moisture, Ash, and Organic Matter – *Zizyphus lotus*

- Ash: $12.59 \pm 2.83\%$
- Moisture: $41.19 \pm 3.59\%$
- Organic matter: $87.41 \pm 2.83\%$

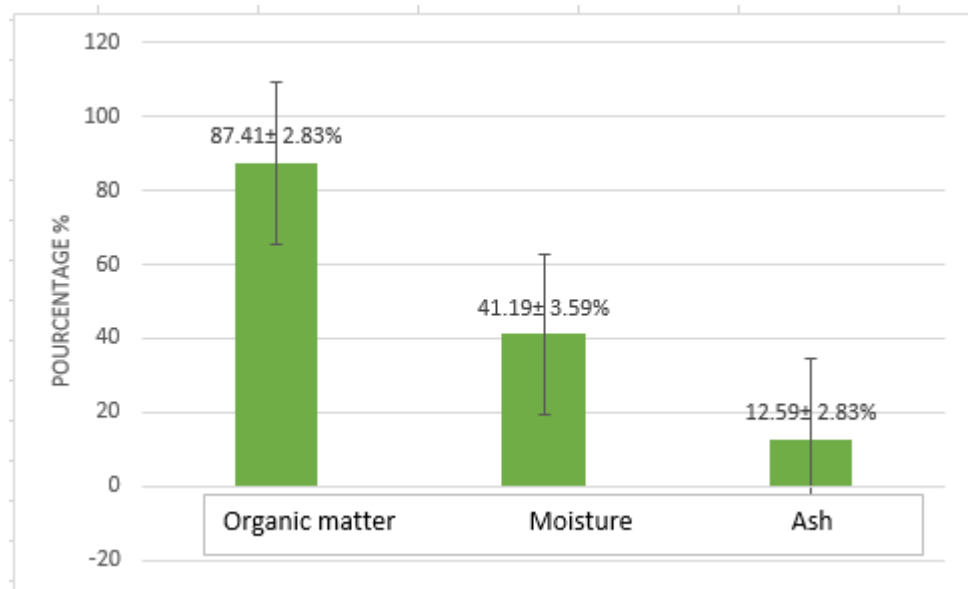


Fig 03: Moisture, Ash, and Organic Matter – *Zizyphus lotus*

The plant is high in organic compounds and moderately mineralized.

IV.7. Chlorophyll Content – *Zizyphus lotus*

- Chlorophyll *a*: 5.34 ± 0.91 mg/g FM
- Chlorophyll *b*: 9.99 ± 1.96 mg/g FM
- Total chlorophyll: 15.32 ± 2.87 mg/g FM

These photosynthetic pigments are noted for their preventive roles against cancer.

IV.8. Sugar and Protein Content – *Zizyphus lotus* (Fig 04)

- Total sugars: 10.06 ± 0.60 mg/g MS
- Proteins: 1.84 ± 0.11 mg/g MS



Fig. 04 : Sugar and Protein Content – *Zizyphus lotus*

Again, sugar levels are notably higher than protein content.

V. Conclusion

Humans have a direct relationship with nature, often utilizing plants in herbal medicine, cosmetics, and nutrition. *Ridolfia segetum* and *Zizyphus lotus* are both traditionally used medicinal plants. This study involved the extraction of essential oils from *Ridolfia segetum*, phytochemical screening to identify bioactive compounds (alkaloids, flavonoids, etc.), and spectrophotometric quantification of chlorophyll, sugars, and proteins. These preliminary findings confirm the phytochemical richness of these plants. The results support the need for further investigation into their therapeutic potential. These two species contain significant reservoirs of secondary metabolites with pharmacological properties. Future research should explore their antibacterial, antioxidant, anti-inflammatory, and antidiabetic activities, aiming to develop plant-based pharmaceuticals.

References

- [1]. Agyare, C., Boakye, Y. D., Bekoe, E. O., Hensel, A., Dapaah, S. O., & Appiah, T. (2016). African medicinal plants with wound healing properties. *Journal of ethnopharmacology*, 177, 85-100.
- [2]. Mamadou, A. J., Djima, T., Douma, S., Inoussa, M. M., Mahamane, A., & Saadou, M. (2020). Caractéristiques botaniques et phytochimique de *Chrozophora brocchiana* Vis.(Euphorbiaceae): Une plante médicinale utilisée dans le traitement des diarrhées au Niger. *International Journal of Innovation and Applied Studies*, 29(4), 926-935.
- [3]. Asaf, S., Ahmad, W., Al-Harrasi, A., & Khan, A. L. (2022). Uncovering the first complete plastome genomics, comparative analyses, and phylogenetic dispositions of endemic medicinal plant *Ziziphus hajarensis* (Rhamnaceae). *BMC genomics*, 23(1), 83.
- [4]. Elaloui, M., Essghaier, B., Ghazghazi, H., Chaouachi, R. D., Bahri, S., Hamdi, S., ... & Laamouri, A. (2022). LC-MS Analysis and biological activities of *Ziziphus spina-christi* L.(Christ's Thorn, Jujube) leaves from Tunisia Oasis. *Journal of Exploratory Research in Pharmacology*, 7(4), 215-222.
- [5]. Messaad, C. E., & Belhadj, H. (2025). Nbeg, a Neglected Functional Fruit from Sedra (*Ziziphus lotus* L.): A Mini Review. *Journal of Medicinal Food*.
- [6]. Carrubba, A., Labruzzo, A., Comparato, A., Muccilli, S., & Spina, A. (2020). Use of plant water extracts for weed control in durum wheat (*Triticum turgidum* L. Subsp. durum Desf.). *Agronomy*, 10(3), 364.
- [7]. Drinić, Z., Pljevljakušić, D., Živković, J., Bigović, D., & Šavikin, K. (2020). Microwave-assisted extraction of *O. vulgare* L. spp. *hirtum* essential oil: Comparison with conventional hydro-distillation. *Food and Bioproducts Processing*, 120, 158-165.
- [8]. Hazzoumi, Z., Moustakime, Y., & Joutei, K. A. (2017). Effect of arbuscular mycorrhizal fungi and water stress on ultrastructural change of glandular hairs and

essential oil compositions in *Ocimum gratissimum*. *Chemical and Biological Technologies in Agriculture*, 4, 1-13.

[9]. Dikme, T. G. (2023). Use of medicinal and aromatic plants in food. *Eu Clin Anal Med*, 11(1), 6-10.

[10]. Zhang, B., Hao, L., Zhang, J., Feng, J., Wang, C., & Zhang, J. (2024). Integration of transcriptome, volatile and non-volatile metabolite profile reveals characteristic aroma formation in *Toona sinensis*. *Food Chemistry*, 436, 137788.

[11]. Sadiki, F. Z., El Idrissi, M., Cioanca, O., Trifan, A., Hancianu, M., Hritcu, L., & Postu, P. A. (2019). *Tetraclinis articulata* essential oil mitigates cognitive deficits and brain oxidative stress in an Alzheimer's disease amyloidosis model. *Phytomedicine*, 56, 57-63.

[12]. Song, B. W., Lee, C. Y., Park, J. H., Kim, B., Lee, S., Lim, S., ... & Kim, I. K. (2022). Cold-pressed oil from *Citrus aurantifolia* inhibits the proliferation of vascular smooth muscle cells via regulation of PI3K/MAPK signaling pathways. *Experimental and Therapeutic Medicine*, 23(1), 21.

[13]. Dhaslin, Y. F., Issac, R., & Prabha, M. L. (2019). Antioxidant, antimicrobial, and health benefits of nutmeg. *Drug Invention Today*, 12(1).

[14]. Yanishlieva, N. V., Marinova, E., & Pokorný, J. (2006). Natural antioxidants from herbs and spices. *European Journal of lipid science and Technology*, 108(9), 776-793.