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Comparative Morphological study of *Lavandula angustifolia and Jasminum officinal* in Iraq

[1]Teba waleed Farhan , [2]Zina K. Albahadly
[1,2]Department of Biology, College of Science, Mustansiriyah University, Baghdad, Iraq.
1tebawaleed@uomustansiriyah.edu.iq https://orcid.org/0009-0004-4441-240X
2drzinakhalil@uomustansiriyah.edu.iq https://orcid.org/0000-0003-1508-385X

Abstract :

Background: *Lavandula angustifolia* (lavender) and *Jasminum officinale* (jasmine) are known for their medicinal and aromatic properties. This study aims to examine the morphological characteristics of both plants in Iraq, focusing on their root, stem, leaf, and flower structures. **Method**: Samples of Lavandula angustifolia were collected from Erbil, and *Jasminum officinale* from Baghdad in October 2024. Morphological traits were analyzed, focusing on structural differences that reflect ecological adaptations.**Results** :The study found significant differences in the plants' morphology. Jasminum officinale had a taproot system with secondary roots and climbing stems that averaged 60 cm in length. Its compound leaves were petiolate, while Lavandula angustifolia had a single taproot, with outwardly spreading roots. Its upright stems averaged 14 cm, and the leaves were simple, linear, and sessile. Flower structures differed as well: Lavandula angustifolia had purple flowers in spike-like clusters, while *Jasminum officinale* had white flowers in cymes.**Conclusion**:This morphological comparison highlights the distinct ecological adaptations of *Jasminum officinale* and *Lavandula angustifolia*. *Jasminum officinale* is adapted for climbing, maximizing light capture, while Lavandula angustifolia is suited to dry, sun-exposed habitats, reducing water loss. These findings provide insights into the cultivation and sustainable use of these aromatic and medicinal plants in Iraq.

Keyword: *Jasminum officinale*,*Lavandula angustifolia*, flowers, leaves,Comparative, root.

دراسة مقارنة للصفات الشكلية لنباتي الخزامى والياسمين في العراق

طيبة وليد فرحان ، زينة البهادلي
الجامعة المستنصرية / كلية العلوم - قسم علوم الحياة

مستخلص:

الخلفية: يُعرف نباتا Lavandula angustifolia (الخزامى) و Jasminum officinale (الياسمين) بخصائصهما الطبية والعطرية. تهدف هذه الدراسة إلى تحليل الخصائص الشكلية لكلا النباتين في العراق، مع التركيز على بنية الجذور والسيقان والأوراق والأزهار. المنهجية: تم جمع عينات Lavandula angustifolia من أربيل، و Jasminum officinale من بغداد في أكتوبر 2024. تم تحليل الصفات الشكلية، مع التركيز على الاختلافات البنيوية التي تعكس التكيفات البيئية.النتائج: كشفت الدراسة عن اختلافات واضحة في الشكل الخارجي للنباتين. كان لدى Jasminum officinale نظام جذر وتدي مع جذور ثانوية، وسيقان متسلقة بمتوسط طول 60 سم. أما أوراقه المركبة فكانت معنقة. بينما امتلك Lavandula angustifolia جذرًا وتديًا واحدًا مع جذور متفرعة بشكل أفقي، وسيقان منتصبة بمتوسط طول 14 سم، وكانت أوراقه بسيطة خطية ولاطئة. كذلك، تميزت بنيات الأزهار بين النباتين؛ حيث أظهرت Lavandula angustifolia زهورًا أرجوانية في تجمعات سنبلية، بينما امتلك Jasminum officinale زهورًا بيضاء في نورات هرمية. الخاتمة: توضح هذه المقارنة الشكلية التكيفات البيئية المتميزة لكلا النباتين. يتميز Jasminum officinale بقدرته على التسلق، مما يسمح له بزيادة امتصاص الضوء، في حين أن Lavandula angustifolia مناسب للبيئات الجافة المعرضة للشمس، مما يساعد على تقليل فقدان الماء. تسهم هذه النتائج في تعزيز فهم أساليب الزراعة المستدامة لكلا النباتين، مما يتيح الاستفادة المثلى منهما في التطبيقات الطبية والعطرية في العراق.

الكلمات المفتاحية: الياسمين ، الخزامى ، الأزهار، الأوراق، المقارنة، الجذور.

Introduction

The use of medicinal plants dates back thousands of years and may even be the foundation of modern medicine. Plant-derived compounds have long been, and continue to be, an essential source for drug development (1, 2). Among the many plants recognized for their distinctive biological properties are lavender (*Lavandula angustifolia*) and jasmine (*Jasminum officinale*), both of which belong to the order Lamiales (3, 4). *Lavandula angustifolia*, part of the Lamiaceae family, is native to regions such as the Cape, Canary Islands, and Madeira (5, 6). The leaves of *Lavandula angustifolia* used to extract essential oils, which have many sedative, antifungal, antibacterial, and antidepressant activity (7, 8).One the other hand, *Jasminum officinale*, is a member of the Oleaceae family sometimes known as white jasmine or common jasmine (9). This plant is known for its pinnate leaves, robust climb(4) ing habit, and unique, fragrant scent (10). Traditional Western Himalayan medicine uses *Jasminum officinale* to treat a variety of conditions, including hepatitis, diabetes, duodenitis, and urinary tract infections (11, 12). This study aims to investigate the morphological features of *Lavandula angustifolia* and *Jasminum officinale* in Iraq, with particular attention on stem qualities, flower production, and leaf structure. This research is important because it will help for better understand these plants and investigate sustainable methods of managing the region's aromatic plant resources.

Materials and methods

Plant Collection

The samples of Lavandula angustifolia were collected on October 13, 2024, from the Erbil area. On October 12, 2024, Jasminum officinale was removed from the Baghdad region. Digital photographs were taken By canon camera to Document the plnts in their habitats.The Identification of plants speciemens were done by using Dichotomous key based on different literature article and published Books.

Results and Discussions

The morphological analysis of the roots, as illustrated in **Table (1)**, reveals both similarities and differences.

Both species have light brown, cylindrical, and woody roots. Jasminum officinale possesses a taproot with small secondary roots, growing horizontally and shallowly. The root length averages 4.7 cm (range 7-8 cm), and the width is approximately 2 mm (range 2.5-5 mm). In contrast, *Lavandula angustifolia* also has a taproot but lacks secondary roots, and its root growth spreads outward from the plant base. The root length averages 3.5 cm (range 2.5-5 cm), with a width of 2 mm (range 1-4 mm).The roots of *Jasminum officinale* may grow horizontally and shallowly because to its special taproot system, which is augmented by many tiny lateral roots. This root system efficient absorption of moisture and nutrients from the surface. , on the other hand, *Lavandula angustifolia* has a single, dominating taproot that radiates outward from the base of the plant and has a very few lateral branches. This root system may be improves stability and increases resistance to drought condition (13). The variations in length and width of root can be attributed from the unique genetic characteristics of the plants or their environmental adaptations (14, 15).

The comparative analysis of the stem traits between *Jasminum officinale* and *Lavandula angustifolia* **Table (2)**, reveals distinct differences in their growth patterns. The green aerial stems of both plants are present, but *Jasminum officinale* grows in a climbing fashion. Its stems are usually 60 cm long (ranging from 45 to 75 cm) and 3.3 mm in diameter (varying from 3.1 mm to 5.1 mm).The stem surface is smooth, and the presence of tendrils aids in vertical growth, a characteristic feature of climbing plants that depend on surrounding structures for support.In contrast, Lavandula angustifolia follows an upright growth form. Its stems are much shorter, averaging 14 cm (ranging between 12 cm and 18 cm) with a diameter of 0.2 mm (ranging from 0.1 mm to 0.5 mm). Both species exhibit caulescent growth, meaning their stems grow above the ground. *Jasminum officinale* has a green aerial, smooth stem that shoots upward with the aid of tendrils. In contrast *Lavandula angustifolia* has an erect, short, rough-textured stem that shows its hapit of self-supporting growth. Unlike the Jasminum

officinale, Lavandula shows to prefer stable conditions when tendrils are absent (16). The climbing species need external support, but open, dry conditions are ideal for erect species. These variations reflect how the shape of the stem supports the ecological needs of the plants (17).

The comparative analysis characteristics of leaf between *Jasminum officinale* and *Lavandula angustifolia* **Table (3)**, revealed structural and functional diversity. Jasminum officinale exhibited compound, green leaves with lanceolate-shaped leaflets, measuring an average of 4.1 cm in length and 1.9 mm in width. The leaves were petiolate, estipulate, with an entire margin, ovate to elliptical blade, acuminate apex, and cordate base. Conversely, *Lavandula angustifolia* had simple, white-green leaves of linear lanceolate shape, averaging 7 cm in length and 5 mm in width. The leaves were sessile or with a very short petiole, estipulate, with an entire margin, acute apex, and attenuate base. These bases have a cordate form, petiolate, estipulate, ovate blades, and smooth leaf edges these trait's enhance the plant's ability to absorb light, be elastic, and grow vertically (18). In contrast, *Lavandula angustifolia's* has a very short petiole and is sessile, these leaves have a smooth margins, sharp apex, and a shorten basis. These traits are usually found in plants that grow in dry or sunny conditions due to low water loss (19).The variation in leaf structure between the two categories show how each plant adapts to its environment (20).

In **Table 4**, the flowers of L. angustifolia are predominantly purple with a spike-type inflorescence, while J. officinale displays white flowers arranged in cymes or subumbellate forms. Sepal structure is also different; Lavandula possessed ovoid tubular sepals, in contrast to the cupular sepals of Jasminum. Regarding petal morphology, L. angustifolia showed a corolla with 13 blue veined lobes and a densely tomentose outer surface, whereas J. officinale exhibited a smooth, white corolla forming a tubular shape. The number and structure of stamens also varied: Lavandula had four stamens (two fertile and two sterile), while Jasminum had only two slender stamens with attached anthers. The pistil of *L. angustifolia* consisted

of two fused carpels forming a single pistil, compared to J. officinale, where the pistil is also made up of two fused carpels but distinctly organized with a style and stigma. Both plants possessed superior ovaries, yet Lavandula showed a four-lobed ovary compared to the bilocular ovary of Jasminum. In J. officinale, the style served as a connecting stalk between the ovary and stigma, but in L. angustifolia, the style formed a slender stalk that erupted straight from the ovary. Stigmatic differences were also apparent: Lavandula exhibited a bifid, sticky-surfaced stigma, while Jasminum had a single sticky tip. Pedicel structure further distinguished the two, with Lavandula showing a main flower stalk, as opposed to the individual flower stalk (pedicel) of Jasminum. Finally, although Lavandula had little, leaf-like bracts at the base of the flower, Jasminum had bigger, leaf-like structures. The spike-like clusters of purple flowers of Lavandula angustifolia are ideal for insect pollination (21). Nonetheless, Jasminum officinale attracts insects to its white blossoms in cymose clusters with its strong aroma, making it ideal for pollination at night or in low light (22). These adaptations are further highlighted by the variations in sepal and petal structure. Lavender's tomentose petals, in contrast to Jasmine's smoother petals, potentially help retain water or safeguard against herbivorous animals (23). In addition, *Lavandula* has four stamens (two fertile and two sterile), reflecting a more convoluted floral structure, whereas Jasminum has a simpler two-stamen system suited for efficient pollen dispersal (24). The two species' bicarpellary and fused pistils demonstrate a shared angiosperm characteristic, although their ovary shape demonstrates divergence: L. angustifolia has a superior, four-lobed ovary, which may be relevant to its quadrilocular fruit development, while J. officinale preserves a bilocular ovary compatible with the formation of its berry-like fruits (25, 26). Lavandula's bifid and sticky stigmatic shape facilitates pollen collecting and specificity, whereas Jasminum's sole sticky stigma favors direct adhesion and fertilization. Ecological specialization is further demonstrated by the differences between bract and pedicel. The central floral stalk of lavandula

aids in elevating flowers above foliage for pollinator visibility, while the individual flower pedicels of jasmine allow for elasticity and nodding bloom orientation, possible protecting reproductive systems from environmental stress (27, 28).Lastly, the small bracts of Lavandula are likely vestigial or protective, whereas the broader bracts in Jasminum may contribute to bud shielding and microclimate regulation.

Concluion

This study compare of the morphology of *Lavandula angustifolia* (lavender) and *Jasminum officinale* (jasmine) in Iraq. *Jasminum officinale* has a climbing growth habit, with a taproot system and compound lanceolate leaves, adapted for maximizing light capture. In contrast, *Lavandula angustifolia* has an upright stem, simple linear leaves, and a taproot system suited for drought resistance in dry, sun-exposed environments. The flowers of *Lavandula angustifolia* are purple and spike-like, while *Jasminum officinale* has white, cymose flowers, each adapted to different pollination strategies. The morphological differences reflect the ecological adaptations of each plant, with implications for their cultivation and sustainable use in Iraq (highlighting their medicinal and aromatic value).

Table (1) Explain Morphology characteristics of plant root

Morphology characteristics	*officinale Jasminum*	*Lavandula angustifolia*
Type of root	**Primary root –tap root with small secondary root**	**Primary root –tap root**
Colour of root	**Light Brown**	**Light Brown**
Shape of root	**cylindrical**	**cylindrical**
Texture of root	**woody**	**woody**
Growth habit of root	Horizontal and Shallow Growth	**Spread out ward form the plant base**
Length of root	**cm 4.7 (7-8)**	**cm 3.5 (5-2.5)**
Width of root	**2mm (5-2.5)**	**2mm (4-1)**

Table (2): Morphology characteristic of plant stem

Morphology characteristics	*Jasminum officinale*	*Lavandula angustifolia*
Type of stem	**Aerial stem -climbers**	**Aerial stem-Erect stem**
Colour of stem	**green**	**green**
Growth habit of stem	**Growing up ward by tendrils**	**Pointing up wards**
Length stem	**cm 60(75-45)**	**14cm(18-12)**
Width stem	**mm 3.3(5.1)**	**0.2mm(0.5-0.1)**
Texture of stem	**smooth**	**rought**
Modificion of stem	**Tendriller**	**no**
Habit of stem	**caulescent**	**caulescent**

Table (3) characteristic of plant leaf

Morphology characteristics	*Jasminum officinale*	*Lavandula angustifolia*
Type of leaves	**- Compound leaves**	**Simple leaf**
Shape of leaves	**lanceolate**	**linear**
Colour of leaves	**green**	**White green**
Length leaves	**4.1cm (5.5-3.1**	**7cm (9-3)**
Width leaves	**1.9mm (5_4.1)**	**5mm(8-2)**
venation	**Reticulate**	**Reticulate**
Blade	**Ovate to elliptical leaflets**	**Linear lanceolate shape**
petiole	**Petiolate leaf**	**Sessile or very short petiolate**
stipules	**estipulate**	**estipulate**
margin	**Entire**	**Entire**
apex	**acuminate**	**acute**
base	**cordate**	**attenuate**

Table (4) characteristic of plant flower

Morphology characteristics	*Jasminum officinale*	*Lavandula angustifolia*
The color	**white**	**purple**
The type of inflorescence	**Cymes umbellate Or subumbellate**	**Spike**
seplas	**cupular**	**Ovoid tubular**
Petals	**Corolla white saverforms tube**	**Corolla blue 13 veined densely tomentose outside**
stamens	**stamens flower slender fila- 2 ments with anthers**	**stamens (2 fertile, 2 sterile ٤**
Pistil	**One pistil composed of two fused carpels ovary -style and stigma**	**Consist of 2 fused carples .forming single pistil**
ovary	**Superior, bilocular**	**Superior, four-lobed**
Style	**Slender stalk connecting ovary to stigma**	**Thin stalk the emerges form .ovary**
stigma	**the top of the style Sticky tip at**	**Bifid split in to two parts sticky surface**
pedical	**The stalk of individual flower**	**Main flower stalk**
bracts	**Leaf like structures at the base of the flower**	**Small- leaf like structure**

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