



Hordeum distichon L. (Gramineae) in Iraq. As a Review

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مراجعة (Gramineae) *Hordeum distichon* L. في العراق ك مقال

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ABSTRACT

Background:

Hordeum distichon L. is the most important cereal crop grown in Iraq and is commonly cultivated in temperate climate across the world that is often known as common barley or two-rowed barley is a cultigen of barley belonging to the Poaceae family and the Triticeae tribe.

Results:

The present review summarized collected information that is spread in different scientific articles about *Hordeum distichon's* morphology, ethnomedicinal uses, phytochemistry, and pharmacology. It was also gathered scientific evidence supporting ethnobotanical claims and identified holes that must be filled by future study

Conclusion:

These data will be helpful to provide future directions for the agricultural and medicinal use of *Hordeum distichon* plant which no need to remain the most extensively used herbal plant, according to traditional applications and scientific examination.

Key words:

Hordeum distichon, Two-rowed, Gramineae Balary and Herbal plant.

الخلاصة**مقدمة:**

يعد النوع *Hordeum distichon* L. أهم محصول حبوب يُزرع في العراق ويُزرع بشكل شائع في جميع أنحاء العالم ذات المناخ المعتدل ويُعرف غالبًا باسم الشعير الشائع أو الشعير ذو الصفيين وهو مستنبت من الشعير ينتمي إلى العائلة Poaceae، والعشيرة Triticeae.

النتائج:

لخصت المراجعة الحالية المعلومات التي تم جمعها والتي تم نشرها في مقالات علمية مختلفة حول الصفات المظهرية للنوع *Hordeum distichon* والاستخدامات العرقية والطبية والكيمياء النباتية وعلم الأدوية. كما تم جمع الأدلة العلمية الداعمة للنسل النباتي وتحديد الثغرات التي يجب سدها من خلال الدراسة المستقبلية

الاستنتاجات:

هذه البيانات ستكون مفيدة في توفير الاتجاهات المستقبلية للاستخدام الزراعي والطبي لنبات *Hordeum distichon* الذي لا يزال أكثر النباتات العشبية استخدامًا، وفقًا للتطبيقات التقليدية والفحص العلمي

الكلمات المفتاحية:

Hordeum distichon، ثنائي الصف، الشعير، النجيليات ونباتات عشبية.

Introduction

Hordeum distichon L. commonly known as barley belongs to genus *Hordeum* from the Gramineae family which is the second-largest family in the monocotyledons after family Orchidaceae [1] belongs to the Triticeae tribe of grasses Table (1), An annual grass species (Fig.1), It is distinguished by their inflorescence, which is a spike rather than the panicle seen in most other grasses. [2] is the staple food and subsistence crop in Iraq and other countries [3]. It is the world's fifth most grown crop. [4] is an important cereal crop of the world. [5]. Some fungal species, particularly the roots, can cause infection, including one or two pathogenic fungi (*Cochliobolus sativus* and *Fusarium culmorum*) [6].

Table 1. Botanical Classification by [7 and 8]

Kingdom	Plantae
Subkingdom	Phanerogames
Super division	Angiosperms
Division	Magnoliopsida
Subdivision	Spermatophytina
Class	Monocotyledons
Order	Poales
Family	Poaceae
Subfamily	Hordoideae
Tribe	Triticeae
Subtribe	Hordeinae
Genus	<i>Hordeum</i>
Species	<i>distichon</i>



Figure (1) Scheme and sample of species *H. distichon* diagnosed by Tropicos.org. Missouri Botanical Garden, by [9].

Synonyms and Common Name

Barley, TWO-ROW [10], Locally, ABU SIKKATAIN, (SHAIR) ABU SUWAIF, (“2-rowed”) SHAIR ASWAD, (“black”) in Arabic, while in Kurd is JU RESH (“black barley”). [11]

Distribution

H. distichon is a paramount cereal crop of the world. It is essential to growing in a region where there are fewer irrigation facilities and where soils are alkaline [12]. It is cultivated in a variety of ecologies at altitudes ranging from 1800 to 3400 meters from sea in various seasons and production techniques. The total area covered by the crop is around one million hectares, with an annual yield of 1.3 million tons. [13]. Distribution mainly in temperate and dry areas of the world. In Europe-Turkey, [14], Ethiopia [13], India (Punjab) [12] in Iran [15] in Iraq (In addition to 7 other species), Syria, and Palestine Arabia, to C. Asia, N. and S. Africa region [11].

Morphological Description

Plants of barley contained six to seven seminal roots and two to four adventitious roots. [15], rhizomatous [16]. Stems 50-90 cm, solitary or fasciculate flowering stems usually cylindrical. Leaves flat 5-12cm broad glabrous or scabrid on the more ap surface [17], arranged on the stem of the plant alternately in two opposite rows [18], consisting of the sheath, ligule, as that the sheath surrounding stem, Leaf-blades linear dense, distichous lateral. Spikelets are sterile up to 12 cm long, with two rows of, fertile spikelets.

H. distichon is very similar to *H. vulgare* only disagree in the structure of spike, in the species, it is the central spikelet of the sessile, which is hermaphrodite, the two lateral being neuter or masculine, awnless: awn of the fertile. The fruiting spike is therefore 2-rowed, [10]. Glumes 32-4mm similar, [17]. self-pollinating [19]. Caryopses are 8-8.5 mm long, elliptic, with a small compression dorsiventral and a rounded dorsal face. There are no lateral ridges. apical hairs sparse and short or missing; sulcus shallow, narrow, widened distally to medium; corona 0.5-1 mm long; sulcus shallow, narrow, widened distally to medium; embryo $\frac{1}{3}$ as long as caryopsis (Fig 2) [20].

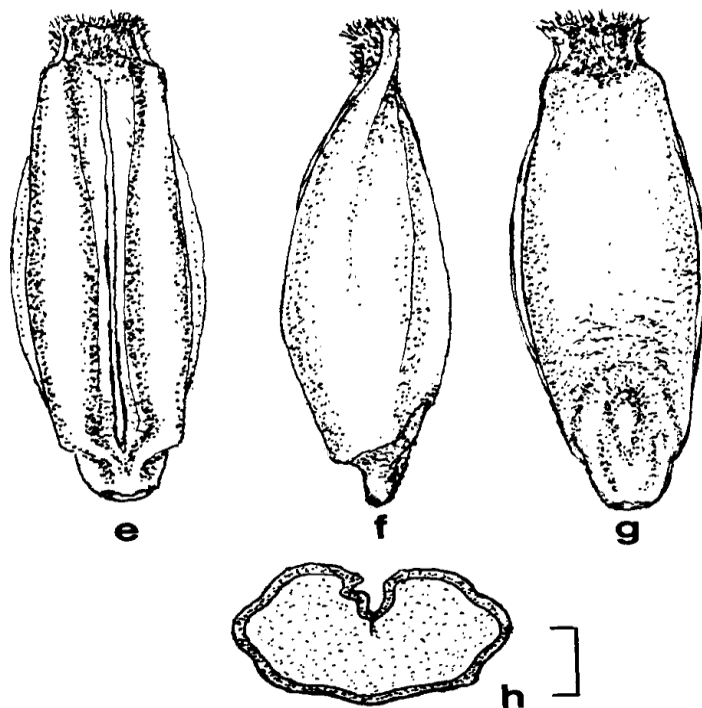


Figure (2) Caryopsis of *Hordeum distichon* L. [20].

Anatomical Study

Photosynthesis is C₃, it is diploids ($2n-2x=14$) and studies have shown that it has a large size and is a genetic complex containing 10.5.3. Double base (INAR), [18], have a single mid-vein median vascular bundle with the abaxial strand on their upper surfaces, furrows and ribs feature deep furrows between the veins. Silica Bodies have costally arranged silica bodies on their leaf surfaces, only the adaxial surface of leaves sparsely covered with macro hair, (Fig 3) [13].

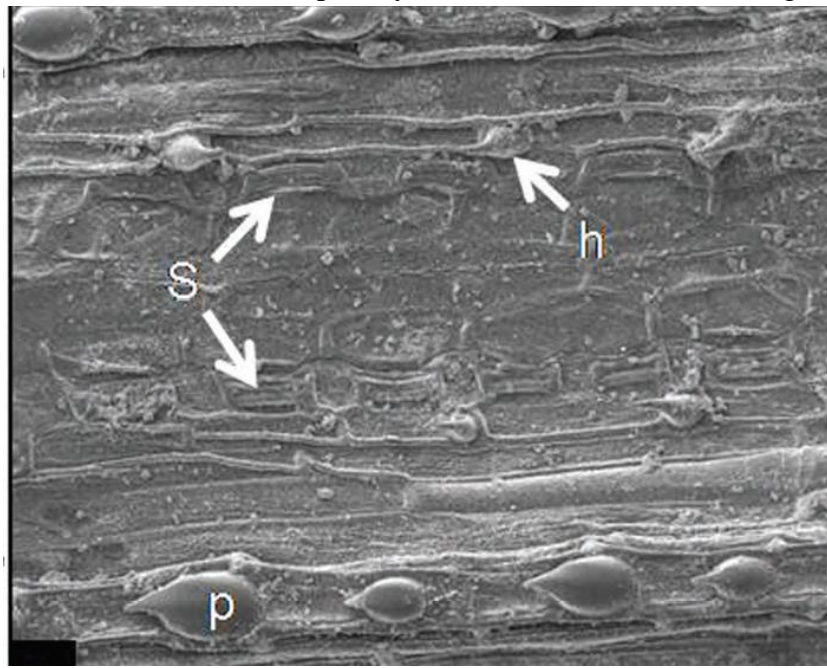


Figure (3). SEM observations of leaf surfaces - Adaxial surface of *H. distichon* L.(h: hook, p: prickle and S: stoma) [13].

Leaf blades are corrugated (Fig 4), but the furrows on the top surface are not. The midrib is convex, with a pointed crown of sclerenchyma cells on the leaf edges. It has an uneven form and arrangement of epidermal cells on both sides. Stomata with parallel sub-cells that may occur on two sides, one parallel and the other a low triangular side. [21].

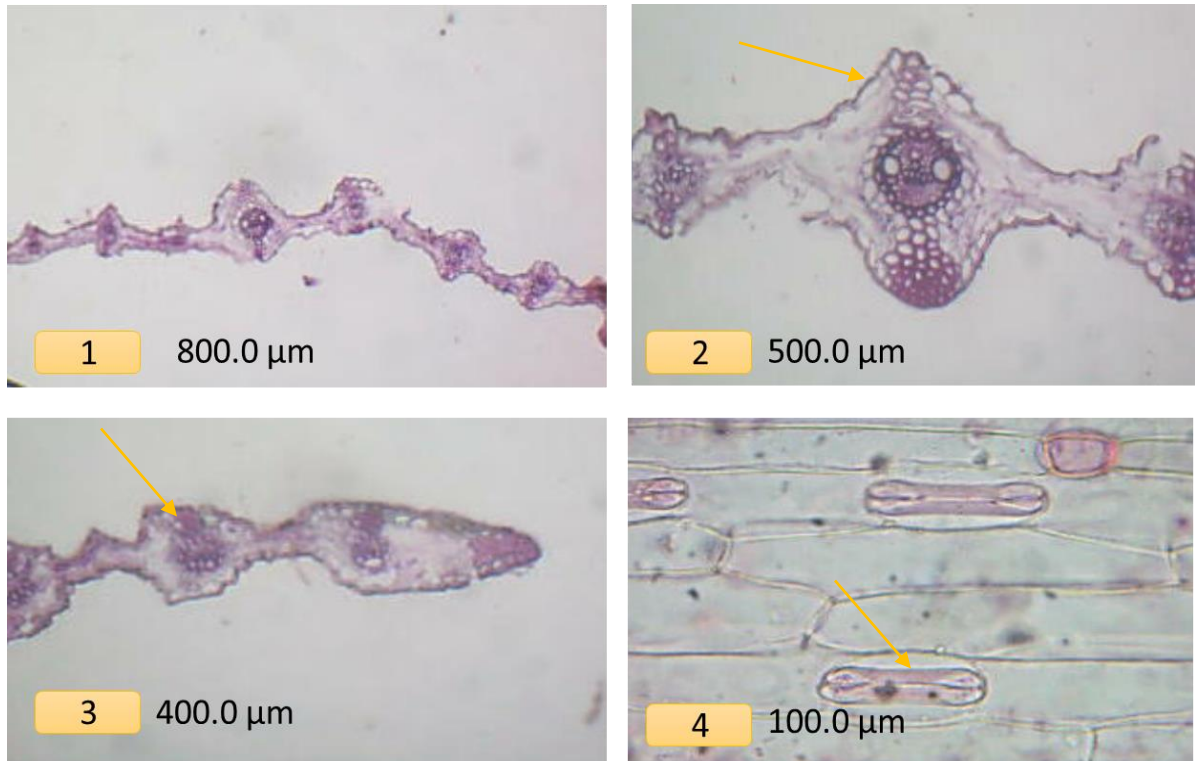


Figure (4): 1: General appearance of leaf transverse section 2: Keel structure and midrib 3: Variation in the shape of marginal sclerenchyma cap 4: stomata in Adaxial epidermis. [21].

Pollen grain surface sculpture, in which the pore circle is closed by an operculum and ringed by an annulus. The resistant exine and the nonresistant intine make up the grain wall. According to [22 and 23], exine structure exists. It has been incised. The distribution of the scabrae over the tectum is more or less regular, according to the sculpture type from the carbon reproductions. The tectum surface between the scabrae is somewhat subsided rather than smooth.

[24] mentioned that the pollen grains of species belonging to the genus *Horedum* are Spheroidal-shaped, medium-sized, single-pore, smooth-walled (pilate), and perhaps the reason for this is because they studied them under a light microscope. These results are in agreement with the results obtained by [25] when he studied pollen grains for some species of the Poaceae family using a scanning electron microscope. (Fig 5)

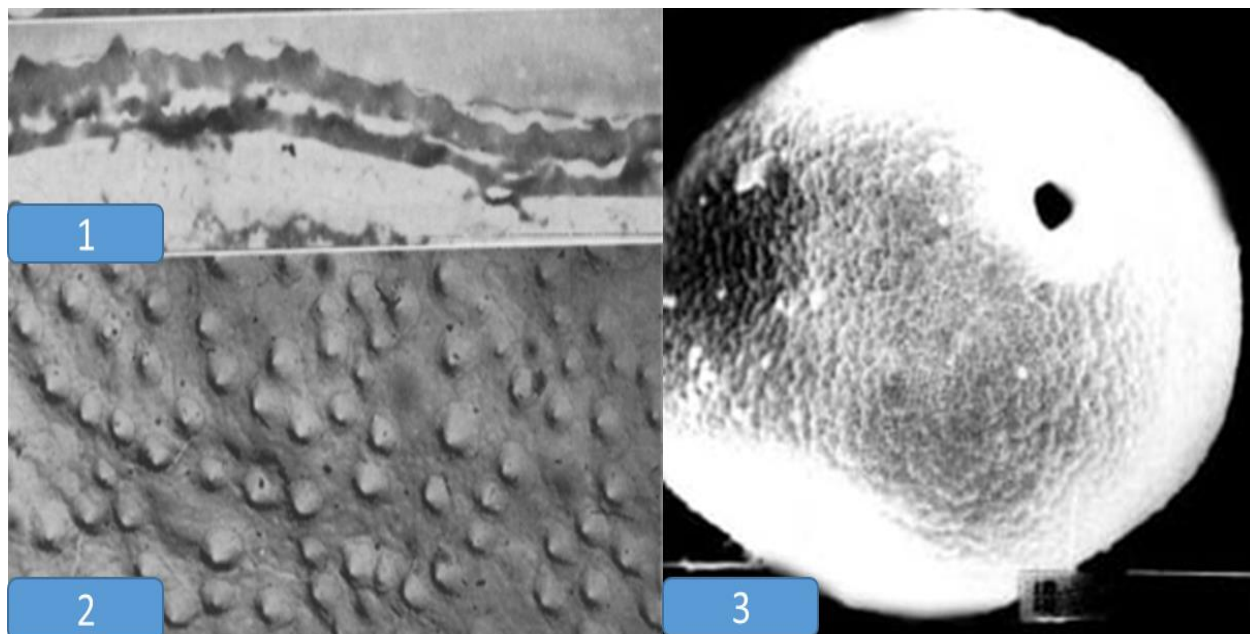


Figure (5). 1- exine, 2- description, (3) Pollen grain under a scanning electron microscope: Scale bar = 10 μ m. [23]

Traditional Uses

Barley has been grown for human food nutrition like the bread, a quantity of barley flour (5%) is mixed with wheat flour malting and it is used in limited quantities in the beer industry and whisky, and feed and fodder for livestock and also to process malt from the grains [5] also used in baked products [26] as for animals feed where sufficient carbohydrate sources are not available, like corn in many ecological conditions. the Gladiators used to like eating because it gives strength and stamina and also used mucilage by Greeks derived from the cereal to treat GI inflammations [27].

Chemical Composition

Phytochemical analysis of grains for *H.distichon* are studied by using the GC-MS technique It showed the higher presence of two chemical compounds as mentioned [28].

- 1- Diethyl phthalate (15.51%)
- 2- n-Hexadecanoic acid (14.73%).

In addition to 81 chemical compounds, which varied between phenols such as 2-Furanone, 3,4-dihydroxytetrahydro, Phenol, 2-methoxy-4-(2-propenyl)-, acetate, 1-Octadecanesulphonyl chloride and alkaloids such as N-(3-Oxobutyl)-2- methylazetidene, 9-Octadecenamide, (z)- and 1,2-propanediamine, N, N'-dimethyl-3-phenyl-, (S)- also contained many esters such as oxalic acid, hexadecyl propyl ester, sulfurous acid, octadecyl 2-propyl ester, Dichloroacetic acid, heptadecyl ester, in addition to sugars such as the compound Diethoxymethyl acetate and contained the steroid compound .gamma.-Sitosterol and contained Alkanes such as Hexadecane,



3-methyl-, Tetradecane, Tritetracontane and Undecanes-9, and several fatty acids were recorded, including several fatty acids. Hexadecenoic acid and glycerin. As for Carbonic acid, the compound Carbonic acid, monoamide, N-(2-ethylphenyl)-, propyl ester was found. Wax was also found in the analysis, which was represented by the compound Cis-Vaccenic acid.

According to the findings, volatile organic compounds (VOCs) produced by crushed root tissues and released by unexcavated root systems were analyzed using dynamic sampling devices coupled to a gas chromatography-mass spectrometry methodology (synchronous SCAN/SIM) by Dynamic Headspace Sampling (DHS)-GC-MS. Hexanal, (E)-hex-2-enal, (E)-non-2-enal, and (E, Z)-nona-2,6-dienal were the primary volatile aldehydes formed by crushed barley roots. [29].

Pharmacological Properties

Plants produce a large number of secondary metabolites, according to [30], which are a major source of secondary metabolites in the pharmaceutical sector and Phytochemical surveys. As for *Hordeum distichon* revealed that it contained flavonoids, esters, glycosides, steroids, terpenes, alkaloids, terpenoids, essential oils, alkanes, carbohydrates, protein, separated amino acids and many other secondary metabolites. It exerted anticancer, antioxidant, anti-inflammatory, antibacterial, antipyretic, analgesic, hypolipidemic, weight control, Nematicide, Hypochlesterolemic, and many other effects [31, 32 and 33] mentioned that the species under study contains Phenolics and Flavonoids, which showed the best antimicrobial activity against *S. aureus* against test microorganisms

Planting, Irrigation And Fertilization Time

Barley can be planted from early October until mid-November for maximum grain yield and quality. Early planting leads to spoilage of pollen during flowering due to lower temperatures at flowering time. In late cultivation, the grains are incomplete due to the high temperature during the ripening period. Barley needs 5-4 waterings during the season distributed on the basis of one watering during the germination period, one or two waterings during the period of branches and vegetative elongation, and two waterings during the flowering and ripening periods [34]

Optimal use of fertilizers is one of the important factors responsible for successfully growing barley, whereas one research [35] found a substantial rise in plant height and dry matter accumulation. leaf area index, and spike length, and grain weight when appropriate nitrogen and potassium were used in N2 treatment (100% recommended N). in addition to a study [11] that showed that the use of NPK fertilizer increased spike length, number of grains, and fresh and dry weight.



Conflict of interests.

There are non-conflicts of interest.

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