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Aegilops columnaris Zhukovsky (Poaceae) : A new record for Libya

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Abstract

Based on previous vegetation survey made in the Asliyt area southeast the city of Al-Bayda in Jabal Al-Akhdar, Libya in 2017, a new species of grass *Aegilops columnaris* Zhukovsky belonging to the Poaceae family is recorded for the first. The morphological characteristics of this species were precisely studied. Current specie was compared with the six species in the Libyan flora by using the DATA*tab* Hierarchical cluster software analysis. *Aegilops neglecta* found to be the closest species to *Aegilops columnaris* and was add it to the species identification key in the Flora of Libya.

Keywords: *Aegilops columnaris*; New record; Poaceae; Asliyt-Libya

1. Introduction

Th herb family, sometimes known as the grass family, represents of the biggest and most diverse plant families on earth. This family includes a wide range of plants ranging from simple grasses to cereals that are essential to food around the world. The Poaceae family is of great economic importance due to the genera and species it includes that are used by human; e.g Wheat, Sugarcane, Rice, Corn, and barley, this is in addition to the species that represent the basic components in gardens and football fields Like grass [1]. In addition to that, approximately 750-770 genera that contains about 11,000 species of the family of Poaceae. Within the flowering plants, Poaceae was reported that it's the fifth biggest and covers around forty percent of the land area Al-sghair, *et.al*. [2]; represented by 93 genera and 228 species in Libya [3]. Respecting the scientific name, the genus called *Aegilops* comes from the Greek egelos, which can mean goat grass [4]. It was reported that the cultivated wheat was classified in the second genetic group, which include *Aegilops* L. genus that contain around 20 species. In general, those species were found in alongside the mediterranean, the southwestern and at the central of Asia, [5]. About 6 species of those were recorded in Libya [3]. Some of important features such as resistance to different infections and environment conditions were stated in all of Wild *Aegilops* species that associated to (*Triticum* spp.) cultured wheat [4]. The most important characteristics of *Aegilops*, as described in the Flora of Libya; Annuals, culm usually kneed at the base. Leaves flat, narrow. Inflorescence a spike of spikelets. Spikelets solitary at each node of the axis, cylindrical, hermaphrodite, 2-8 florets, the upper male or neuter, the others hermaphrodite; glumes thick, with rounded back, truncate, awnedor awnless, lemma toothed or awned, palea 2-keeled; Stamens3; lodicules 2, fimbriateon the upper margin; Caryopsis compressed, with a hairy apical appendage, hilum linear [3].

The aim of current study is to describe the *Aegilops columnaris* morphologically, add it to the identification key of the Flora of Libya species in and finally compare it with the closest species in the Flora of Libya.

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2. Materials and methods

2.1. Location Description

Current research was accompanied in the Asliyt region, situated in the coastal area of Libya along the Mediterranean Sea, between latitude 32°44′9.762" N and longitude 21°47′14.115" E southeast of the city of Al-Bayda (Fig. 1), at an elevation between (600 - 660m), [6].

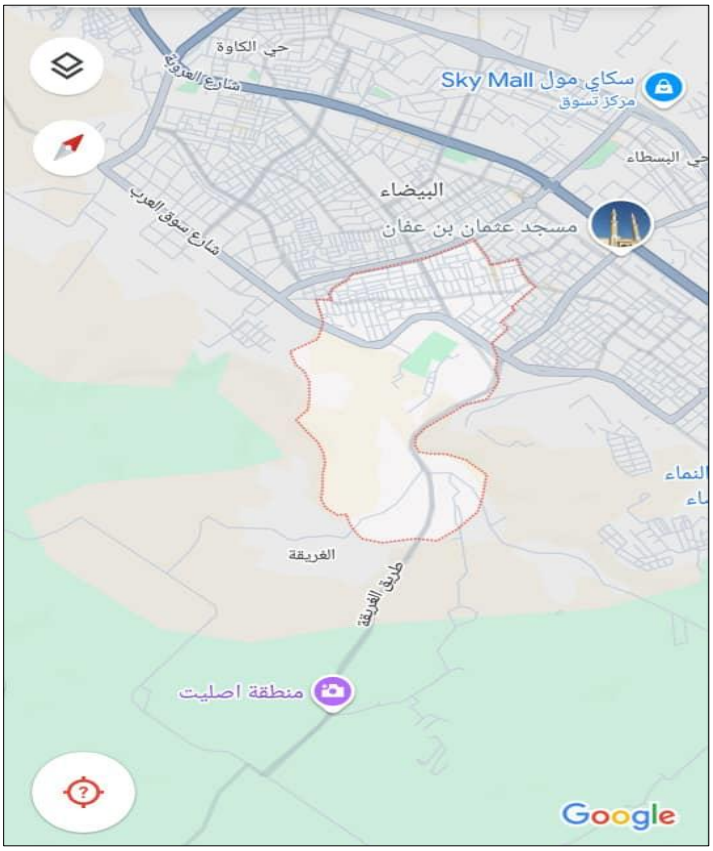

Figure 1 Location of the study sites (From map of Libya)

2.2. The specimen collection

The Specimen was collected in 2017 from the Asilyt area south east the city of Al-Bayda in Jabal Al-Akhdar was classified and registered as a new species in the Flora of Libya. The specimen was in the fruiting stage. 6 replicates were collected where most of the morphological characteristics of the species were studied using dissecting microscope attached with camera (Leica EZ4E Schweiz).

A typical herbarium specimen was collected, dried and preserved as the first specimen of this species to be preserved in a Sylphium herbarium- Botany department – faculty of science- Omar Al- Mukhtar University.

2.3. Morphological measurements.

The lengths range of six replicates were taken for each of the specimen, represented by (Plant height, Spike length, Spike (excl awns), Number of spikelets in each spike, Lower spikelet length (excl awns), Number of flowers per spikelets, Culm long, Number Awned of Glume, Upper leaf width and Awns glume of lower spiklete length.

2.4. Data analysis.

The morphological characteristics were compared between the species present in the Flora of Libya and the new species using the DATA *tab* Hierarchical cluster software analysis (available online) for statistical analysis and to determine the relatedness of the new species and the remaining of the species present in the Flora of Libya.

3. Result and discussion:

3.1. Recording data

This species was first classified after being collected in 2017 from the Asilyt area. According to the Turkish flora, it was identified as a new record in Libya. It was confirmed through the morphological description that it is a new record not present in the Flora of Libya, in comparison with the Turkish flora. Its description added to the taxonomic key of the Flora of Libya.

3.2. Morphological analysis

The specimen was examined in 6 replicates and the results were represented in table 1.

Table 1 The morphological characteristics used in the description of the specimens.

Morphological characteristics	**R1**	**R2**	**R3**	**R4**	**R5**	**R6**
Plant height (cm)	30	33	30	28	30.5	30.5
Spike length (cm)	4.5	5	4.5	5	4.9	3.8
Spike (excl awns) (cm)	2	2.5	1.5	1.9	2.3	1
Number of spikelets in each spike	3	3	2	2	3	3
Lower spikelet length (excl awns) (mm)	8	9	11	9	9	8
Number of flowers per spikelets	3.3.1	3,3,2	3.1	2.1	3.3.2	3.3.1
Culm long (cm)	25.5	28	25.5	23	25.6	26.2
Number Awned of Glume	3.2.3	3.2.3	3.3	2.2	3.2.3	2.2
Upper leaf width (mm)	1.8	2.5	1.8	1.9	1.7	3
Awns glume of lower spiklete (cm)	3	2.1	2.5	3.4	2.1	2.4

R1, R2, …….. R6 meaning Replicates

3.3. Description

From the above data, *Aegilops columnaris* (Syn**.:** *Triticum columnare* (Zhukovsky) Morris & Sears) as (Fig. 2) can be described as: Annual, erect plant tufted 28-33 cm tall, upper leaf blade Linear – Lanceolate 1.8-3 mm wide. Spike 1-2.5 cm (excl awns), obconical (incd awns), 2-3 spikelets. Lower spikelet 8-11 mm length (excl awns), 2-3 fertile, usually densely and depressed, pilose and divergent. Spekelet that are Vestigial two Glumes of oblong elliptic, fertile spikelets; awns 2-3, 2.1-3.4 cm setaceous above the broad base of 0.5-1mm. When two awns are present, one is notably wider than the other and frequently exhibits distal bifurcation. The lower lemmas bear a pair of narrow teeth-like awns. The upper spikelet comprises two lemmas: the lower lemma possesses three awns, while the second lemma is awnless.

The flowers are typically two, occasionally three, fertile florets, with one reduced in size and sterile. These form a slender column characterized by internodes that are longer than the spikelets. The uppermost spikelet features glumes each bearing 2-3 setaceous awns, which often surpass those of the lower spikelets in length. The lemmas are more shortly 3-awned.

3.3.1. Flowering & Fruiting time

March -April

3.3.2. Habitat & Ecology

Steppes, valleys, gravel, fallow fields, rock layers, ... calcareous and igneous.

3.3.3. Distribution

Syria, N. W. Iran, N. Iraq and Caucasia.

3.4. Distinguishing characters

Lower fertile spiklelets 8-11 mm, oblong – elliptic; c. 25 - 50 total number of awns on the spike, awns of lemmas more than half as long as those of glumes This is consistent with the Davis *et al.* [7].

The morphological study in this research agreed with what was reported by Van Slageren MW [8] as this a relatively small morphological diversity related to spike size number of fertile and primitive spikelets, and spike development it is difficult to distinguish it from *Aegilops neglecta* and *Ae. recta* bearing only, it has 2 awn per glume. The differences between *Ae*. *neglecta* and *Ae. columnaris* will be shown in (Table. 2) according to [9]

The morphological description of this species agrees exactly with that reported in the flora of Turkey [7] and Flora of Iraq [10], as Fig. (3) is completely consistent with the results of the description made.

Table 2 The variances among *Aegilops columnaris* and *Aegilops neglecta*

No.	***Aegilops columnaris***	***Aegilops neglecta***
1	The lower two to three spikelets include (have) elliptic-oblong glumes.	The lower, fertile spikelets have oblong-elliptical glumes.
2	The apex exhibits a dimorphic awn structure. A basal, diminutive, linear awn, typically ≤ 1 mm in length, is present. Additionally, a larger awn, ranging from 1.5 to 2.5 mm in basal width, is also evident, frequently displaying bifurcation distally.	The apex typically presents three awns of equivalent length and basal width
3	The spike exhibits an ovate morphology in its proximal portion, transitioning to a more linear shape distally. It comprises 3 to 4, occasionally up to 6, spikelets, all of which are fertile.	The spike displays an ovoid-ellipsoid and inflated morphology in its proximal region, followed by an abrupt constriction to an almost linear distal portion. It bears 3 to 6 spikelets, with the uppermost 1 to 3 being sterile.

Figure 2 *Aegilops columnaris* Zhukovsky

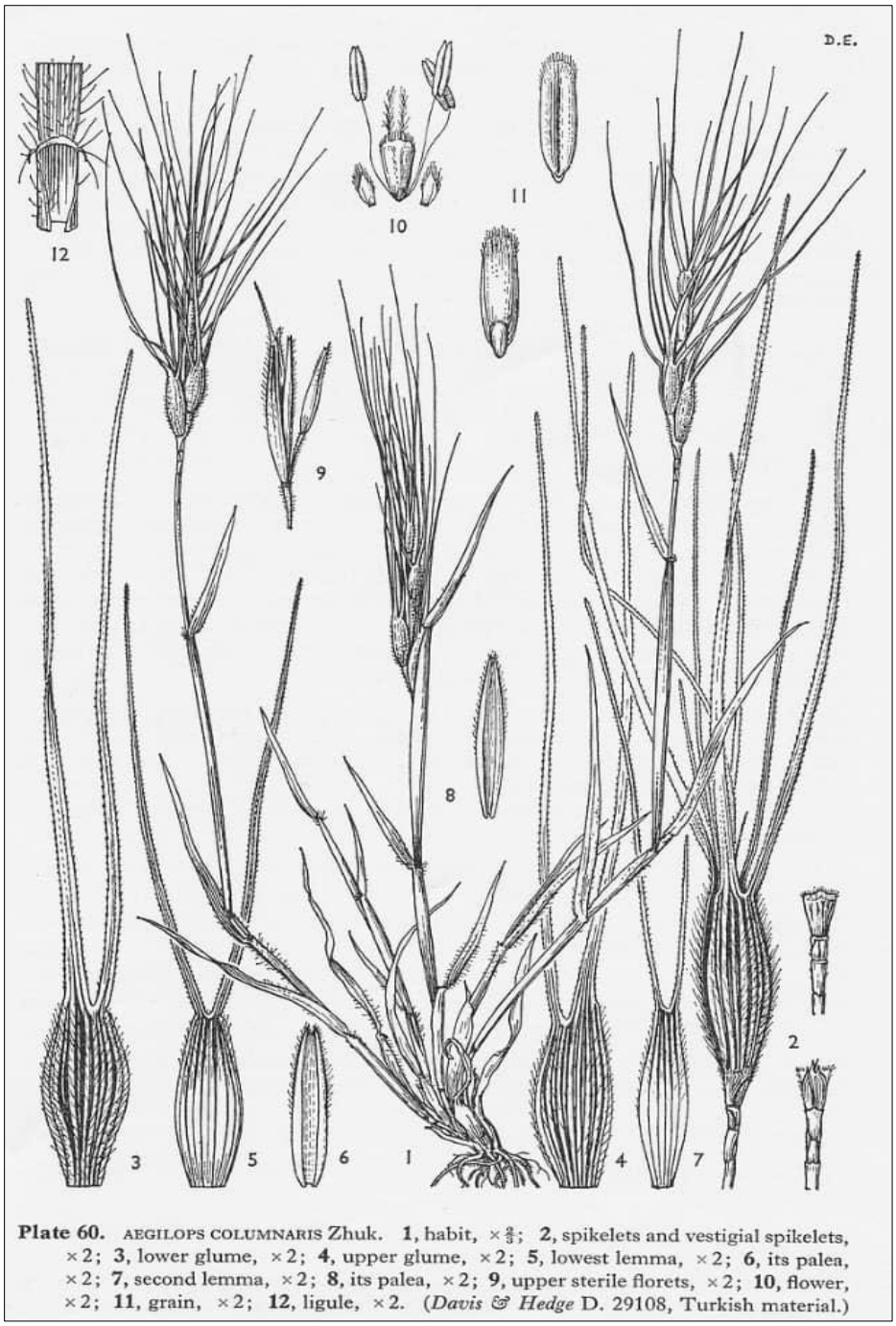

Plate 60. AEGILOPS COLUMNARIS Zhuk. **1**, habit, ×⅔; **2**, spikelets and vestigial spikelets, ×2; **3**, lower glume, ×2; **4**, upper glume, ×2; **5**, lowest lemma, ×2; **6**, its palea, ×2; **7**, second lemma, ×2; **8**, its palea, ×2; **9**, upper sterile florets, ×2; **10**, flower, ×2; **11**, grain, ×2; **12**, ligule, ×2. (*Davis & Hedge* D. 29108, Turkish material.)

Figure 3 *Aegilops columnaris* Zhukovsky

3.5. Similarity examination

By using hierarchical cluster analysis to clarify the degree of similarity and difference between *Aegilops columnaris* and the six species recorded in the Flora of Libya through morphological characteristics, it was found that the closest was *Aegilops neglecta* and this is consistent with the [7] as illustrated in Figure 4.

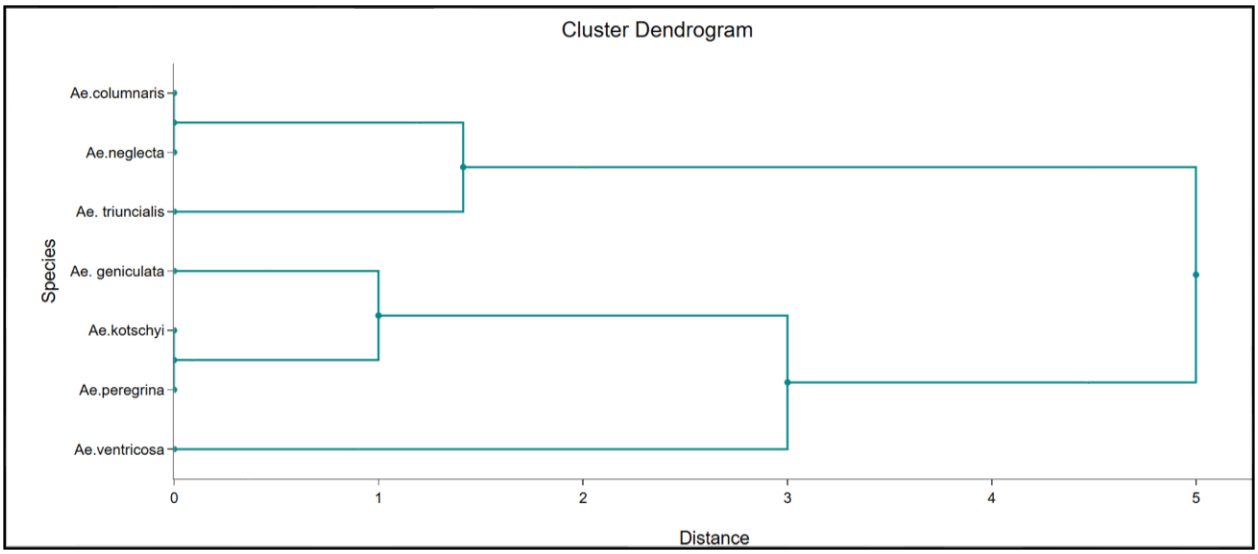

Figure 4 Dendrogram to illustrate the degree of similarity and difference between the new species and the 6 species recorded in the Flora of Libya

4. A key to the Libyan species of *Aegilops*

- 1. + Spikes (excluding awns) more than 10 times as long as wide moniliform; glumes awnles…….. *A. ventricosa*
- Spikes (excluding awns) c.5 times or less longer than wide (if longer, then not moniliform); glumes awned 2
- 2. + Nerves on the glumes narrow, equally broad, approximately parallel……3
- Nerves on the glumes unequally broad, flattened, not parallel..... 4
- 3. + Lemmas awnless ..... *A. peregrina*
- Lemmas awned ..... *A. kotschyi*
- + Glumes of some spikelets with 4 or more awns ..... *A. geniculata*
- Glumes with 3 or less awns..... 5
- + Spikes (excluding awns) 4 cm or more long: spikelets 3 or more, all fertile and ovoid in shape..... *A. triuncialis*
- Spikes (excluding awns)2-3 cm long; spikelets up to 3 with the upper most one sterile, ovoid in shape.....6
- + Lower fertile spiklelets 8-11 mm, oblong – elliptic; total number of awns in spike c. 25 – 50, those of lemmas more than half as long as those of glumes..... *A. columnaris*
- Lower fertile spiklelets 7-9 mm, obovate- elliptic; total number of awns in spike. c.15 - 35, those of lemmas half as long as those of glumes..... *A. neglecta*

5. Conclusion

With the current findings, the species *Aegilops columnaris* belonging to the Poaceae family is a new record in Libya. Moreover, by using cluster analysis to compare six remaining species, *Aegilops neglecta* was confirmed that it is the most similar to *Aegilops columnaris.*

Compliance with ethical standards

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Disclosure of conflict of interest

No conflict of interest to be disclosed.

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