



## First Record of the Invasive Plant Species *Chloris pycnothrix* Trin. (Poaceae) in Libya

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### SUMMARY

This research documents the initial finding of *Chloris pycnothrix* Trin., frequently referred to as spiderweb chloris, in Libya, particularly from the Ariggiba region close to Sabha city. This grass, originating from tropical and subtropical regions, is versatile and may become invasive. It was recognized via morphological examination during field surveys in 2023–2024, with samples stored in a herbarium. The species flourishes in alluvial plains as well as in disturbed habitats like road shoulders. It can be mistaken for *Chloris virgata*, although they differ in some important morphological aspects. It was previously believed that only one species of *Chloris* existed in Libya. This study provides a revision and an identification key for them in the context of Libyan flora. The tolerant nature of *C. pycnothrix* to drought, combined with its ability to colonize poorly maintained land, makes its potential introduction—most likely through anthropogenic means—alarming ecologically and emphasizes the need for management strategies to contain its spread and monitor its impact.

**Keywords:** Plant, *Chloris pycnothrix*, invasive species, taxonomy, Sabha

**Citation:** El-Ahamir, S.-H. M., and K. S. Imohammed. 2025. First Record of the Invasive Plant Species *Chloris pycnothrix* Trin. (Poaceae) in Libya. *Journal of Wildlife and Ecology*. 9: 131-138.

Received 8 March, 2025

Revised 12 May, 2025

Accepted 10 June, 2025

Published 29 June, 2025

### INTRODUCTION

*Chloris pycnothrix* Trin. (Gram. Unifl. Sesquifl. 234, 1824), commonly known as “Spiderweb chloris,” is an annual or short-lived perennial grass notable for its adaptability to a wide range of environmental conditions (Fish et al., 2015). Native to tropical and subtropical regions, particularly in Africa and Asia, it has successfully expanded its distribution to other parts of the world, including the Americas and Australia. This expansion is largely attributed to unintentional human-mediated dispersal and the species’ natural ability to establish in disturbed environments (Roodt, 2015).

The germination of *C. pycnothrix* is influenced by various factors such as temperature, light availability, and soil conditions. Its seeds are highly resilient, allowing it to colonize diverse habitats, including agricultural lands and urban areas (Brako and Zarucchi, 1993). Additionally, its tolerance to drought and poor soil fertility enables the species to thrive in degraded ecosystems, where it often becomes a dominant component of the vegetation (Clayton et al., 2006).

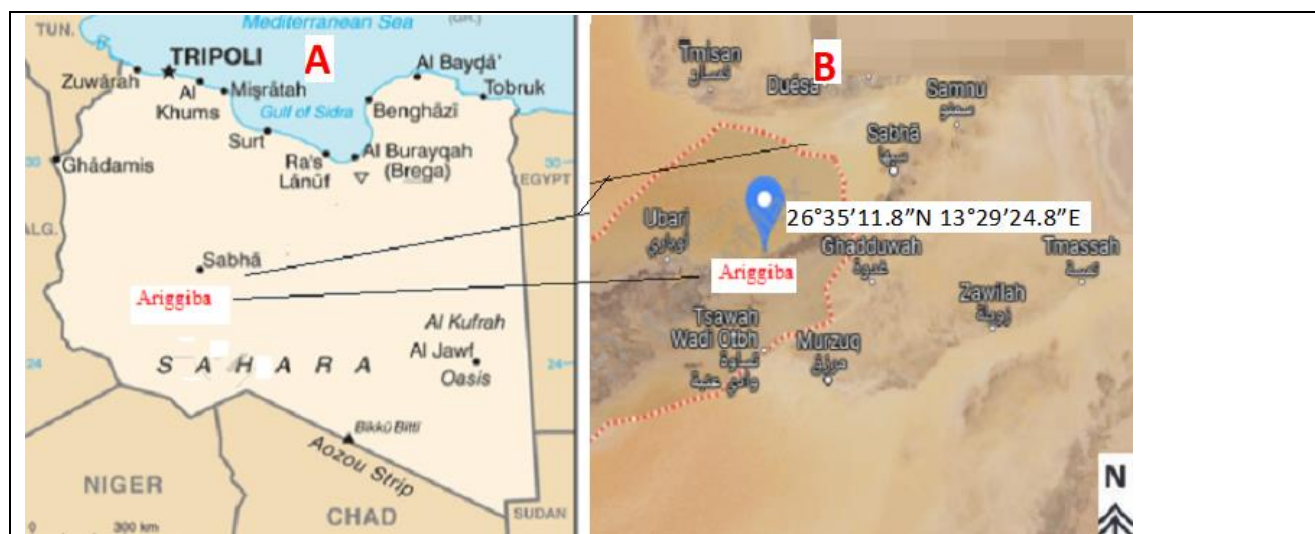
Although *C. pycnothrix* offers some ecological and economic benefits, such as aiding in soil stabilization and serving as forage in livestock systems, it also presents notable agricultural and environmental challenges. In cropping systems, it is considered a weed, competing with cultivated plants for water, nutrients, and sunlight, which can result in reduced yields (Faccenda, 2023). Moreover, its invasive behavior in non-native regions has raised concerns due to its ability to displace native species and disrupt local ecosystems (Figueiredo and Smith, 2008).

This study presents the first documented occurrence of *C. pycnothrix* in Libya. It offers a comprehensive examination of its ecological adaptability, and potential impacts. By contributing new taxonomic and ecological insights, this research aims to enhance understanding of the species behavior in novel environments and support future management strategies.

## MATERIALS AND METHODS

### OBSERVATION AND IDENTIFICATION OF *Chloris pycnothrix* Trin.

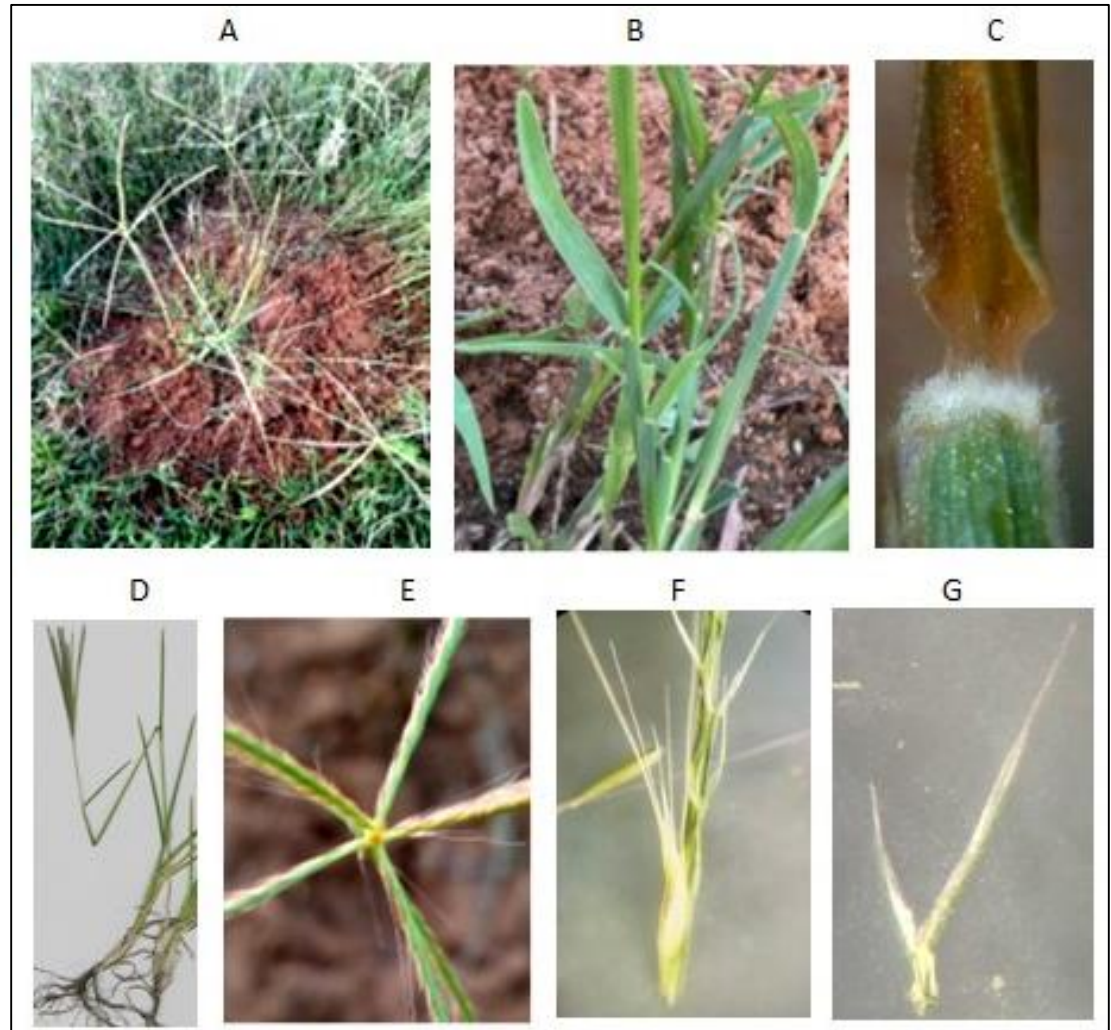
Specimens of *Chloris pycnothrix* Trin. were systematically observed across various life cycle stages, including flowering, fruiting, and newly germinated seedlings, during field surveys (2023-2024), from various localities in the Ariggiba Region, 110 Km Southwest Sabha city about 1000 Km south of Tripoli ( $26^{\circ}35'11.8''N$ ,  $13^{\circ}29'24.8''E$ ) (Figure1). The collected specimens were meticulously photographed, collected, and identified as *Chloris pycnothrix* Trin (Figure 2).



**Figure 1: Map of Libya (A) and detailed map of the Sabha district (B) showing the locality where *Chloris pycnothrix* Trin was collected and Longitude and latitude Location.**

Standard herbarium techniques were employed for specimen preparation, including pressing, drying, mounting, and labeling. Following rigorous examination, the plant was confirmed as *C. pycnothrix* Trin using data from multiple references (Germishuizen, and Meyer 2003., Valdés, et al., 2009., Trinius, 1824., Flora of North America Editorial Committee, 2003; Iwatsuki et al., 2020) which contribute to the understanding of this newly recorded species within the Libyan flora. The voucher

specimens have been deposited in the Herbarium of the Botany Department at the University of Sabha (ULS), Faculty of Science, under voucher number 02145532N (Figure 3). A duplicate set of the specimens has also been sent to the Herbarium of the Botany Department at Gharyan University, Gharyan, Libya, ensuring accessibility for further research.



**Figure 2:** (A) habit of *Chloris pycnothrix* Trin. (B) lamina, auricles (C) lamina base, sheath and ligule (D, E) inflorescences (F) portion of spike with few spikelets (G) glumes (Photos: K.Salem., Design S. El-Ahamir).

#### **MORPHOLOGICAL DESCRIPTION OF *Chloris pycnothrix* Trin**

*C. pycnothrix* Trin. is an annual grass, reaching up to 45 cm in height. It is typically erect or ascending, with slightly swollen nodes that may exhibit a purplish tinge. The internodes are elongate and hollow. Leaves are linear, flat or slightly folded, measuring 5–30 cm in length and 2–6 mm in width. The upper surface of the blades is often sparsely hairy, while the lower surface is glabrous. Leaf margins are scabrid (rough to the touch). The sheaths are open and smooth, occasionally sparsely hairy

near the base, with slightly overlapping edges. Ligules are membranous, approximately 1–2 mm long, and bear a fringe of fine hairs along the margin.

The inflorescence is characterized by a digitate arrangement of racemes, typically comprising 5–15 slender racemes radiating from a central point. Each raceme is 5–15 cm long and bears densely packed spikelets on one side of the rachis. Spikelets are lanceolate, measuring 3–4 mm in length, and are arranged in two rows along each raceme. Each spikelet contains one fertile floret and one or more sterile florets. The lower glume measures roughly half the length of the spikelet, whereas the upper glume is almost equal in length to the spikelet; both glumes are membranous and lack awns (Figure 2). The fertile lemma has awns measuring 5–12 mm in length, and its surface is somewhat scabrid. The palea is present and well-formed in fertile florets (Valdés et al., 2009). This species can be distinguished from related *Chloris* species by its densely arranged racemes, the length of the spikelet awns, and its adaptation to subtropical and tropical environments (Anderson, 1974).

*Chloris pycnothrix* Trin, referred to as Spiderweb chloris, is a grass type noted for its unique inflorescence resembling a spiderweb. The species has been taxonomically confirmed by Acevedo-Rodríguez and Strong (2012). Throughout the years, it has been known by various synonyms, such as *Chloris anomala* B.S. Sun and Z.H. Hu, *C. beyreichiana* Steud., *C. beyrichiana* Kunth, *C. humilis* Kunth, *C. intermedia* A. Rich., and *C. leptostachya* Hochst. ex A. Rich., indicative of its intricate taxonomic background. The plant shows vigorous growth and reproduction throughout its phenological period from May to November, reflecting its adaptation to seasonal climate changes.

### ***Habitat***

It is a common species found on roadsides at an altitude of 200-1300 m. Widespread, in coastal and floodplain to montane grasslands, usually as a common weed in disturbed ground. Its Annual grass-habit and tolerance for poor soils make it easily recognizable in its native and introduced ranges.

### ***Distribution***

Northwards throughout tropical Africa; Arabia and tropical America (Acevedo-Rodríguez and Strong 2012). General habit is an Annual-grass, typically growing in dense clumps. It can reach heights of 40–100 cm, depending on environmental conditions. The plant demonstrates a robust and upright growth form, with occasional sprawling stems near the base.

### ***Chromosome number***

Chromosome number is  $2n=20$ , indicating its diploid status.

### **VOUCHER SPECIMEN**

This plant were observed near roadsides, alluvial plains, and borders of fields, wastelands and dried water bodies of Ariggiba region (Figure 1) located at Sabha, Libya, and Tripoli (Figure 3).

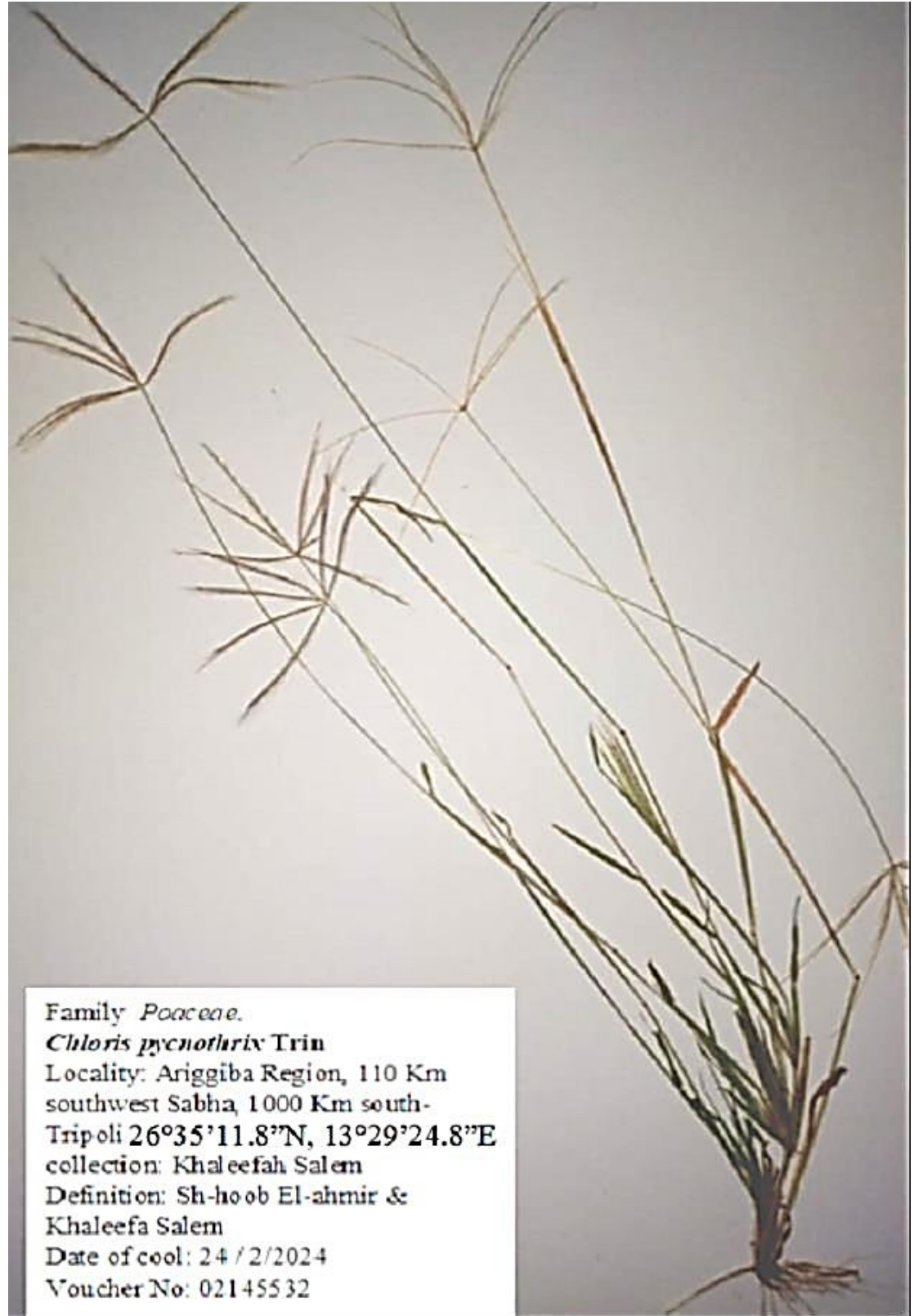


Figure 3: Herbarium specimen of *Chloris pycnothrix* Trin. collected from Ariggiba regions.

## RESULTS AND DISCUSSION

This study presents the first record of *Chloris pycnothrix* Trin. in Libya. The species was observed in the Ariggiba Region, located approximately 110 km southwest of Sabha city. Although its presence appears locally common in this area, further surveys are needed to confirm its broader distribution in the country. This finding is noteworthy, as *C. pycnothrix* Trin. was not included in the flora of Libya compiled by Sherif and Siddiqi (1988), likely due to its morphological similarity to *C. virgata*, which may have led to previous misidentifications or it being overlooked entirely. This marks *C. pycnothrix* as a new addition to Libya's plant diversity and a potential invasive species. The identification of *C. pycnothrix* is complicated by its resemblance to *C. virgata*, which highlights the importance of distinguishing features (Table 1).

**Table 1: Distinguishing Features Between *Chloris pycnothrix* and *C. virgata* (Danin, 2004).**

Feature	<i>Chloris pycnothrix</i>	<i>Chloris virgata</i>
<b>Growth Habit</b>	Annual grass, forming dense clumps.	Annual grass with a more open, less compact growth habit.
<b>Culms (Stems)</b>	Erect or decumbent, smooth, and purplish at nodes.	Erect or decumbent, nodes often with short hairs.
<b>Leaf Blades</b>	Linear, flat, sparsely hairy on the upper surface; up to 30 cm long.	Narrower, linear, scabrid, and frequently covered with fine hairs.
<b>Leaf Sheaths</b>	Glabrous or slightly hairy near the base.	Covered in more prominent hairs, especially near the ligule.
<b>Ligule</b>	Membranous with a fringe of fine hairs (1–2 mm long).	Membranous with a more prominent fringe of hairs.
<b>Inflorescence</b>	Digitate racemes (5–15), densely packed, radiating from a central point.	Digitate racemes (3–10), thinner and less dense.
<b>Racemes</b>	5–15 cm long, spikelets densely arranged on one side.	2–10 cm long, spikelets more sparsely arranged.
<b>Spikelets</b>	3–4 mm long, lanceolate; awns 5–12 mm long.	2–3 mm long, elliptic; awns up to 15 mm long.
<b>Glumes</b>	Lower glume shorter (half spikelet length); upper glume nearly as long as spikelet.	Similar, but spikelets are generally smaller.

### Key to the Genus *Chloris* in Libya

Since the genus *Chloris* mentioned in the Flora of Libya includes only one species, this study provides a classification key that includes *C. virgata* and *C. pycnothrix*

- 1 + (a). Annual, decumbent, rooting from the nodes, finally erect..... 2 (a)
  - (b). Annual grass with a robust, dense fibrous root system and a non-stoloniferous growth habit..... 2(b)
- 2 + (a). Longer stems and a more open, branched inflorescence, resulting in a more airy appearance..... *Chloris virgate*
  - (b). More compact growth habit, shorter stems, and denser foliage, with typically less branched inflorescence..... *Chloris pycnothrix*

**Scientific Classification of *Chloris pycnothrix* Trin**

kingdom - Plantae.

Division - Tracheophyta.

Class - Magnoliopsida.

Order - Poales.

Family - Poaceae

Tribus - Cynodonteae

Genus - *Chloris* Sw.

Species- *Chloris pycnothrix* Trin (Trinius, 1824).

The distribution of *C. pycnothrix* can largely be attributed to human activities such as agriculture, trade, and the movement of goods. Often classified as a weed in agricultural contexts due to its vigorous growth and herbicide resistance, it has the potential to spread rapidly (Danin, 2004). The global expansion of agricultural practices has created environments conducive to the proliferation of this species. Its adaptability to diverse soil types and climatic conditions has enabled it to thrive beyond its native habitat (Clayton et al., 1974). The introduction and establishment of *C. pycnothrix* in Libya further illustrate the species' adaptability and the region's ecological conditions. Ongoing research is essential to understand its ecological role and potential impacts on local ecosystems and agriculture in North Africa. Gaining insights into these dynamics will be crucial for effective management of this species and for mitigating any negative effects on regional biodiversity and agricultural productivity.

**CONCLUSIONS**

It is reported that *Chloris pycnothrix* Trin, is a natural plant under the original growth in tropical and subtropical area. The results underscore both the invasiveness and the naturalization of the species and its population establishment outside the areas of its natural distribution, which is for the first time documented in the flora of Libya. The introduction of this species may be partly explained by multiple causes, including unintentional introduction, intentional introduction, and adaptation to the local environment in Libya and other North African countries. Future research is needed to assess its impact on Libyan ecosystems and develop management strategies to prevent potential negative effects.

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**Competing interests:** Authors have declared that no competing interests exist.  
**Funding:** Authors have no source of funding for this work.  
**Authors' contributions:** Both authors have designed this project, collected data and written this article; while Both authors have critically analyzed this article and approved as final.

