



## Weed Flora of the Barley Field (*Hordeum vulgare* L.) in Ghot El Sultan, Al Abyar Region, Libya

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### فلورا الحشائش في حقل الشعير (*Hordeum vulgare* L.) في غوط السلطان، منطقة الأبيار، ليبيا

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Received: April 29, 2026

Accepted: July 07, 2026

Published: July 21, 2026

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#### Abstract:

In the farms of Ghot El Sultan, located in the Al Abyar Region, barley is the predominant crop. However, this crop faces significant challenges, particularly in terms of weed management, which greatly affects yields. To address this issue, a field survey was conducted over two seasons (2024 to 2026) to identify the most problematic weeds in barley crops. The study used field research methods, including surveys and quadrat sampling, to record the most prevalent weed species. Weed density and frequency were then calculated based on these findings. Samples from the fields of the barley crop were taken using a quadrat of size 1 m × 1 m randomly thrown at multiple points in the fields. The plants were identified using available literature and by comparison with previously identified plant species. Data inventory has been documented in the form of family, Botanical name, vernacular name and life form. A total of 86 weed species were identified, belonging to 70 genera and 22 families of angiosperms. The most dominant families, based on the number of species, were Asteraceae (20 species), Fabaceae (18 species), Poaceae (10 species), and Brassicaceae (8 species). The results also showed that the highest densities were recorded for *Oxalis pes-caprae* (25 m<sup>-2</sup>), *Sinapis alba* (18 m<sup>-2</sup>), and *Avena sterilis* (17 m<sup>-2</sup>). Additionally, the highest frequency was observed for *Brassica tournifortii* and *Oxalis pes-caprae*, with 57% each. These results provide valuable insights into the database in terms of its density and distribution in the District Ghot El Sultan, Al Abyar Region, Libya.

**Key words:** Density, Frequency, Life form, Barley, Weed species.

## الملخص:

يُعدّ الشعير المحصول الرئيسي في مزارع غوط السلطان، الواقعة في منطقة الأبيار، إلا أن هذا المحصول يواجه تحديات كبيرة، لا سيما فيما يتعلق بمكافحة الحشائش، مما يؤثر بشكل كبير على الإنتاجية. ولمعالجة هذه المشكلة، أُجري مسح ميداني على مدار موسمين (2024 إلى 2026) لتحديد أكثر الحشائش إشكالية في محاصيل الشعير. استخدمت الدراسة أساليب البحث الميداني، بما في ذلك المسوحات وأخذ العينات باستخدام مربعات، لتسجيل أكثر أنواع الحشائش انتشاراً. ثم حُسبت كثافة الحشائش وتكرارها بناءً على هذه النتائج. جُمعت عينات من حقول الشعير باستخدام مربعات قياسها متر مربع واحد، وُضعت عشوائياً في نقاط مختلفة من الحقول. حُدّدت النباتات بالرجوع إلى المراجع العلمية المتاحة وبالمقارنة مع أنواع نباتية سبق تحديدها. وُثِّقت البيانات في شكل عائلة، واسم علمي، واسم محلي، وشكل الحياة. حُدّد ما مجموعه 86 نوعاً من الحشائش، تنتمي إلى 70 جنساً و22 عائلة من كاسيات البذور. كانت العائلات النباتية الأكثر انتشاراً، بناءً على عدد الأنواع، هي المركبة (20 نوعاً)، والبقولية (18 نوعاً)، والنجيلية (10 أنواع)، والصلبية (8 أنواع). كما أظهرت النتائج أن أعلى كثافة سُجّلت لنباتات *Oxalis pes-caprae* (25 م<sup>2</sup>)، و *Sinapis alba* (18 م<sup>2</sup>)، و *Avena sterilis* (17 م<sup>2</sup>). بالإضافة إلى ذلك، لوحظ أعلى تردد لنباتات *Brassica tournifortii* و *Oxalis pes-caprae* بنسبة 57% لكل منهما. تُقدّم هذه النتائج رؤى قيمة حول قاعدة البيانات من حيث كثافتها وتوزيعها في منطقة غوط السلطان، بلدية الأبيار، ليبيا.

**الكلمات المفتاحية:** الكثافة، التردد، أشكال الحياة، الشعير، أنواع الحشائش.

## Introduction:

In no other parts of the world does uncontrolled weed growth cause as great a reduction in crop yields as it does in dry areas where soil moisture is the limiting factor, and weeds compete significantly with the crop for available moisture [1]. Weeds are unwanted plants that grow alongside crops, competing for sunlight, space, and nutrients, ultimately leading to a decrease in crop yield [2].

Its variety and distribution differ from crop to crop and generally has no any aesthetic and economic values. Such vegetation is found abundant in cultivated fields of great financial and biological significance [3]. These unwanted plants grow along with agricultural plants and cause gradual and important loss in crop yield because they can compete with crop plants for want of available nutrients, space, water contents, sunlight etc. [4]. Weeds and crops usually have the same requirements, but weeds make their living at the expense of the crop by competition for nutrients, moisture, light, carbon dioxide, and space [5]; [6]; [7]. There are about 30,000 species of weeds in the world, of which 50 to 200 usually cause appreciable damage to the major food crops [8].

In Libya, the discipline of weed science has been overlooked, despite its significance being on par with other crop protection disciplines such as entomology and plant pathology [9]. While there have been numerous studies on weeds in different regions of the country, such as Sirte [1], Jardina-Soloq Region [10], Beir Bullerjam, Soloq Region [11], and [12], the recognition of weed science as a distinct discipline has been lacking. The purpose of this study was to identify various weed species and document their frequency and density in barley crops.

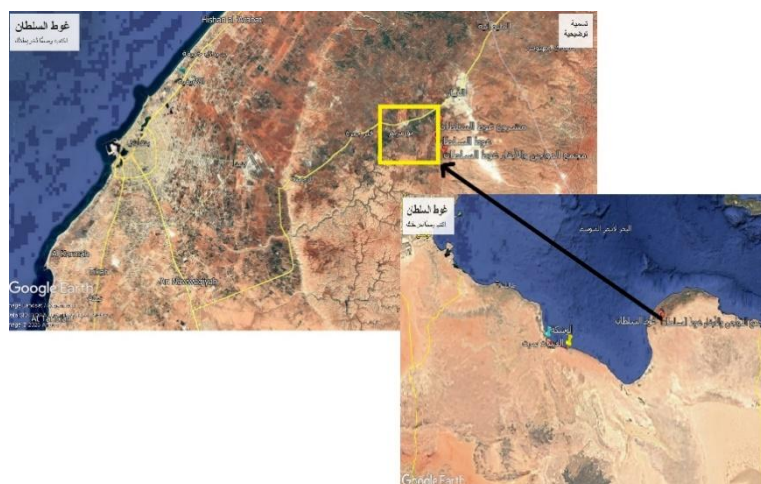
## Materials and Methods:

The study area is located approximately 50 km east of Benghazi city, adjacent to Al Abyar city at approximately 32° 08' N latitude and 20° 32' E longitude. The area has an elevation of approximately 250 m above sea level (figure 1). The study was conducted over a two-year period, from 2024 to 2026. After selecting the fields to be surveyed, the surveyor followed a "w"-designated set pattern to count the weeds in each farm. The size and number of 1 m<sup>2</sup> quadrats used varied depending on the size of the farms. For areas with high-density weeds, smaller quadrats of 0.25 m<sup>2</sup> were used and then extrapolated to estimate the number in a full square meter. The data were recorded on the following parameters:

$$\text{Density} = \frac{\text{Total number of individuals per species in all quadrats}}{\text{Total number of quadrats studied}}$$

$$\text{Frequency} = \frac{\text{Total number of quadrats with the species}}{\text{Total number of quadrats studied}} \times 100$$

The collected plants from the study areas were identified based on available taxonomic literature, such as [13], [14], [15], [16], [17] and [18]. The specimens were identified by observing their morphological and sometimes anatomical features of reproductive parts.



**Figure (1):** The study area and location (source: Bing Maps and Google Earth)

### Results and Discussion:

The study area's weed flora consists of 86 species of flowering weeds, which belong to 70 genera and 22 families. A comprehensive list of the weed species found in the barley crop of the study area, including their scientific names, families, vernacular names, and life forms, is presented in Table 1 below.

**Table (1):** Weed species, their vernacular names and life form of the barley crop recorded in the study area. (THE. = Therophytes, CHA. = Chaemophytes, HEM. = Hemi-cryptophytes, and GEO. = Geophytes.)

| Scientific Name                                          | Family         | Vernacular name   | Life form |
|----------------------------------------------------------|----------------|-------------------|-----------|
| <i>Allium erdelii</i> Zucc.                              | Amaryllidaceae | Korath            | Geo.      |
| <i>Allium nigrum</i> L.                                  | Amaryllidaceae | Thom Bary         | Geo.      |
| <i>Foeniculum vulgare</i> Mill                           | Apiaceae       | Kammun            | HEM.      |
| <i>Scaligeria napiiformis</i> (Willd. ex Spreng.) Grande | Apiaceae       |                   | HEM.      |
| <i>Scandix pecten-veneris</i> L.                         | Apiaceae       |                   | THE.      |
| <i>Arisarum vulgare</i> O.Targ.Tozz.                     | Araceae        | Eshlaket etheeb   | GEO.      |
| <i>Filago contracta</i> (Boiss.) Chrtek & Holub          | Asteraceae     |                   | THE.      |
| <i>Anthemis secundiramea</i> Biv.                        | Asteraceae     |                   | THE.      |
| <i>Bombycilaena discolor</i> (Pers.) M.Laínz             | Asteraceae     | Bseda             | THE.      |
| <i>Carduus getulus</i> Pomel                             | Asteraceae     | Qurtum Bariy      | THE.      |
| <i>Calendula arvensis</i> L.                             | Asteraceae     | Ain-esh-shams     | THE.      |
| <i>Catananche arenaria</i> Coss. & Durieu                | Asteraceae     | Geez Elghazal     | THE.      |
| <i>Centaurea alexandrina</i> Delile                      | Asteraceae     | Mrier.            | THE.      |
| <i>Cynara cornigera</i> Lindl.                           | Asteraceae     | Gaamool           | HEM.      |
| <i>Dittrichia viscosa</i> (L.) Greuter                   | Asteraceae     |                   | CHA.      |
| <i>Echinops galalensis</i> Schweinf                      | Asteraceae     | Shembet Elgatoos  | HEM.      |
| <i>Glebionis coronaria</i> (L.) Cass. ex Spach           | Asteraceae     | Gahwan            | THE.      |
| <i>Launaea resedifolia</i> (L.) O.Kuntze                 | Asteraceae     | Adeeda            | THE.      |
| <i>Matricaria aurea</i> (Loefl.) Sch.Bip.                | Asteraceae     | Flaya             | THE.      |
| <i>Notobasis syriaca</i> (L.) Cass.                      | Asteraceae     |                   | THE.      |
| <i>Onopordum arenarium</i> (Desf.) Pomel                 | Asteraceae     | Libid             | HEM.      |
| <i>Pallenis spinosa</i> (L.) Cass                        | Asteraceae     | Schok- es- sera   | HEM.      |
| <i>Reichardia tingitana</i> (L.) Roth.                   | Asteraceae     | Sahani            | THE.      |
| <i>Rhagadiolus stellatus</i> (L.) Gartner                | Asteraceae     | Njm eddib         | THE.      |
| <i>Senecio gallicus</i> Chiaux                           | Asteraceae     | Daraita, Mourare. | THE.      |
| <i>Sonchus oleraceus</i> L.                              | Asteraceae     | Tefaf             | THE.      |
| <i>Echium horridum</i> Batt                              | Boraginaceae   | Kehla             | CHA.      |

|                                                                                    |                      |                   |      |
|------------------------------------------------------------------------------------|----------------------|-------------------|------|
| <i>Echium angustifolium</i> Mill                                                   | Boraginaceae         | Henna alagrab,    | CHA. |
| <i>Biscutella didyma</i> L.                                                        | Brassicaceae         | Ain Al Hanash     | THE. |
| <i>Coincya tournefortii</i> (Gouan) Alcaraz, T.E.Díaz, Rivas Mart. & Sánchez-Gómez | Brassicaceae         | Shultam           | THE. |
| <i>Didesmus bipinnatus</i> (Desv.) Dc                                              | Brassicaceae         | Lisli             | THE. |
| <i>Enarthrocarpus pterocarpus</i> (Pers.) DC.                                      | Brassicaceae         | Shultam           | THE. |
| <i>Eruca sativa</i> Mill.                                                          | Brassicaceae         | Gargeer Barry     | THE. |
| <i>Matthiola fruticulosa</i> (L.) Maire                                            | Brassicaceae         | Eshegara          | THE. |
| <i>Sinapis alba</i> L.                                                             | Brassicaceae         | Khardal, Harra    | THE. |
| <i>Sisymbrium irio</i> L.                                                          | Brassicaceae         | Fegeela           | THE. |
| <i>Gypsophila vaccaria</i> (L.) Sm.                                                | Caryophyllaceae      | Ful el Arab       | THE. |
| <i>Silene gallica</i> L.                                                           | Caryophyllaceae      |                   | THE. |
| <i>Convolvulus althaeoides</i> L.                                                  |                      | Ullag             | GEO. |
| <i>Convolvulus arvensis</i> L.                                                     |                      | Muddad            | GEO. |
| <i>Euphorbia helioscopia</i> L.                                                    | <i>Euphorbiaceae</i> | Lebbena           | HEM. |
| <i>Astragalus boeticus</i> L.                                                      | Fabaceae             | Grambushia        | THE. |
| <i>Astragalus caprinus</i> L.                                                      | Fabaceae             | Shaewit Erraie    | HEM. |
| <i>Astragalus hamosus</i> L.                                                       | Fabaceae             | Katai, kedad      | THE. |
| <i>Astragalus peregrinus</i> Vahl.                                                 | Fabaceae             |                   | THE. |
| <i>Coronilla scorpioides</i> (L.) W.D.J. Koch                                      | Fabaceae             |                   | THE. |
| <i>Hippocrepis multisiliquosa</i> L.                                               | Fabaceae             | Hadhwat Alhisan   | THE. |
| <i>Lathyrus aphaca</i> L.                                                          | Fabaceae             |                   | THE. |
| <i>Medicago littoralis</i> Rohde ex Lois                                           | Fabaceae             | Nefal             | THE. |
| <i>Medicago polymorpha</i> L.                                                      | Fabaceae             | Nefal             | THE. |
| <i>Melilotus sulcatus</i> Desf.                                                    | Fabaceae             | Gharat            | THE. |
| <i>Onobrychis crista - galli</i> (L.) Lam                                          | Fabaceae             |                   | THE. |
| <i>Trifolium purpureum</i> Lois                                                    | Fabaceae             |                   | THE. |
| <i>Trifolium tomentosum</i> L.                                                     | Fabaceae             |                   | THE. |
| <i>Tripodion tetraphyllum</i> (L.) Fourr.                                          | Fabaceae             |                   | THE. |
| <i>Vicia villosa</i> Roth                                                          | Fabaceae             | Jelbana Hmam      | THE. |
| <i>Vicia monantha</i> Retz                                                         | Fabaceae             | Jilban            | THE. |
| <i>Vicia sativa</i> L.                                                             | Fabaceae             | Jilban            | THE. |
| <i>Vicia narbonesis</i> L.                                                         | Fabaceae             | Jilban            | THE. |
| <i>Erodium moschatum</i> (L.) L'Hér.                                               | Geraniaceae          | Missaykah         | THE. |
| <i>Erodium neuradifolium</i> Delile ex Godr.                                       | Geraniaceae          | Henet El-Ghula    | THE. |
| <i>Salvia lanigera</i> Poir.                                                       | Lamiacea             | Sag en naga       | CHA. |
| <i>Thymbra capitata</i> (L.) Cav.                                                  | Lamiacea             | Zaater            | CHA. |
| <i>Malva parviflora</i> Linn                                                       | Malvaceae            | Khobaiz           | THE. |
| <i>Malva sylvestris</i> L.                                                         | Malvaceae            | Khobaiz           | THE. |
| <i>Oxalis pes-caprae</i> L.                                                        | Oxalidaceae          | Hummdha           | GEO. |
| <i>Fumaria officinalis</i> L.                                                      | Papavaraceae         | Sfinari el homar  | THE. |
| <i>Papaver hybrium</i> L.                                                          | Papavaraceae         | Bugraun, Talma    | THE. |
| <i>Papaver rhoeas</i> L.                                                           | Papavaraceae         | Garun, Bugraun    | THE. |
| <i>Plantago lagopus</i> L.                                                         | Plantaginaceae       | Widna             | THE. |
| <i>Plantago notata</i> Lag                                                         | Plantaginaceae       | Aenm              | THE. |
| <i>Linaria tarhunensis</i> Pamp.                                                   | Plantaginaceae       |                   | THE. |
| <i>Aegilops ventricosa</i> Tausch                                                  | Poaceae              |                   | THE. |
| <i>Avena sterilis</i> L.                                                           | Poaceae              | Spulet el- aghreb | THE. |
| <i>Briza maxima</i> L.                                                             | Poaceae              |                   | THE. |
| <i>Bromus rigidus</i> Roth.                                                        | Poaceae              | Summa             | THE. |
| <i>Hordeum marinum</i> Huds.                                                       | Poaceae              | Bu Shterta        | THE. |
| <i>Lolium rigidum</i> Gaudin                                                       | Poaceae              | Bomanjor.         | THE. |
| <i>Phalaris minor</i> Retz.                                                        | Poaceae              | Zewan             | THE. |
| <i>Poa annua</i> L.                                                                | Poaceae              |                   | THE. |
| <i>Setaria adhaerens</i> (Forssk.) Chiov.                                          | Poaceae              |                   | THE. |
| <i>Trisetaria macrochaeta</i> (Boiss.) Maire                                       | Poaceae              |                   | THE. |

|                                                   |               |                  |      |
|---------------------------------------------------|---------------|------------------|------|
| <i>Lysimachia arvensis</i> (L.) U.Manns & Anderb. | Primulaceae   | Ain Al-Gatuus    | THE. |
| <i>Adonis aestivalis</i> L.                       | Ranunculaceae | Zeghalil         | THE. |
| <i>Caylusea hexagyna</i> (Forssk.) M.L.Green      | Resedaceae    | Fattolet El Holi | THE. |
| <i>Galium tricornutum</i> Dandy                   | Rubiaceae     | Dibbaykah        | THE. |

In this study, a total of 86 species of flowering weed plants were collected, representing 70 genera and 22 families. Of these, 20 families, 59 genera, and 74 species were dicotyledons, while two families, 11 genera, and 12 species were monocotyledons (Table 2). This results in a ratio of approximately 6:1 between dicotyledons and monocotyledons.

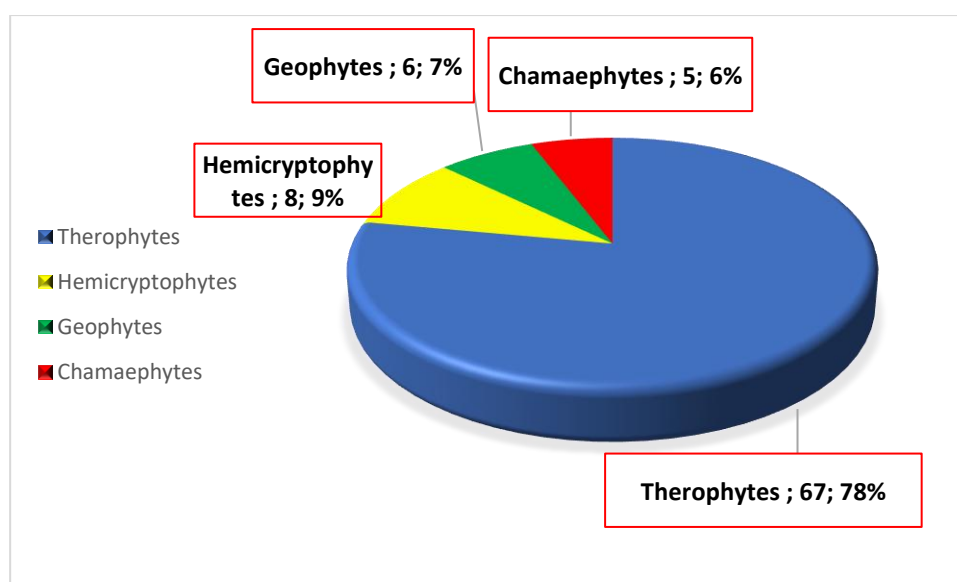
**Table (2):** Different taxonomic groups present in the study area.

| Plant group    | No. of families | No. of Genera | No. Species |
|----------------|-----------------|---------------|-------------|
| Dicotyledons   | 20              | 59            | 74          |
| Monocotyledons | 2               | 11            | 12          |
| Total          | 22              | 70            | 86          |

The families with the highest number of species in the study area were Asteraceae with 20 species, followed by Fabaceae with 18 species and Poaceae with 10 species. The next largest family was Brassicaceae with eight species, while Apiaceae, Papaveraceae, and Plantaginaceae each had three species. Previous studies on the Libyan flora have also reported these families as having the largest number of species [14]; [15]; [1]; [10]; and [12]. Seven families, including Amaryllidaceae, Boraginaceae, Convolvulaceae, Caryophyllaceae, Geraniaceae, Malvaceae, and Lamiaceae, had two species each, while the remaining families were represented by only one weed species each.

Based on the number of species in each genus in the study area, it was determined that *Astragalus* and *Vicia* were the only two genera with four weed species each. Ten genera, including *Allium*, *Echium*, *Malva*, *Erodium*, *Convolvulus*, *Papaver*, *Trifolium*, *Plantago*, and *Medicago*, were represented by two species each. The remaining seventy-four genera were each represented by only one species.

The plant life forms in the study were classified into four categories: Therophytes with 67 species (78%), Hemicryptophytes with 8 species (9%), Geophytes with 6 species (7%), and Chamaephytes with 5 species (6%) (Figure 2). Therophytes were found to be the most dominant life form in the study area. These results are consistent with previous studies by [10] and [12], which also reported the prevalence of therophytes over other life forms.



**Figure (2):** Life form spectrum of the recorded species in study area.

The survey data revealed that 15 weed species were present in the quadrates that were studied. However, species with low densities (less than 1.5 plants in all quadrates) were not considered in the analysis. The results of the weed density for each species can be found in Table 3. The data indicated that the surveyed fields were primarily infested with *Oxalis pes-caprae*, *Sinapis alba*,

*Avena sterilis*, *Malva parviflora*, *Brassica tournifortii*, *Lolium rigidum*, *Matricaria aurea*, *Poa annual*, *Bombycilaena discolor*, *Malva sylvestris*, *Lysimachia arvensis*, *Anthemis secundiramea*, *Notobasis syriaca*, *Hordeumm marinum* and *Aegilops ventricosa*. Furthermore, the study revealed that the field contained a mixture of both broadleaf and grass species.

**Table (3):** Weed density ( $m^{-2}$ ) and weed frequency (%) for the individual weed species of barley crop in the study area.

| Species                      | Density ( $m^{-2}$ ) | frequency (%) |
|------------------------------|----------------------|---------------|
| <i>Oxalis pes-caprae</i>     | 25                   | 57            |
| <i>Sinapis alba</i>          | 18                   | 31            |
| <i>Avena sterilis</i>        | 17                   | 34            |
| <i>Malva parviflora</i>      | 15                   | 23            |
| <i>Brassica tournifortii</i> | 7                    | 57            |
| <i>Lolium rigidum</i>        | 7                    | 23            |
| <i>Matricaria aurea</i>      | 5                    | 17            |
| <i>Poa annual</i>            | 4                    | 9             |
| <i>Bombycilaena discolor</i> | 3                    | 17            |
| <i>Malva sylvestris</i>      | 2                    | 23            |
| <i>Lysimachia arvensis</i>   | 2                    | 11            |
| <i>Anthemis secundiramea</i> | 2                    | 17            |
| <i>Notobasis syriaca</i>     | 2                    | 43            |
| <i>Hordeumm marinum</i>      | 2.2                  | 31            |
| <i>Aegilops ventricosa</i>   | 1.7                  | 6             |

Based on the findings of this study, it was determined that the *Oxalis pes-caprae* species is the most prevalent in the study area, with an estimated density of 25 plants/ $m^{-2}$ . This species of pest is considered invasive and toxic to livestock, making it a priority for controlling alien plants [19], followed by *Sinapis alba* with 18 plants/ $m^{-2}$  and *Avena sterilis* with 17 plants/ $m^{-2}$ , while the lowest weed density was calculated for *Aegilops ventricosa* with 1.7 plants/ $m^{-2}$  in the barley fields. The observed rise in weed density can be attributed to the lack of a weed-control practice mindset among farmers in the study area. There is a previous study conducted on barley crop in District Beir Bullerjam, Soloq Region, Libya by [11], which showed that the highest density of grasses was for the species *Lolium rigidum*, followed by *Melilotus indicus*, then *Melilotus indicus*.

Weed frequency is the most effective indicator for the prevalence of weed species in a study area. The frequency percentages for each species are presented in Table 3. According to the data, *Brassica tournifortii* and *Oxalis pes-caprae* had the highest frequency at 57%, followed by *Notobasis syriaca* at 43%. The lowest frequency was recorded for *Aegilops ventricosa* at 6%. This study differs from previous studies conducted by [11] and [10] in terms of the most frequently observed species. Unlike those studies, which primarily focused on *Eruca sativa*, *Melilotus indicus*, *Lolium rigidum*, and *Bromus rigidus*, this study found a higher frequency of different species in crop fields across Libya.

#### Conclusion:

It is necessary to conduct regular surveys to identify potentially problematic weed species and shifts in weed populations. This will allow for targeted research to be directed towards developing new and improved methods of weed control.

#### Acknowledgments:

The authors would like to express their gratitude to the farm owners, particularly Mr. Mohammad Al Amrny, for generously providing facilities and transportation during the field study.

#### Conflict of Interest:

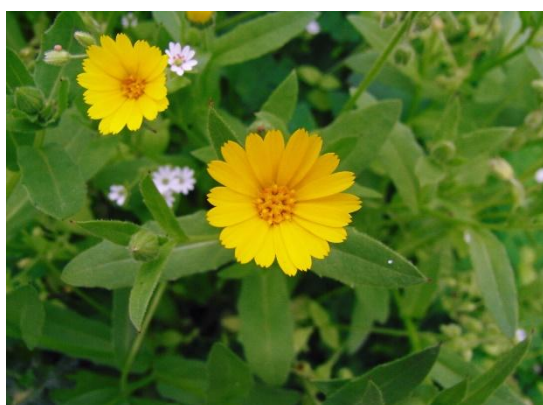
The authors declare that there are no conflicts of interest.

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#### Illustrative Images Appendix:



*Calendula arvensis* (Asteraceae)



*Echinops galalensis* (Asteraceae)



*Matricaria aurea* (Asteraceae)



*Onopordum arenarium* (Asteraceae)



*Echium angustifolium* (Boraginaceae)



*Oxalis pes-caprae* (Oxalidaceae)



*Biscutella didyma* (Brassicaceae)



*Coincya tournefortii* (Brassicaceae)



*Sinapis alba* (Brassicaceae)



*Avena sterilis* (Poaceae)