

Morphological descriptions and checklist of exotic plants in Baghdad

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Abstract:

A total of twenty-five alien species were identified belonging to twenty-five genera and nineteen families, the surveys included 22 different locations of Baghdad illustrated by a geographic map created by ArcGIS v. 10.4 during the period from July 2023 to March 2024. This study reveals the most recent floristic checklist of some alien plants in Baghdad based on-site surveys. The most widely distributed families were Lamiaceae (12%) followed by Acanthaceae, Asteraceae, Asparagaceae and Euphorbiaceae (8%), and Fabaceae (8.3%). Fourteen other families represented (4%). However, in terms of life forms, they consist of perennials (76%), annuals (20%) and biennials (4%). The present comprehensive study of morphology within 25 exotic plants were conducted in which the analysis of morphological characters were including quantitative morphological features like root length and width, blade length, blade width, petiole length, petiole width, etc and qualitative features as leaf apex, base and leaf texture and type, on the other hand, floral traits have been investigated.

Keywords: Alien species, Baghdad city, Micromorphology.

الوصف المظهري و قائمة بأسماء بعض النباتات الغريبة في محافظة بغداد

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مستخلص

تم تشخيص خمسة وعشرين نوعاً غريباً تنتمي إلى خمسة وعشرين جنساً وتسعة عشر عائلة نباتية، وشملت المسوحات 22 موقعاً مختلفاً في بغداد موضحة بالخريطة الجغرافية التي تم انشاؤها عن طريق برنامج ArcGIS v. 10.4 خلال الفترة من يوليو 2023 إلى مارس 2024. تعتبر هذه الدراسة من أحدث الدراسات بإنشاء قائمة بأسماء بعض النباتات الغريبة في بغداد والمعتمدة على المسوحات الحقلية. كانت العوائل النباتية الأكثر انتشاراً هي العائلة الشفوية (12%)، يليها العائلة الأقتنسية والعائلة المركبة، والهلونية، والعائلة السوسبية (8%)، والعائلة البقولية (8.3%). أما العوائل النباتية الأربعة العشر المتبقية فقد مثلت نسبة (4%). أما بالنسبة لأشكال الحياة فقد مثلت النباتات المعمرة نسبة (76%) أما النباتات الحولية فقد مثلت (20%) والنباتات ثنائية الحول نسبة (4%). كذلك تم إجراء الدراسة المظهرية الشاملة لـ 25 نباتاً غريباً، حيث تم دراسة الصفات المورفولوجية بما في ذلك الصفات الكمية مثل طول الجذر وعرضه، وطول نصل، الورقة وعرضها وطول السويقات، وعرضها بالإضافة إلى الصفات الكمية الأخرى الأخرى. كذلك تم دراسة الصفات المظهرية النوعية مثل شكل قمة الورقة وقاعدتها ونوع الورقة وطبيعتها وغيرها من الصفات النوعية الأخرى كصفات الزهرة.

الكلمات المفتاحية: النباتات الغريبة ، مدينة بغداد ، الصفات المظهرية الدقيقة .

1. Introduction:

Baghdad is from the small city in Iraq which situated along the banks of Tigris River, including two quarters (Al-Karkh and Al-Rusafa). This city is characterized by a temperate region as it is hot in the summer season and cold in the winter. The rainfalls usually occur from January till May (Dhamin *et al.*, 2020 and Abdul-Hammed and Mahdi, 2022). For Physio-geography regards, Al-Rawi in 1961 mentioned that Baghdad is located in the Alluvial Plain of Lower Iraq starting from Daltawa about 100 km. north of Baghdad to the shore of the Persian Gulf. The flat terrain of Baghdad is attributed to the origins of the geological of Tigris River and high floods resulted in a diversity of plant life forms in Baghdad (Guest, 1966; Chaudri *et al.*, 1971; Abdulla, 2020; Bashir and Al-Habib, 2020; Naif *et al.*, 2020 and Hussein, 2022). The plant species are regarded as exotic in specific locations when human introduce them accidentally directly or indirectly. The exotic species are one of the most dangerous threats to diversity on the planet. In spite of the introduction of numerous plants in Baghdad but there are no publica-

tions available regarding the checklist of alien plants (Whipple, 2001, Ahmed and Rocha, 2009).

2. Materials and methods:

2.1 Area of study:

The city Baghdad is situated in the middle of Iraq surrounded by Diyala in the east, Babylon in the south, Anbar province in the west and in close to Salahalddin in the north, on a wide alluvial plain at a height of 112 feet above sea level in the coordinate $33^{\circ} 18'55''\text{N}$ and $44^{\circ} 21'58''\text{E}$. This land is primarily flat and low-lying, originating from alluvial deposits. The area of Baghdad is about 204.2 km². The vegetation differs seasonally based on soil moisture and rainfall percentage. The physiognomy of this area is dominated by annual and perennial herbs during winter. Generally, this area is characterized by the distribution of trees and shrubs (Ali *et al.*, 2019 and Abdul-Hammed and Mahdi, 2022).

2.2 Plant collection:

Fresh samples of twenty-five exotic plants were collected from different locations of Baghdad during the period from July 2023 to March 2024. Digital photographs were taken by Canon camera to document the plants

in their habitats. The identification of plant specimens were done by using dichotomous key based on different literature articles and published books (Rechinger, 1964; and Simpson, 2019). For further plant identification, an image comparison in online international websites and herbaria were utilized. A map is created by ArcMap v. 10.4 illustrated the collection zones (Fig.1). 3-D charts were used to investigate the predominance of alien plants and life forms .

2.3 Morphological descriptions and morphometric analysis:

This analysis based on morphological characters on a dissecting microscope was used to magnify the structures of both vegetative and reproductive parts from fresh specimens representing twenty-five introduced plants. Five accessions for each taxa were examined for their morphological features. Some characters were difficult to examine accurately or were missing so this data was eliminated. Quantitative morphological characters like root length and width, blade length, blade width, petiole length, petiole width, etc. were measured by using a ruler and Image J software processing program. The mean values of

morphological data were calculated in Microsoft Excel spreadsheet. Morphological terminology was based on (Harris and Harris. 2009 and Hickey and King, 2010).

3. Results and discussion

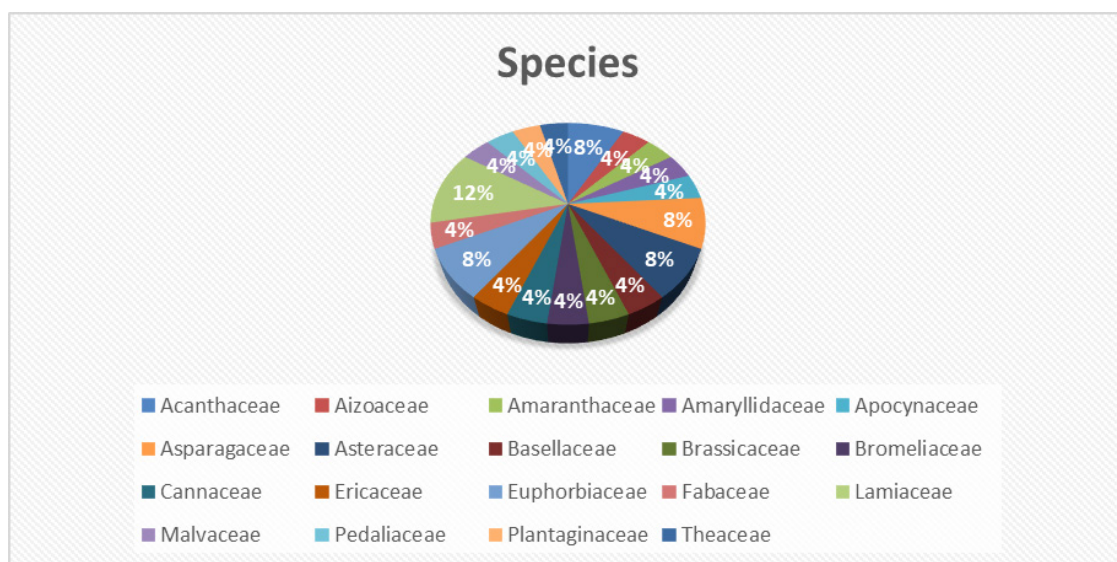
3.1 Checklist of Alien Species

A total of twenty-five alien species were identified belonging to twenty-five genera and nineteen families as illustrated in Table.1 .

Table.1 Checklist of some alien species with their common names and habits

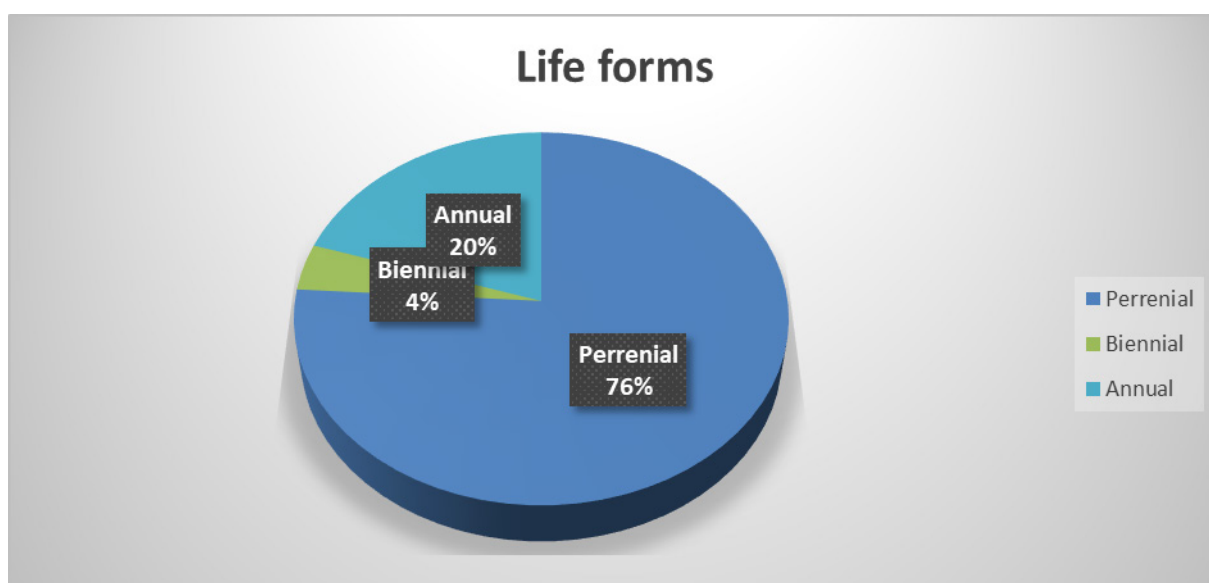
Seq.	Family	Scientific name	Common names	Habits
1	Acanthaceae	<i>Justicia brandegeana</i> Wassh. & L.B.Sm.	Shrimp Plant	Evergreen shrub
2	Acanthaceae	<i>Ruellia simplex</i> C.Wright.	Mexican petunia	Perennial herb
3	Aizoaceae	<i>Lithops karasmontana</i> (Dinter & Schwantes) N.E.Br.	Living stone	Dwarf perennial succulent plant
4	Amaranthaceae	<i>Celosia argentea</i> L.	Silver cockscomb	Annual shrub
5	Amaryllidaceae	<i>Hippeastrum puniceum</i> (Lam.) Voss	Amaryllis lily	Perennial herbaceous bulb
6	Apocynaceae	<i>Stephanotis floribunda</i> Jacques.	Madagascar Jasmine	Evergreen woody vine
7	Asparagaceae	<i>Agave victoriae-reginae</i> T. Moore	Queen Victoria Century Plant	perennial succulent plant
8	Asparagaceae	<i>Asparagus aethiopicus</i> L.	Basket asparagus	Evergreen sprawling herbaceous plant
9	Asteraceae	<i>Calendula officinalis</i> L.	Calendula	Annual herb
10	Asteraceae	<i>Gazania rigens</i> (L.) Gaertn	Coastal Gazania	Perennial herb
11	Basellaceae	<i>Basella alba</i> L.	Malabar spinach	Perennial, succulent vine
12	Brassicaceae	<i>Brassica oleracea</i> L. var. <i>acephala</i>	Ornamental kale	Biennial
13	Bromeliaceae	<i>Lutheria splendens</i> (Brongn. ex Neumann) Barfuss & W.Till	Flaming Sword	Perennial herb
14	Cannaceae	<i>Canna</i> × <i>generalis</i> L.H.Bailey	Canna Lily	Perennial herb
15	Ericaceae	<i>Calluna vulgaris</i> (L.) Hull	Scotch Heather	Perennial shrub
16	Euphorbiaceae	<i>Jatropha integerrima</i> Jacq.	Spicy Jatropha	Perennial woody shrub
17	Euphorbiaceae	<i>Ricinus communis</i> L.	Castor Oil Plant	Perennial shrub
18	Fabaceae	<i>Mimosa pudica</i> L.	Shame lady	Perennial diffuse prickly undershrub
19	Lamiaceae	<i>Callicarpa bodinieri</i> H.Lév.	Beautyberry	Perennial herb
20	Lamiaceae	<i>Leonotis leonurus</i> (L.) R.Br.	Lion's Ear	Short-lived Perennial shrub
21	Lamiaceae	<i>Salvia farinacea</i> Benth.	Mealy cup Sage	Sprawling perennial herbaceous plant
22	Malvaceae	<i>Hibiscus sabdariffa</i> L.	Red sorrel	Annual herb
23	Pedaliaceae	<i>Sesamum indicum</i> L.	Sesame	Annual herb
24	Plantaginaceae	<i>Antirrhinum majus</i> L.	Common Snapdragon	Annual herb
25	Theaceae	<i>Camellia japonica</i> L.	Japan rose	Perennial shrub

The most widely distributed families were Lamiaceae (12%) followed by Acanthaceae, Asteraceae, Asparagaceae and Euphorbiaceae (8%) and Fabaceae (8.3%). Other fourteen families were represented (4%) (Table 1, Fig. 1)



Fig(1). Relative proportion of alien species families

In terms of life forms, they consisted of perennials (76%), annuals (20%) and biennials (4%) (Fig. 2)



Fig(2). Relative proportion of alien species life forms

The field survey including 22 different locations in Baghdad as geographic map was created by ARC-map v.10.4 as illustrated in (Table., Fig.2)

Table.2 Coordinates of field survey

Id	Area	Latitude	Longitude
1	Al-Gherai'at	44.35532	33.40814
2	Al-Gherai'at	44.354491	33.411708
3	Al-Gherai'at	44.345272	33.402982
4	Al-Gherai'at	44.360191	33.396479
5	Suleikh	44.362981	33.386508
6	Al-Adhamiyah	44.376052	33.370607
7	Al-Adhamiyah	44.376805	33.370716
8	Al-Fahama	44.356229	33.435648
9	Al-Fahama	44.360953	33.44082
10	Al- Rashdiya	44.357412	33.419134
11	Al- Sha'ab	44.391322	33.408061
12	Al- Sha'ab	44.401755	33.407019
13	Al-Mustansiriya	44.403544	33.367458
14	Al-Jadriyah	44.379204	33.272386
15	Ziyouna	44.452074	33.331139
16	Ziyouna	44.455037	33.3256
17	Al-Madain	44.581302	33.109876
18	Al- Jamaa	44.325359	33.312563
19	Al-Washash	44.34644	33.329457
20	Andalus	44.333848	33.321779
21	Al- Za'franiya	44.497384	33.252697
22	Al-Thaalbah	44.392018	33.439715



Native to: The northeastern region of Mexico. (Castillo Reyes et al., 2022)



Morphological description: It is a small monocotyledon succulent perennial acaulescent plant (10 cm) in height, known for its dark green leaves characterized with white edges and streaks, the leaves are organized in compact rosettes appearance making it a popular choice for ornamental purposes. Triangular in shape, the thick and hard simple leaves (7-10 cm) are concave at the inner face with a sharply keeled back with white entire margins. The apex of the leaf ends in a brown single stiff thorn (1-1.5 cm) with a truncated base. The plant eventually reaches its reproductive age and produces flowers only once after many long years of life, typically taking around 30 years. When fruits are generated then the plant rapidly dies after (Marti' nez-Palacios et al., 1999).

3.2.2- Scientific name: *Antirrhinum majus* L.

Family: Plantaginaceae (family of Plantago also known as Psyllium or ispaghula)

Arabic names: حلق السبع ، فم السمكة
الشائع ، أنف الثور

Native to: western Mediterranean regions such as France and Spain.(To-

lety & Sane, 2011)

Morphological description: *Antirrhinum majus* is a herbaceous annual plant, measuring 20 cm tall. The green stem exhibits an erect growth pattern, showcasing multiple branches. The leaves, are light green and have a simple broad lanceolate to ovate or elliptic shape, measuring (1-6 cm) long and (1-2.5 cm) broad with opposite arrangement. The leaf is simple with an entire leaf edge with an acute apex and base. The florets are arranged in terminal raceme composed of pink, purple, or white flowers. The flowers (1.5-4 cm) have five hairy green sepals, while the corolla consists of petals fused into tube and bilabiate. The upper lip is characterized by two yellow appendages and trichomes. The stamens are didynamous. Heterostyly is noticed in this plant. There is a continual blooming of flowers from September through January.



Figure (5) *Antirrhinum majus* L.

3.2.3- Scientific name: *Asparagus aethiopicus* L.

Family: Asparagaceae

Arabic names: الاسبرجس الخشن، الهليون الخشن

Native to: Cape Provinces in South Africa. (Rojas-Sandoval & Acevedo-Rodriguez, 2022)

Morphological description: This monocotyledon plant is an evergreen sprawling herbaceous species with numerous low stature, arching, or semi-erect to weakly decumbent stems. Young shoots are ribbed and armed with small, stiff, curving axillary spines measuring between (1–1.5 cm). The leaves have been reduced into veinless scales and are found at the bases of numerous branchlets (Cladodes or clado-

phylls) which are leaf-like modified stems (1-4 cm) emerging in clusters (2-8) from knobs above the spines and they lend the plant a ferny appearance. One can observe the cladodes linear, flat structure which resembles needles, varies in shade from light to bright green as they exhibit a single middle vein. Furthermore, these cladodes measure (2–5 mm) wide and gradually narrow towards a fine short point (acuminate apex). The branches are adorned with numerous small white bisexual flowers (3-4 mm) in diameter, arranged in short axillary racemes. These flowers exhibit a star-like form, adorned with six white stamens and orange or red anthers, as well as a swollen ovary. The fruit is a round, juicy berry that measures (3-5

mm) in diameter, changing color from green to orange-red as it ripens and containing a single black seed. Between January and March, the species

reaches its peak period of flourishing, with fruiting occurring continuously throughout the year.



Figure (6) *Asparagus aethiopicus* L.

3.2.4- Scientific name: *Basella alba* L

Family: Basellaceae

Arabic names: سبانخ مالابار

Native to: Tropical Asian countries such as India, and Indonesia. (Chaurasiya et al., 2021)

Morphological description: It is perennial, succulent vine. The red stem is succulent and stout at the base and becomes green and fleshy towards the tip, it's (70 cm) in length, and bears terminal spikes. The leaves are green, acuminate apex, rounded or cordate base with red entire margins, they are

alternate distichous in arrangement. The length of cordate leaves ranges between (1-10) cm depending on the age. A characteristic feature of these leaves is their well-defined veins that radiate outwards from the middle and have a reddish shade. *Basella alba* main edible component is these succulent leaves. The actinomorphic flower is white and pinkish are arranged in short spikes at the leaf axils, the flower is sessile and remains closed during anthesis. The fruits are like a small pea with four lobes and enclosed within fleshy,

purple, or black perianth. The fruits and fruit development lasts from July through December. contain one seed and red juice. Flower



Figure (7) *Basella alba* L.

3.2.5- Scientific name: *Brassica oleracea* L. var. *acephala*

Family: Brassicaceae

Arabic names: كرنب البستاني ، ليشو

Native to: France, Britain, and Spain.(Šamec et al., 2019)

Morphological description: the plant is a biennial plant, often cultivated as an annual ornamental plant that is used during the cool season. Lacks the ability to form dense cabbage-like heads (the term *acephala* refers to being without a head). The large loose rosette (15-20 cm) in diameter, on an erect thick unbranched stem (20-35 cm) with sand color, the rosette displays ruffled and curly white, pink, purple,

or red leathery broad and flat leaves with crinkle-edged, it is formed by the strongly overlapping alternate leaves. Upper kale leaves are sessile, but the lowermost kale leaves have long petioles and exhibit a reticulate venation pattern. The plant was not flowering during the study period.



Figure (8) *Brassica oleracea* L. var. *acephala*

3.2.6- Scientific name: *Calendula officinalis* L.

Family: Asteraceae

Arabic names: بكورية طبية ، نبتة القديس
يوحنا ، أذريون طبي

Native to: Mediterranean area.(Cromack & Smith, 1998)

Morphological description: This herb usually grows as an annual or short-lived perennial with a height ranging from (20 - 30 cm). The ribbed erect green stem is covered with fine hairs. Heterophylly is a distinctive feature in the plant's appearance, where the lower leaves are spatulate and the upper leaves are lanceolate. The leaves exhibit a variety of sizes (5 - 15 cm)

in length; the leaves are hairy on both sides, sessile and alternate, display a pinnate venation with acute apex and cuneate base, and the margins are entire. The yellow-orange terminal inflorescences consist of a dense flowerhead measuring (5-8 cm) in diameter. It is encompassed by two layers of hairy bracts followed by multiple circles of ray florets (with two or three teeth) surrounding the green disc florets at the base and purple at the apex in the centre. the flowering period is during January. The plant has no fruits.



Figure (9) *Calendula officinalis* L.

3.2.7- Scientific name: *Callicarpa bodinieri* H.Lév.

Family: Lamiaceae

Arabic names: جميلة الثمر ، كاليكاربا

Native to: Vietnam, Laos, Thailand, Cambodia, and China. (Leeratiwond et al., 2009)

Morphological description:

Callicarpa bodinieri H. Lév. is a perineal herb reaching a height of 1 meter, the leaves are opposite, simple, sessile, serrated margins, elliptical to ovate, and deep green color with purple and bronze streaking contributing to its ornamental appeal. No flowers have been noticed as this plant is introduced in fruiting status. The clustered

berries that emerge in late summer are small, glossy, and jewel-like displaying shades of violet to magenta. This plant is imported into the country and flourishes with fruits but lacks any visible flowers. The plant was examined exclusively in November.



Figure (10) *Callicarpa bodinieri* H.Lév.

3.2.8- Scientific name: *Calluna vulgaris* (L.) Hull

Family: Ericaceae

Arabic names: حشيشة المكنسة، خنج
أسكتلندي

Native to: all of Europe. (Ghedira & Goetz, 2013)

Morphological description: These shrubs are small and low-growing, with a maximum height of 25 cm. They have green leaves that are needle or scale-like and evergreen, measuring less than (2-3 mm) in length. The leaves grow in pairs that are opposite and decussate. The crowded leaves create a feathery appearance to the plants. Additionally,

these shrubs produce vibrant blooms in various shades of yellow, blue, pink, or purple. The flowers arranged in terminal racemes are accompanied by bracts with different colors at their base. The flowers are like bells and four petals fused together with four sepals of identical shades. The plant population flourished and was photographed during December.



Figure (11) *Calluna vulgaris* (L.) Hull

3.2.9- Scientific name: *Camellia japonica* L.

Family: Theaceae (tea family).

Arabic names: كاميليا ، زهرة الشتاء

Native to: specific parts of Japan and the islands nearby.(Wendel & Parks, 1985)

Morphological description: This woody shrub, standing at 70 cm tall is an evergreen flowering plant with an abundance of branches characterizing the growth pattern. As the branches mature, they transition from reddish-brown to a woody grey-brown color. The simple leaves are arranged in an alternate spiral manner. The leaves are broad elliptical shapes with acute apex, acute to obtuse base, and (serrulate)

margins, these leathery leaves measure (4-10 cm) long and have a dark green color on their upper side and a paler appearance on their underside, the petioles measure (0.5-1 cm) in length. and stipules are not observed. The young shoots have two budding flowers, during blooming, only one bud will develop into a white or pink individual axillary bisexual flower (4-5 cm) across (Prominent apical dominance phenomena). The pink flowers have numerous whorls of petals rows, whereas the white flower exhibited only a single row of (5-8) petals. Numerous yellow stamens are noticed. November and December are ideal months for its blossoming. No fruits have been recognized.

Figure (12) *Camellia japonica* L.

3.2.10- Scientific name: *Canna* × *generalis* L.H.Bailey

Family: Cannaceae

Arabic names: كانا ، ورد الموز الاحمر

Native to: cultivated.

Morphological description: The plant Herbaceous and perennial in warm regions, this monocot artificially crossbreed hybrid (*Canna* × *generalis* is not naturally present in the environment; it is a cross between *Canna indica* × *C. glauca* and *Canna indica* × *C. iridiflora*). (Prince, 2010). The plant is measuring (1 m) in height with a stiff, purple cylindrical stem, woody at the base and enveloped by leaf sheath. The leaves are paddle-shaped, measuring (30-60 cm) in length, and are arranged alternately in two rows, deciduous. The shape of the blade is ovate to elliptic, tapering at the base and acute at the tip.

The blade is fleshy and becomes thin at the membranous margins, with smooth edges. It is characterized by pinnately veined leaves with a prominent midrib and parallel lateral veins. There are no stipules. The leaves possess a range of colors, from greens to purple and reddish brown, with beautiful streaks of these colors; even when the plant isn't blooming, its foliage enhances its ornamental value. The panicle consists of a pair of flowers on a peduncle (10- 15 cm) in a terminal bracteate cyme, with one flower younger than the other and the young one enclosed in a tubular sheath. The large, showy flowers have wide petals that often overlap, creating a striking aesthetic enhanced by their red color and yellow spots at each petal's base. Blooming is at its peak during the summer and autumn months.



Figure (13) *Canna* × *generalis* L.H.Bailey

3.2.11- Scientific name: *Celosia argentea* L.

Family: Amaranthaceae

Arabic names: عرف الديك

Native to: South America such as the Bahamas, Cuba, and Jamaica. (Acevedo-Rodríguez & Strong, 2012)

Morphological description: It is an erect plant with a stiff stem reaching 1 meter high changing from pink to yellowish-green as it matures. The alternate leaves have a lanceolate-oblong with entire margins and a glabrous, shiny green surface, typically ranging from (5-15 cm) in length. The slender petiole measures (2-3 cm) in length. The petiole and midrib of early

seedling leaves are reddish. *Celosia argentea* is characterised by its unique feathery, reddish-purple inflorescence, which consists of densely packed flowers on an unbranched pedunculate spike that ranges from (3 - 20 cm) long and (2 - 5 cm) wide. The inflorescence eventually transforms into a cylindrical or cockscomb-like shape, leading to its common name. The flowers are small, apetalous and inconspicuous, enclosed by delicate bracts ranging from pink to creamy or light copper color, characterised by a concave lanceolate shape and deltoid appearance at the base of the spike. The plant is flowering in October. No seeds have been recognised.



Figure (14) *Celosia argentea* L.

3.2.12- Scientific name: *Gazania rigens* (L.) Gaertn.

Family: Asteraceae

Common name: Treasure Flower, Coastal Gazania, or African Daisy.

Arabic names: الغازانيا الجامدة

Native to: Southern Africa coastal regions. (Reddy et al., 2014)

Morphological description: it is an herbaceous plant that thrives perennially, being characterized by its limited spreading stems, which commonly grow no taller than 15-30 cm. The leaves, which are arranged alternately, display a variation in shape and measure between (4-12 cm) long and (5-40 mm) wide, they may be thin and mostly lanceolate tapering gradually towards the petiole or divided into numerous narrow lobes, characterized

by serrated margins. A slightly fuzzy look is given to the dark green leaves due to their delicate, silky, and white hairs. The flower heads (Capitula) are terminal, single, borne on peduncles, and comprise of central disk florets and outer ray florets, making the blooms. The bases of outer ray floret petals are brown and the longitudinal ridges are pink characterized by arrow shape tips, these ray florets surround the central disk (eye) containing numerous yellow disk florets. A cup-shaped structure (involucre) is situated at the base of every flower head, which is composed of elongated green bracts arranged in either two or three rows. From July through to February, the time of flowering was documented.



Figure (15) *Gazania rigens* (L.) Gaertn.

3.2.13- Scientific name: *Hibiscus sabdariffa* L.

Family: Malvaceae

Arabic names: الكجرات ، الكركدية

Native to: India, Egypt, and Tropical African countries such as Nigeria, Sudan, Congo, Central African Republic, Chad, Ghana, and Zaire.

Morphological description: *Hibiscus sabdariffa* L. is a glabrous herbaceous plant, that grows annually and has erect, red, stems reaching heights of 2.5m at maturation. Gradually, the young simple - single leaves will evolve into three to five-lobed leaves with its growth, (15 cm) in length. Long petioles (reach to 11 cm) support the leaves, which are arranged alternately and characterized by serrate

margins. The leaves of roselle are dark green and the veins are red. In solitary pattern, the flowers occur exclusively at the tip with short peduncles. They are white or pale pink with a dark red center and the short staminal column consists of multiple stamens along it. The flower has a red calyx (2 cm) in length, it contains five connate large sepals with ten, red at the beginning and black at the end accompanying epicalyx. The fruit is a deltoid capsule, it remains within the accrescent calyx and contains numerous seeds. Blooming happens from the end of September to the end of October while the fruits mature in November and December.



Figure (16) *Hibiscus sabdariffa* L.

3.2.14- Scientific name: *Hippeastrum puniceum* (Lam.) Voss

Family: Amaryllidaceae (the Narcissus family).

Arabic names: نجمة الفارس القرمزية ،
ابصال الاماريليس

Native to: Countries in tropical South America. (Ziffer-Berger & Chic-aia, 2015)

Morphological description: This monocot plant is an herbaceous perennial tunicate bulb. The bulbs are large and brown enveloped by a strong outer covering consisting of membranes, with a diameter ranging from (5-10 cm). The bulb produces linear glaucous-green basal leaves that resemble straps, gradually tapering to form an acute apex, entire margin, and glabrous texture on either side, their length ranges

from (30-60 cm) and the width ranges from (2-5 cm). The plant undergoes a period of dormancy after the aerial parts have died out for several months (leaves become dry then fall before flowering and the appearance of flowers precedes the complete growth of the leaves), after flowering, the leaves exhibit hysteranthous behaviour by unfolding. A leafless stem, known as a scape, arises from the bulb and bears flowers on its tall (40 cm) structure. The arrangement of (2-8) flowers in umbels includes lanceolate bracts at their base. When flower buds develop, they direct their noses upwards, the flowers are quite large (6–10 cm) in diameter and shaped like trumpets. Six brilliant tepals form the perianth, incorporating both large outer sepals

and smaller inner petals, but exhibit similar color streaking and appearance, frequently display a color ranging from pale yellow to green at their outer face and a beautiful combination of white and delicate crimson veins and margins create this fascinating color of the perianth inner face, this has caused it to be widely selected for ornamental pur-

poses. At the base, the tepals combine together to create a small tube or throat (2.5-3 cm). The androecium is composed of six stamens featuring white filaments and golden anthers surrounding a filiform white style. It is during November and December when the flowering occurs.



Figure (17) *Hippeastrum puniceum* (Lam.) Voss

3.2.15- Scientific name: *Jatropha integerrima* Jacq.

Family: Euphorbiaceae

Arabic names: جاتروفا حمراء، يטרوفة كاملة

Native to: West Indies (Caribbean islands) such as Cuba.(Minn, n.d.)

Morphological description: It

is a Perennial woody shrub, erect in their growth, the stems exhibit a deep brown shade with branches. The leaves are simple, ovate-semi cordate with an acute apex, rounded leaf base and entire margins, petiolate with alternate foliar arrangement, the petiole length

is (1-5.5 cm). The inflorescence is revealed as a terminal cymose compound dichasium, the peduncle length reaches to (10 cm) it represents the ornamental value of the plant that bears many pedicellate flowers both staminate and pistillate, each pedicel adorned with two reddish-green bracts, sessile, ligulate shape, and acute apex. measuring (1-3 mm) in length while the flowers

measure about (2.5 cm) across and have five red or scarlet petals. The calyx consists of five green campanulate sepals. The female flower is located at the peak of the rachis. In the present research findings, no ripened fruits were identified; just ovary growth was noted. The continuous free flowering period spans from February to December.

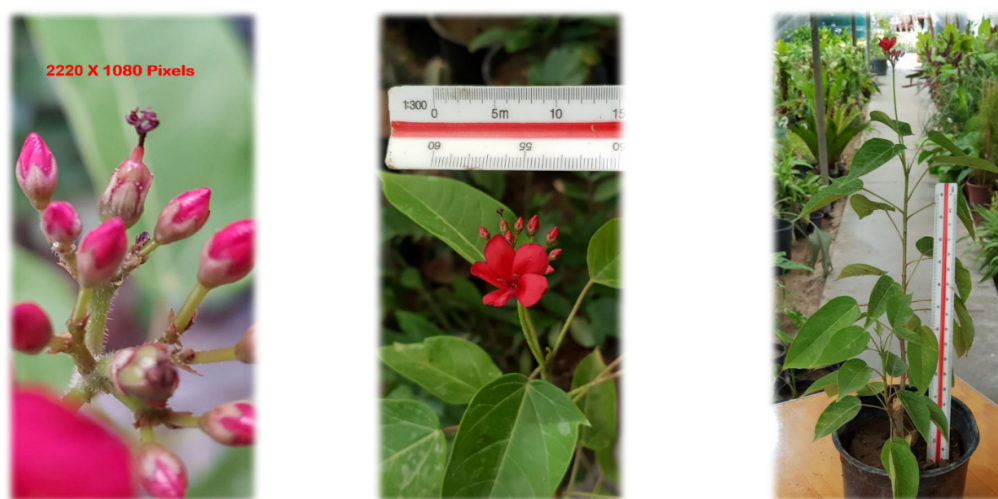


Figure (18) *Jatropha integerrima* Jacq.

3.2.16- Scientific name: *Justicia brandegeana* Wassh. & L.B.Sm.

Family: Acanthaceae.

Arabic names: ورد الروبيان ، نبات الجمبري

Native to: : Mexico.(SINGHURST & HOLMES, n.d.)

Morphological description: The shrimp plant is a type of evergreen

shrub, approximately 45 cm tall. The plant exhibits a stem that is typically erect with multiple branches. Lance-shaped or elliptical is the typical shape of the leaves, (5-8 cm long), (2- 5 cm wide), and they are arranged oppositely on the stem. The bracts are red, orange, and yellow hairy that overlap to form a spike inflorescence, (10 -

15 cm long) resembling a shrimp, as they enclose small white tubular and bi-labiate, the petals highlighted by purple to red spots on their lower lip.

It is a common feature of this plant to possess four stamens. During July, the plant displayed its blooms.

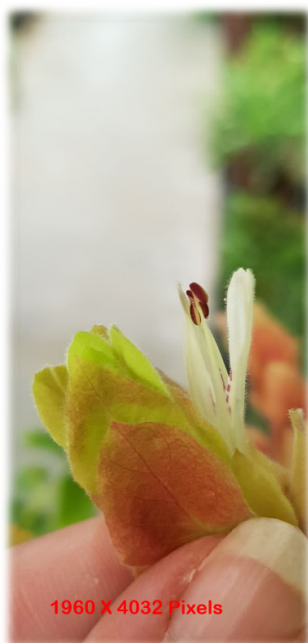


Figure (19) *Justicia brandegeana* Wassh. & L.B.Sm.

3.2.17- Scientific name: *Leonotis leonurus* (L.) R.Br.

Family: Lamiaceae

Arabic names: أذن الاسد الذنبية ، برج خليفة

Native to: : South Africa. (Makhubu et al., 2022)

Morphological description: It is a short-lived perennial hard shrub, rapidly growing and reaching a height of 90 cm. Erect, square and woody thick base stems with numerous vertical branches

covered in thick hair when young. Positioned oppositely, the green leaves (8-12 cm) are lanceolate in shape with toothed margins and pinnate venation pattern, subacute apex; their base gradually narrows into a petiole (2-5 cm). The upper side of the leaves is rough, but underneath they are smooth like velvet. If you crush the leaves, you'll notice a lovely scent that is common among mint family members. Highly ornamental woolly orange curled tubu-

lar two-lipped flowers (1-5 cm long) are located close to the ends of the branches, arranged in axillary rings (5-8 cm wide) around the square stems (sessile inflorescence raceme of verticillasters above a pair of leaves) at various distances. A tube-shaped corolla is made up of fused petals, with the upper lip noticeably longer and more concave than the

lower lip, creating a distinctly curved opening along its length with a flabby edge colored in white and brown. The flowers are enclosed by a green-toothed calyx tube created from fused sepals. Two extended, lanceolate green bracts are linked with every flower. September through November marks the time when blooming takes place.



Figure (20) *Leonotis leonurus* (L.) R.Br.

3.2.18- Scientific name: *Lithops karasmontana* (Dinter & Schwantes) N.E.Br.

Family: Aizoaceae

Arabic names: الصخيرة الحية ، الحجارة الحية ، وجه الصخرة

Native to: : South Africa and Namibia.(Wallace, 1988)

Morphological description: This

plant is a dwarf perennial succulent with no stem. It reaches a height of 3 cm off the ground. Developing clusters of tiny, grey, thick, gravel-like bodies (often 2–6) with wrinkly, rust-coloured tops. Each body is made up of two fused, fleshy leaves that look like horse hooves on top of thick columns. The leaves have a flattened tip with a slit

in the middle and produce new pair of leaves emerging from the central slit. The old leaves split apart in the spring to make way for the new ones, and they eventually dry out, shrink, and eventually disappear within the soil. Lithops

exhibit mimicry and closely resemble stones. In order to evade predation, this plant can employ the strategy of camouflaging itself with the nearby rocks. (Vatandoost, n.d.)



Figure (21) *Lithops karasmontana* (Dinter & Schwantes) N.E.Br.

3.2.19- Scientific name: *Lutheria splendens* (Brongn. ex Neumann) Barfuss & W.Till

Family: Bromeliaceae (pineapple family).

Common names: Flaming Sword, Vriesea.

Arabic names: فيريسيا

Native to: : Guiana.(Corbara et al., 2019)

Morphological description: This plant is a perennial herbaceous mono-

cot measuring (30 cm) in height. The distinctive feature of the Bromeliaceae family lies in its plant's shorter stem axis and closely positioned rosette leaves, which are broad lanceolate, measuring (15 cm) tall and (4 cm) broad, overlapping foliage that creates a unique funnel shape for water storage (tank-type Bromeliaceae). The leaves exhibit a glossy green coloration, including parallel veins and entire margins. The two distinct crimson erect

spike inflorescences emerge from the centre of the rosette leaves in the form of a flattened, sword-like measuring (7-11 cm) tall.



Figure (22) *Lutheria splendens* (Brongn. ex Neumann) Barfuss & W.Till

3.2.20- Scientific name: *Mimosa pudica* L.

Family: Fabaceae

Arabic names: المستحية

Native to: Middle America, regions ranging from Mexico to Tropical America such as Brazil. (Wang et al., 2015)

Morphological description: - It is a perennial spiny plant with hairy branched stem. The leaves are compound bi-pinnate, alternately arranged with oblong pinnae; within each pinna, there are around 15-20 pairs of oblong

pinnules along the rachis of the compound leaf. The pinnules have hairs on their margins. Leaves are incredibly reactive to touch. Small clusters or groups of purple and pink flowers make the solitary compact and spherical stalked inflorescences. The inflorescences are borne on the peduncle. The small size of the individual flowers within the inflorescence is typically less than 1 centimeter in diameter. The flowering period is from July to October and the fruiting occurs in the same period and lasts until November.

Seed pods are flat and oblong (10-25 mm long) emerging as clusters from the ends of the flowering stalks. The individual pod has (1-6) seeds. When they first emerge, they exhibit a green color and subsequently transform into

a more mature brown shade. The edges of these pods are encased in rigid, nearly thorny bristles. A single nursery in the Al-Shamsiya neighborhood housed a small selection of seedlings.



Figure (23) *Mimosa pudica* L.

3.2.21- Scientific name: *Ricinus communis* L.

Family: Euphorbiaceae

Arabic names: الخروع

Native to: East African regions such as Eritrea, Ethiopia, and Somalia. (Goyal et al., 2014)

Morphological description: It is a long-lived perennial, completely glabrous shrub to tree, monoecious, with a single stem, reaching a height

of 55 cm. solid, erect, cylindrical, and branched stem displays a deep crimson brown color with conspicuous nodes where petioles and nector secretory glands are situated, internodes display a range of different lengths from (5-15 cm). Leaves are star-shaped, glossy, deciduous and large (3-23 cm) long, (4-17 cm) wide with rod-like, reddish-brown long petioles that are attached underneath the blade (peltate leaves),

arranged in alternate patterns along the stems, the simple broad palmate leaves are consisting of lanceolate, acuminate 7-9 lobes, with serrated margins. They bear yellow glandular teeth in young leaves, which start with a deep red-brown color, shifting to a more delicate bronze-green color with red veins in adult plants. Yellowish and ovate stipules united to create a protective sheath around the buds. The male buds are wide conical while the female buds are narrow conical. Male and female flowers are arranged in an upright terminal panicle standing at 10 cm in length arranged on a thick rachis, the male

flowers are shortly stalked, located near the base while the pedicellate female flowers are closer to the top both types are apetalous. Each male flower appears array of globose, creamy polyadelphous stamens projecting from the receptacle, enclosed by five leathery yellowish-pink bracts. Female flowers consist of a small spiny ovary enclosed by caducous black bracts and three styles. The ovary later develops into a globose bright red spiny fruit capsule measuring (1.5-2.5 cm) in diameter. October through December marks the duration of blooming.



Figure (24) *Ricinus communis* L.

3.2.22- Scientific name: *Ruellia simplex* C.Wright.

Family: Acanthaceae

Arabic names: بتونيا الصحراء المكسيكية

Native to : Central and South America.(Siyi et al., 2021)

Morphological description: Flowering perennial plant with a herbaceous growth pattern and small stature.

Tetragonal, erect habit stem. Narrow, lanceolate, dark green leaves, ranging from (5- 12) cm long with serrated margins. An opposite leaf arrangement is observed along the stem. The tubular purple flowers with five petals. The solitary flower is borne at the end of the stem. Blooming season, which lasts from late spring to late autumn.

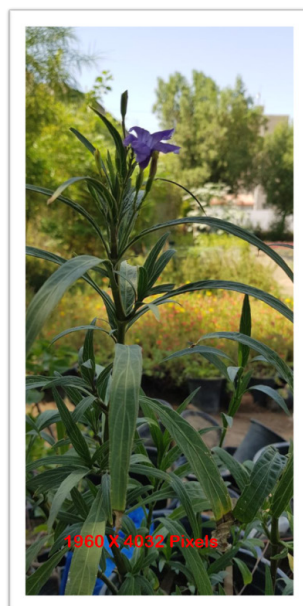
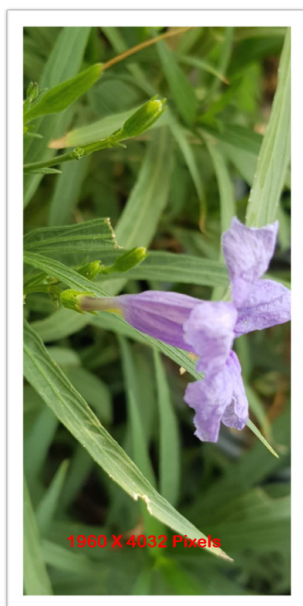


Figure (25) *Ruellia simplex* C.Wright

3.2.23- Scientific name: *Salvia farinacea* Benth.

Family: Lamiaceae (mint family).

Arabic names: ريحان أزرق، ريحان مستورد، قصعين

Native to: North of Mexico and south of United States.(Choi et al., 2022)

Morphological description: It is a flowering sprawling perennial herbaceous plant with erect square stems (a common feature of the mint family), and the stem height is (45 cm). Opposite to whorled, simple leaves arranged in dense clusters on the stems, ovate-lanceolate, glossy, green, and

short petiolate leaves with coarsely serrated margins (3-3.5 cm) in length. Each flower spike bears dense whorls of purple flowers, the terminal spike measuring (11 cm) in length. In each flower, a tubular form can be observed and a remarkable corolla of two-lipped shape; the upper lip shorter than the

lower and takes on the appearance of a hairy hood, while the lower lip displays two distinct lobes with white lines. The plant gets its name (Mealy Cup Sage) because of the calyx, which is covered in dense silky white hairs (like flour). The blooming phase spans from summer through autumn.

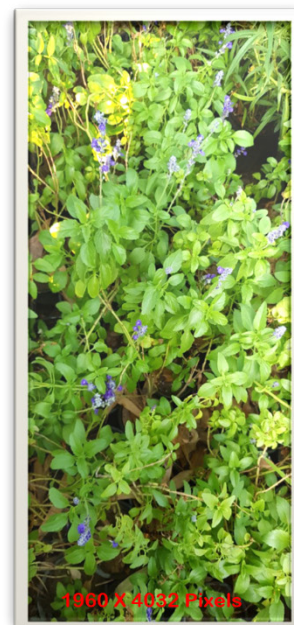
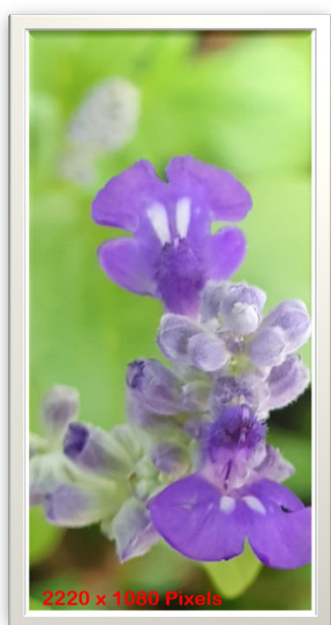


Figure (26) *Salvia farinacea* Benth.

3.2.24- Scientific name: *Sesamum indicum* L.

Family: Pedaliaceae

Arabic names: السمسم

Native to: : India and Tropical Africa.(Miraj & Kiani, 2016)

Morphological description: It is an annual herbaceous plant. Typically having an erect, sturdy, four-angled,

and branching stem with indeterminate growth habit, totally covered with fine hairs, the height of *Sesamum indicum* can range between (1 - 2) m. Leaves are simple, alternate, lanceolate, and petiolate. Their length typically ranges from (5 - 10) cm, while their width is between (2 - 4) cm and they are thinly pubescent with a dark green color. Clus-

ters of bisexual flowers are found in terminal racemes. The flowers are approximately (2-3) cm in length with short pedicels and green calyx is composed of five sepals with a lanceolate shape. The flowers display a bell-shaped form (campanulate, gamopetalous corolla) consisting of five lobes with two lips, with a hairy texture, and a white to creamy color. Very small brown dots adorn the inner side of the flower petals. four stamens arranged in two pairs with white filaments and yellowish-green anthers accompanied by a delicate, white, filamentous style that splits into two branches at the end,

creating a thread-like appearance on the stigma lobes. Axillary floral nectar glands have a small size, globular shape, and yellow color located at the base of the pedicles. The fruit is an oblong capsule with four grooves and a velvety texture, generally around (2-4) cm in length. The capsules contain numerous seeds that are usually organized in rows, characterized by their shape resembling tear-drops and have white color. The plant was in bloom by July, and it started making fruit in August, just one month later, then it faded by October.



Figure (27) *Sesamum indicum* L.

3.2.25- Scientific name : *Stephanotis floribunda* Jacques.

Family: Apocynaceae.

Arabic names: ياسمين مدغشقر ، زهرة
اعراس هاواي

Native to: Madagascar.(Rohrbeck et al., 2006)

Morphological description: It is a woody vine, with an evergreen bloom that climbs upward and has a twining growth habit on wire for support, (45 cm) in height. The leaves are simple, opposite pairs in arrangement, ovate to oblong-elliptical in shape with a slight-

ly mucronate apex, with a leathery texture, and deep green color. Generally, their size ranges from (2 -7) cm tall and (0.8 -5) cm wide. Axillary racemes produce 7 flowers in clusters at the tips of the vine stems. The flower is tubular in shape, waxy pure white. The calyx has five green, broad lanceolate sepals. The corollas with five petals featuring a swollen tip and when the flower opens gives the shape of a star, generally (4 cm) long. The flowering period is during late summer. No fruits have been recognized.



Figure (28) *Stephanotis floribunda* Jacques.

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