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A new species of *Solanum* L.(Solanaceae) from Baghdad city Iraq

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Abstract:

Solanum americanum is a new annual shrubby plant seen recently in fields and gardens of Baghdad city. A new species is described and illustrated, inhabit wet or semi dry places and have consequently a mesophytic habit. A detailed morphological study of the stems, leaves, Inflorescence, flower, male and female reproductive organs and fruits has been done, revealed several interesting taxonomic characteristics, which have not previously been studied in Iraq. Also, anatomical studies reveals constant taxonomical characteristics such as the presence of anthocayanine in outer row of epidermis, distinct chlorenchyma in whole cortex, the wide pith of stems, and presence of distinct mesophyll that differentiated into palisade layer and spongy layer in leaves, amphistomatic bearing anomocytic stomatal complexes that are significant and constant characteristics in species studied.

Key words: Solanaceaceae, *Solanum americanum*, Morphology, Anatomy.

Introduction:

The family Solanaceae is one of large families with around 2000-3000 species in 90 different genera, grow in most temperate and tropical regions, with plants coming from Australia and Central and South America. It is consist mainly of herbs, with a few shrubs and trees, and contains many of most well-known food plants, like Tomatoes, Potatoes and Peppers. Also, it is contains many common garden ornamental plants, including *Petunias*, *Browallia* and *Salpiglossis*. There are several poisonous species, such as Deadly Nightshade (*Atropa belladonna*), Henbane (*Hyoscyamus niger*) and Thorn Apple (*Datura stramonium*), as well as this family contains important economic plants like Tobacco (*Nicotiana tabacum*), which contains the highly toxic alkaloid nicotine [1,2]. *Solanum* is the genus that contains almost half of all the species in the family. Some species of the family contain poisonous alkaloids have given the latter its vernacular name of "nightshade" [1,3]. Solanaceae members are erect or climbing, annual or perennial herbs, but shrubs are not uncommon and there are a few trees. The leaves vary greatly in shape but are generally simple, although sometimes highly lobed, alternate without stipules [2,4].

There are few consistent structures used to identify nightshade species. Flower and fruit structures are the most dependable while vegetative structures are generally inconsistent [5] .There are eight species of *Solanum* in flora of turkey and fifteen species in flora of Europe, but *S.americanum* Mill is not

one of them [4]. *S.americanum* is often found in the form of an erect annual to short-lived perennial [5]. However, many studies on the morphology of various Iraqi species of this family were made. But there was no study on *S.americanum* grown in Baghdad or almost in Iraq. There is just one local specimen for *S.americanum* in BUH (No.45995) collected from house garden in New Baghdad, Baghdad city by A.H. Al-khayat since 1993. The aim of present study was to provide complete information on this new species morphology and anatomy that grown in Baghdad city.

Materials and Methods:

Fresh material of *S.americanum* were collected from house gardens of Baghdad city Al- Karkh side, throughout May-July, 2014. Fresh material were obtained and directly studied in BUH laboratory of College of Science- Baghdad University without any chemical treatment, and was identified using corresponding scientific papers .The stem and leaf have been cross-sectioned by free hand, slides of stems and slides of both sides of leaves were prepared and examined by light microscope Olympus. Digital camera (model Sony Cyber-Shot T 700) was used to take field photographs and microphotographs.

Results and Discussion:

S. americanum is a new annual shrubby plant, seen recently in Baghdad city fields and garden of houses as an interesting weed, has simple or branched stem and fibrous root system as all Solanum species. *S. americanum* has a mesoophytic habit and grow in wet and semi-dry places, Mostly seen in spring or summer in Baghdad city, Figure (1). However, this species is very widespread in the wetter parts as invasive or weed of crops, gardens, parks, roadsides and waste areas in tropical, sub-tropical and warmer temperate regions, [6,7].

Fig. (1) Local *S. americanum* in garden

The stems have taxonomic importance. *S. americanum* stems are glabrous smooth and green, erect, simple or branched, with edentate to inconspicuously dentate ridges, mostly slender but can become woody with age, may have scars at the base where the leaves have fallen. Plants can reach up to 80-130 cm in high, Figure (2 a). Leaves are simple, alternate, stipules absent, ovate-lanceolate to lanceolate, 3 cm to 6 cm long x 2.5 cm to 4 cm wide; margins entire to sinuate, green in color Figure (2b,c). Inflorescence is simple, umbellate cymes, 5 to 10 small star shape flower 8-10 mm across, peduncle is 10-15 mm long. Flower calyces are 5 in number, 1.5 to 2mm long. Corollas are 5 and stellate in shape, white in color, 2 to 5 mm, also it was noticed that corella lobes were converted after porous anthesis, Figure (2d). Anthers are also 5 in number lonely ellipsoid yellow, 1 to 2 mm long with terminal aperture. Figure (2e,f). While ovary is ovate in shape, centric 1mm to 1.5 mm in diameter, Styles were stigmatic with obsolete stigma, terminal, 2 mm to 4.5 mm long, Figure (2g). pedicels were 6 mm to 8 mm long, usually erect Figure (2 h).Fruits

were berries, globose, dark green and become orange in color when ripe, with shiny thick cuticles 4 to 7mm in diameter with many seeds, Figure (2i,j). These findings agreed with the description reported in [2].

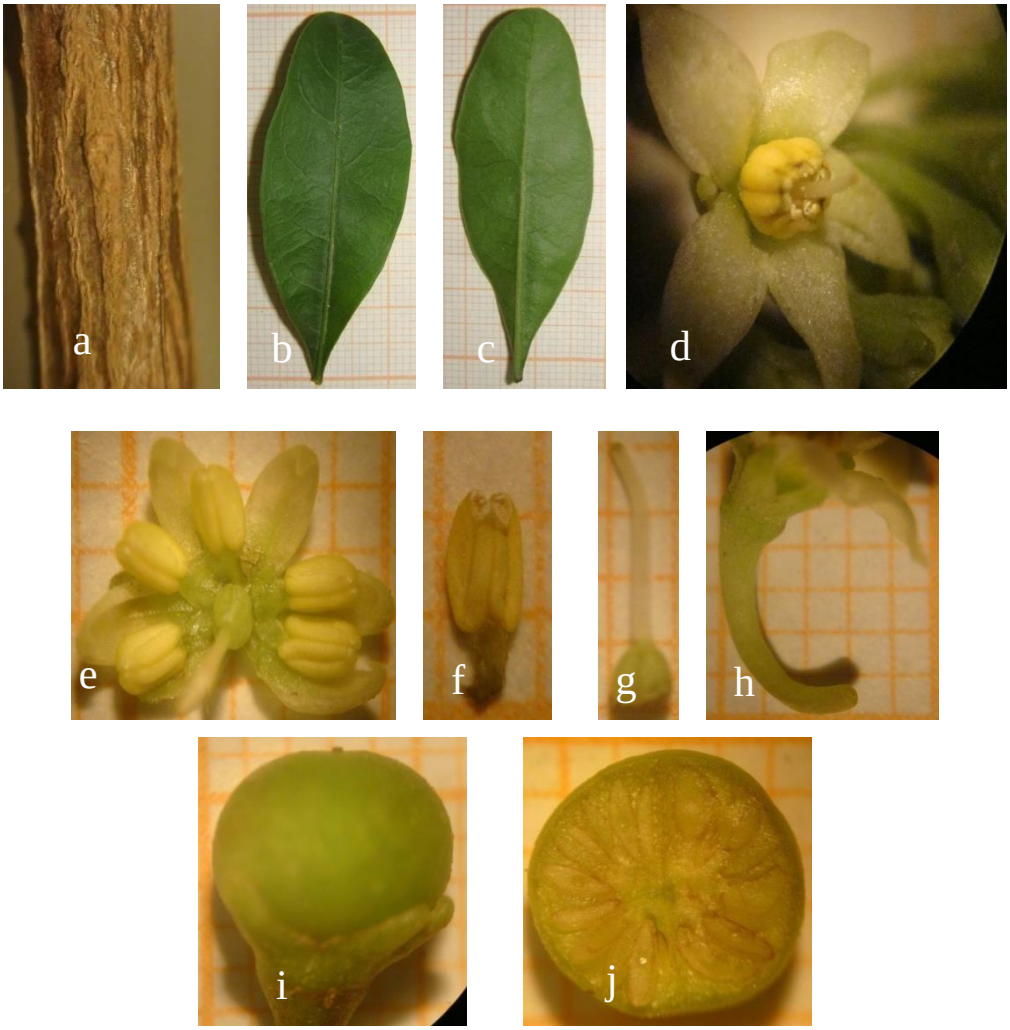

Fig. (2) Morphological features of *S. americanum* a- The Stem, b - The dorsal side of leaf, c- ventral side of leaf, d- the flower, e and f- the anther, g- The ovary and style, - the fruit, h- the pedicels the fruit, i- C.S. in fruit

From anatomical perspective, epidermis of *S.americanum* stem was biseriate to triseriate filled with red color because of Anthocyanin presence. Epidermis thickness is about 18-30 µm,. The epidermal cells seemed to be isodiametric, with distinct cuticle layer over epidermis which reached about 3 µm. Cortex of stem was distinctly formed with 8-12 rows of cells rich in chloroplasts, so is chlorenchyma that constituted the whole cortex, phloem, xylem and deeply within pith cells. Thickness of cortex was about 250-300 µm. The central cylinder was wide with peripheral position because of their similar size and regular positions of bundle caps. Tracheary elements of wood had distinct vessels and trachieds, as were in radial rows. Xylem parenchyma was distinct within the wood. Wood arms projected clearly toward the pith and may be single, double or triples. The mean thickness of wood was about 150-250 µm . The phloem was in external position and surrounded by thick fibrous tissue which identified bundle caps. Phloem thickness was about 22-25 µm.

S.americanum had wide pith where cells were big, with thin walls and distinct intercellular spaces. The pith reached 600-700 µm in diameter .Pith cells were usually spherical and increased in size toward the centre, Figure(3).

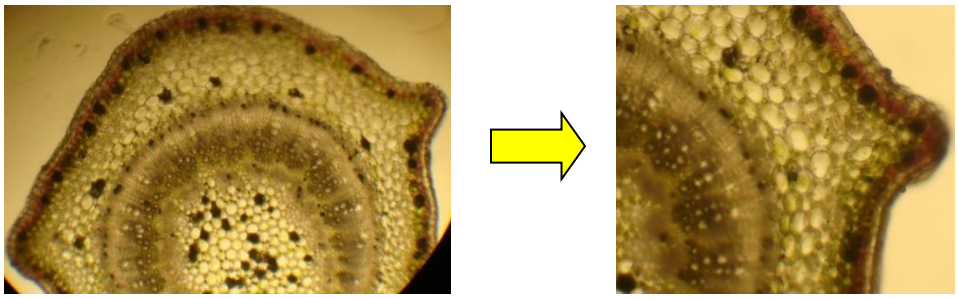

Fig.(3) Cross Section in Stem of *S.americanum* (100X)

Leaf epidermis was uniseriate, regular, thin walled, mostly similar in diameter and covered with thin cuticle layer in time Mesophyll consisted of two palisade and spongy layers. The palisade layer was on adaxial side of leaf and composed of 2-rows of elongated cells. The spongy layer consisted of spherical and subspherical intercellular spaces with around 4-6 rows of cells. Reference [8]Stated that some leaves of plants lacked distinction of layers and others had very marked layers, so the mesophyll can be used as an aid to identification, Figure (4).

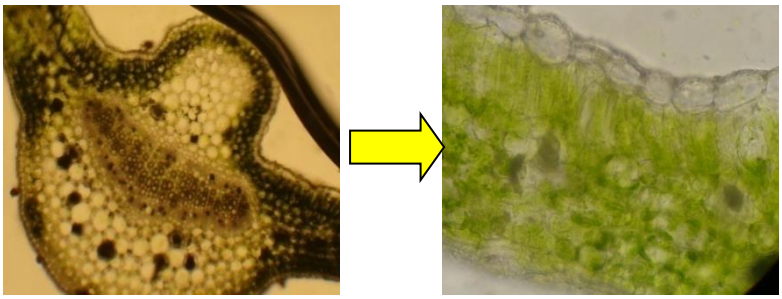

Fig. (4) Cross section in leaf of *S.americanum* (100X)

Vascular bundle shape was seen as circular or sub-circular. The xylem elements was composed of many rows of vessels surrounded by variable parenchyma cells. While, phloem elements were abundant. This characteristic was found in local species and as far as we know it is reported for the first time in this study. The epidermal cells on both abaxial and adaxial sides were irregular or polygonal in outline. Cells pentagonal to hexagonal walls seen. The occurrence of curved walls in species studied agreed with the suggestion of [9,10] that curved wall was a mesomorphic character and that environmental conditions such as humidity played a significant role in determining the pattern of anticlinal cell walls .

S. americanum possessed amphistomatic leaves bearing anomocytic stomatal complexes, this agreed with [11] which noticed the anomocytic type of stomata in some dicotyledonous plants and in many species of *Solanum* . Stomata were more on lower leaf epidermis, although it seen on both sides of leaf

surfaces[12]. In general stomatal complexes occurred only on lower surface (hypostomatic leaves), this might be an adaptation to water loss, this was in consent with [13, 14, 15], as shown in figure (5).

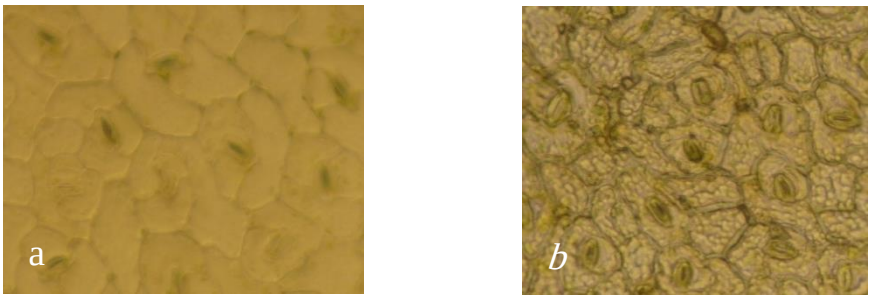

Fig. (5) *S. americanum* anomocytic stomatal complexes (100X) a- adaxial side, b- abaxial side.

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نوع جديد من الجنس *Solanum* L. (Solanaceae) من مدينة بغداد العراق

سيلفا انترانيك زوكيان **علي حسين الموسوي**

قسم علوم الحياة /كلية العلوم/جامعة بغداد

الخلاصة:

Solanum americanum نبات حولي شجيري جديد شوهد مؤخرا في حقول وحدائق مدينة بغداد. نوع جديد تم وصفه وتوضيحه، يتواجد في الاماكن الرطبة وشبه الجافة فهو من نباتات المناطق المعتدلة. قدمت دراسة مظهرية مفصلة للسيقان والاوراق والنورات الزهرية والازهار والاعضاء التكاثرية الذكرية والانثوية فضلا عن الثمار واظهرت صفات تصنيفية مهمة لم تدرس مسبقا في العراق. كما اظهرت الدراسة التشريحية صفات تصنيفية ثابتة مثل تواجد الانثوسيانين في الصف الخارجي من البشرة ووجود الكلورنكيما في منطقة القشرة بأكملها مع وجود منطقة لب واسعة في سيقانها. فضلا عن وجود منطقة ميزوفيل واضحة متمايزة الى طبقة عمادية وطبقة اسفنجية واضحة في الاوراق. كذلك تميزت الاوراق بوجود الثغور في كلا السطحين من نوع Anomocytic والتي تعد من الخصائص الهامة والثابتة في النوع قيد الدراسة.

الكلمات المفتاحية: *Solanum americanum*, Solanaceaceae, المظاهر الخارجية, التشريح الداخلي.