

Taxonomic Studies on the Flowers and Fruits of Some Solanoideae Plants in Egypt

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ABSTRACT

This study is conducted on 18 species representing 6 genera belonging to Solanoideae (Solanaceae). These genera are: *Capsicum* (2 spp.), *Datura* (3 spp.), *Hyoscyamus* (2 spp.), *Lycium* (2 spp.), *Physalis* (3 spp.) and *Solanum* (6 spp.). The plant samples are collected from various floristic regions in Egypt. The study is done on the morphological characters of flowers, inflorescences, fruits and seeds. The results are recorded in the form of comparison between the examined plants. The results showed that the flowers solitary as in *Physalis peruviana* or in cymes inflorescences as in *Hyoscyamus muticus*. Calyx consists of 5 sepals as in *Solanum nigrum* or more as in *Solanum lycopersicum*; campanulate. They are tubular, cub-shaped or plate-shaped. Corolla rotate, funnel-shaped or stellate shaped; lobes 5 or more usually equal or unequal in length and size. Stamens epipetalous is in all the examined plants. The number of the stamens is as many as the lobes of corolla and it is alternate with them; 5 stamens as in *Solanum nigrum* or more than 5 as in *Solanum lycopersicum*; dehiscent longitudinally or by apical pores. Pollen grains spherical as in *Physalis angulata* or oblate as in *Hyoscyamus muticus*. Tri-colporate in all the studied samples as in *Hyoscyamus muticus* except *Physalis angulata* which has four apertures. The ovary has various shapes; ovate as in *Capsicum annuum*, oblong as in *Hyoscyamus muticus* or globular as in *Physalis peruviana*; glabrous, hairy or spiny. Placentation either axile or free central. Fruit capsule as in *Datura stramonium* or berry *Lycium shawii*. Seeds shape ovate, reniform, oblong or globose, testa smooth, curly or hairy.

Key words: Floral Morphology, Fruit, Seed, Palynology, Solanaceae.

INTRODUCTION

The Solanoideae is a major subfamily within the Solanaceae family. This subfamily consists of several well established tribes: Capsiceae, [Datoreae](#), Hyoscyameae, Jaboroseae, Solandreae, Lycieae, [Mandragoreae](#), Nicandreae, Nolanaeae, Physaleae and Solanaeae on the basis of molecular phylogeny Olmstead *et al.* (2008).

Solanoideae contains some of the most economically important genera and species as foods e.g., *Solanum tuberosum* (Potato), *Lycopersicon esculentum* (Tomato), *Solanum melongena* (Eggplant) and *Capsicum* spp. (Pepper), medicinal plants e.g. *Hyoscyamus* spp. and *Datura stramonium* L. or toxic plants e.g. *Solanum nigrum*. Boulos, (2002); Burrows and Tyrl (2013); Kadereit and Bittrich (2016) and Khafagi *et al.* (2018). Solanoideae includes about 50 genera and 1742 species distributed in a diversity range of ecological habitats in both tropical and temperate regions Hunziker *et al.* (2001). The flowers of Solanoideae solitary are as in *Physalis* and *Datura* spp. or aggregated in cymose inflorescences as in *Hyoscyamus* spp.; terminal or axillary (EL-Sayed, (1986) and Fawzi and Habeeb (2016). Flowers, regular or irregular. Calyx 5 sepals, usually equal or unequal in length and size; persistent in fruit

Ara *et al.* (2011). The Corolla of 5 petals is campanulate as in *Hyoscyamus muticus*, funnel shaped as in *Datura metel* or rotate as in *Solanum melongena* Kumari, (2004). Androecium 5 stamens didynamous or not didynamous. Anther dorsifixed or basifixed; dehiscent via pores or dehiscent via longitudinal slits. Pollen grains were single and prolate shaped with 3-zonocolporate apertures as in *Capsicum frutescens* Lashin, (2011); Sharma *et al.* (2017) and Bhat *et al.* (2018). Gynoecium 2 carpelled, rarely 3 carpels. Ovary superior, placentation axile or central. They are fruit fleshy as in *Solanum lycopersicum* or non-fleshy (dry) brown as in *Datura stramonium* or yellowish as in *Solanum elaeagnifolium* Kumari, (2004); Landrum *et al.* (2013); Jagatheeswari, (2014); Kadereit and Bittrich, (2016); Fawzi and Habeeb, (2016); Knapp *et al.* (2017); and Khafagi *et al.* (2018).

MATERIALS AND METHODS

The present study included 18 species of Solanaceae all belonging to one subfamily of Solanoideae and distributed among six tribes according to the classification of Olmstead *et al.* (2008). The study was based on fresh materials collected from different localities in Egypt. The present work was carried out at the Department of Agricultural Botany, Faculty of Agriculture, Al-Azhar University, Cairo,

Egypt. Table (1) represented the scientific names and the sites of collection. The identification of the collected plants was achieved by comparing their morphological characters with the characters of previous plants as published by Boulos (2002) and Kadereit and Bittrich (2016).

The flowers were dissected into their various parts under the light binocular microscope, then spread and cleared in warm lactic acid over slides for examination. The semi-permanent pollen grains preparations were made according to the method of Franks and Watson (1963). All photomicrographs were prepared by digital camera or camera microscope.

Statistical analysis

The analysis was done by Multi Variate Statistical Package (MVSP) program (Sneath and Sokal 1973).

RESULT AND DISCUSSIONS

Flowers characters:

The flowers of the examined samples of solitary are as in *Datura metel* (Fig.1a) or inflorescences scorpioid as in *Solanum lycopersicum* (Fig.1b) or helicoid as in *Hyoscyamus muticus* (Fig.1c). The flowers or inflorescences position is either terminal as *Datura metel* (Fig.1a) or lateral as in *Hyoscyamus muticus* (Fig.1c). Similar results are recorded by Boulos (2002) and Kadereit and Bittrich (2016). The flowers in all the studied plants are actinomorphic as in *Capsicum frutescens*, while they are zygomorphic in *Hyoscyamus muticus* (Table 2). The flowers have pedicels in all taxa, pedicels glabrous as in *Capsicum frutescens* (Fig.1d), hairy as in *Physalis peruviana* (Fig.1e) or hairy and spiny as in *Solanum aelagnifolium* (Fig.1f). These results are in harmony with the findings of Kumari, (2004) and Azza et al. (2018). Calyx consists of 5 sepals in most of the examined species as in *Physalis ixocarpa* (Fig.1g), or more in one whorl as in *Solanum lycopersicum* (Fig.1h). Green Sepals and fused in all the examined species are equal in size as in *Physalis angulata* or unequal as in *Hyoscyamus muticus* (Table 2). Apex of sepals is acute as in *Hyoscyamus muticus* (Fig.1i), acuminate as in *Physalis angulata* (Fig.1j) or obtuse as in *Solanum villosum* (Fig.1k). The calyx has various shapes; campanulate as in *Physalis ixocarpa* (Fig.1g) tubular as in *Datura innoxia* (Fig.1l), cub-shaped as in *Lycium shawii* (Fig.1m) or plate-shaped as in *Capsicum annuum* (Fig.1n). Corolla: petals 5 as many as calyx sepals in most of the studied taxa as in

Solanum nigrum (Fig.1o) or more as in *Solanum lycopersicum* (Fig.1p). The petals are fused in all the examined taxa; they are complete as in *Physalis peruviana* (Fig.1q), shallow as in *Solanum melomgena* (Fig.1r) or deep as in *Solanum nigrum* (Fig.1o). Corolla have various shapes; stellate-shaped as in *Solanum nigrum* (Fig.1o), rotate as in *Physalis peruviana* (Fig.1q) or funnel-shaped as in *Datura innoxia* (Fig.1s). The petals have various colors; purple as in *Solanum melomgena* (Fig.1r); white as in *Datura innoxia* (Fig.1s); yellow as in *Solanum lycopersicum* (Fig.1f) or many colors on the same petals observed in some species as in *Physalis peruviana* (Fig.1q). Petals are equal as in most examined taxa e.g., *Solanum melomgena* or unequal in size and length as in *Hyoscyamus muticus* (Table 2). Apex of petals is acute as in *Solanum nigrum* (Fig.1o) acuminate as in *Solanum lycopersicum* (Fig.1p) or obtuse as in *Physalis peruviana* (Fig.1q). Such results are in accordance with those previously reported by Boulos (2002) and Fawzi and Habeeb (2016).

Androecium:

Stamens are usually epipetalous in all examined samples. The number of the stamens is as many as lobes of corolla and alternate with them; 5 as in *Datura stramonium* (Fig.2a) or more as in *Solanum lycopersicum* (Fig.2b). Stamens are equal as in *Datura innoxia* (Fig.2a) or unequal in length (didynamous) as in *Lycium schweinfurthii* (Fig.22); they are inserted in corolla tube as in *Datura innoxia* (Fig.1s) or exerted from corolla as in *Hyoscyamus muticus* (Fig.2d). Base of filaments is either glabrous as in *Solanum nigrum* (Fig.2e) or hairy as in *Hyoscyamus muticus* (Fig.2f). Filaments are attached with the anther in most studied taxa basifixed as in *Datura metel* (Fig.2a) or dorsifixed in a few samples as in *Physalis angulata* (Fig.2g). Anthers are free as in *Datura metel* (Fig.2a) or united (cone-like) only in *Solanum lycopersicum* (Fig.2h). Anthers' color is white as in *Datura stramonium* (Fig.2a), purple as in *Hyoscyamus muticus* (Fig.2f), yellow as in *Solanum lycopersicum* (Fig.2h) or bluish as in *Capsicum annuum* (Fig.2i). Anthers are glabrous as in *Solanum nigrum* (Fig.2e), hairy as in *Datura metel* (Fig.3a) or papillate texture as in *Lycium shawii* (Fig.3b). Anthers dehiscing by longitudinal slits as in *Physalis ixocarpa* (Fig.3c) or terminal pores as in *Solanum nigrum* (Fig.2e). Pollen grains of the studied taxa are either spherical as in *Physalis angulata* (Fig.3d) or oblate as in *Hyoscyamus muticus* (Fig.3e). Pollen grains apertures are tri-colporate in all the studied samples as in *Hyoscyamus muticus* (Fig.3e) except *Physalis angulata* which has four

apertures (Fig.3d). The filament length varies from 2-125 mm. as in *Solanum villosum* and *Datura stramonium* respectively, while pollen dimension varies from 18.4×18.4 to 67.7×67.7µ. This is in harmony with Lashin (2011), Sharma et al. (2017), Bhat et al. (2018) and Khafagi et al. (2018).

Gynoecium

The number of carpels is two in all examined taxa e.g., *Solanum nigrum* (Fig.4a) except *Capsicum frutescens* and *Capsicum annuum*, which have three carpels (Fig. 4b). Two locules per carpel in most studies samples as in *Solanum nigrum* (Fig.4a) or more as in *Datura metel* (Fig.4c). The ovary has various shapes; ovate as in *Capsicum frutescens* (Fig.4d), oblong as in *Hyoscyamus muticus* (Fig.4e) or globular as in *Physalis peruviana* (Fig.4f). The ovary is glabrous as in *Capsicum frutescens* (Fig.4d), hairy as in *Solanum elaeagnifolium* (Fig.4g) or spiny as in *Datura stramonium* (Fig. 4h). Placentation is axile in all studied samples as in *Solanum lycopersicum*, except *Capsicum frutescens* and *Capsicum annuum* that have free central placentation (Table 2). The styles united in all the studied plants, either exerted from corolla as in *Hyoscyamus muticus* or inserted in corolla as in *Datura stramonium* (Table 2). The style length ranged between 2 mm. to 125 mm. as in *Cestrum nocturnum* and *Datura stramonium* respectively. The style is glabrous as in *Capsicum annuum* (Fig.4d) or hairy as in *Solanum nigrum* (Fig.4i). There are two stigmas in all examined plants e.g., *Datura metel* (Fig.4j) except *Capsicum frutescens* and *Capsicum annuum* that have three (Fig.4k). The capitate shapes of stigma are as in *Physalis ixocarpa* (Fig.4l) they are lobed as in *Datura metel* (Fig.4j) or linear as in *Hyoscyamus albus* (Fig.4m). Nectariferous is as in *Datura stramonium* (Fig.4n) or absent as in *Capsicum annuum* (Fig.4d). Similar results are in agreement with the results of Kumari (2004), Jagatheeswari (2014), Kadereit and Bittrich (2016) and Knapp et al. (2017).

Fruits and seeds:

The fruit types of the studied samples ranged between capsule (dry dehiscence) as in *Datura stramonium* (Fig.5a) and berry (fleshy indehiscence) as in *Solanum melongena* (Fig.5b). Fruit is dehisced by pyxidium as in *Hyoscyamus muticus* (Fig.5c). They are valves as in *Datura stramonium* (Fig.5a). The fruit patent is either erect as in *Datura stramonium* (Fig.5a) or pendulous as in *Solanum melongena* (Fig.5b). The fruits texture is glabrous as in *Solanum melongena* (Fig.5b) or spiny only in *Datura* spp.

(Fig.5a). Shape of fruits are ovate as in *Datura stramonium* (Fig.5a), obovate as in *Solanum melongena* (Fig.5b), oblong as in *Hyoscyamus muticus* (Fig.5c), globose as in *Solanum villosum* (Fig.5d) or cylindrical as in *Capsicum frutescens* only (Fig.5e). The fruit color varies from black as in *Solanum melongena* (Fig.5b), brown as in *Hyoscyamus muticus* (Fig.5c), red as in *Solanum lycopersicum* (Fig.5f), yellow as in *Solanum elaeagnifolium* (Fig.5g), orange as in *Solanum villosum* (Fig.5d) or pale green as in *Solanum tuberosum* (Fig.5h). The seeds have various shapes; ovoid as in *Solanum elaeagnifolium* (Fig.5i), oblong as in *Hyoscyamus muticus* (Fig.5j), reniform as in *Lycium schweinfurthii* (Fig.5k) or globose as in *Physalis peruviana* (Fig.5l). The seed colors are black as in *Datura metel* (Fig.5m), brownish as in *Hyoscyamus muticus* (Fig.5j) or yellowish as in *Physalis peruviana* (Fig.5l). Seed texture is smooth as in *Solanum elaeagnifolium* (Fig.5i) curly as in *Datura metel* (Fig.5m) or hairy as in *Solanum lycopersicum* (Fig.5n). The seeds dimension ranged between 1241 x 1386 µ as in *Solanum nigrum* and 4550 x 3800 µ as in *Lycium schweinfurthii*. These results are in agreement with results obtained by Kumari (2004), Burrows and Tyrl (2013), Jagatheeswari (2014) and Khafagi et al. (2018).

According to the present dendrogram (Fig.6), the studied 18 taxa are classified into 2 different clusters as the follows:

Cluster (1): includes the studied 3 taxa of *Datura* spp. the similarity between *D. metel* and *D.*

innoxia is higher than that those of *D. stramonium*.

Cluster (2): divided into two groups:

Group A: classified into 2 sub-groups as follows:

The sub-group (A₁) includes all the studied species of *Solanum* spp. and *Physalis* spp. In genus *Solanum*, the highest similarity is between *Solanum tuberosum* and *Solanum elaeagnifolium*, while the lowest similarity is between *Solanum nigrum* and *Solanum villosum*. In genus *Physalis* the similarity between *Physalis ixocarpa* and *Physalis angulata* is higher than that those of *Physalis peruviana*.

The sub-group (A₂) includes genera of *Lycium* and *Hyoscyamus* only.

Group B- includes genus *Capsicum* alone.

Generally, in all the studied taxa the highest similarity is 0.975 which is recorded between *Datura metel* and *D.innoxia*, *Lycium*

spp. and *Hyoscyamus* spp., while the lowest similarity is 0.811 which is recorded in genus *Solanum* between *Solanum villosum* and *S. nigrum*.

Qualitative character

Floral characters

Flowers:

- solitary (+), in an inflorescence (-)
- inflorescences, scorpioid (+), helicoid (-)if solitary*
- position, terminal (+),lateral (-)
- actinomorphic (+), zygomorphic (-)
- calyx sepals, number, five (+) more than (-)
- calyx sepals equal (+), unequal (-)
- corolla petals, number, five (+) more than (-)
- corolla petals equal (+) unequal (-)
- androecium stamens number, five (+), more than (-)
- stamens inserted (+)=, exerted (-)
- stamens equal in length (+), unequal (-)
- filament base, glabrous (+), hairy (-)
- anther free (+), united (-)
- basifixed (+), dorsifixed (-)
- dehiscent, by longitudinal (+), with apical pores (-)
- pollen grain shapes, spherical (+), oblate (-)
- pollen grain apertures, three (+), four (-)
- gynoecium carpels number, two (+), three (-)
- locules number, 2 (+), more than 2 (-)
- placentation, axil (+), free central (-)
- style, exerted from corolla (+), inserted in corolla (-)
- glabrous (+), hairy (-)
- stigmas number, two (+), three (-)
- necatariferous present (+), absent (-)

Fruits:

- patent, erect (+), pendulous (-)
- dry (+), fleshy (-)
- dehiscent (+), indehiscent (-)
- dehiscent, valvate (+), pyxidium (-), If indehiscent *

glabrous (+), spiny (-)

Multistate characters:

Flower pedicel (3 categories): glabrous1; hairy 2 and spiny 3.

Calyx shape (4 categories): campanulate 1; tubular 2; cub-shaped 3 and plate-shaped 4.

Sepals' apex (3 categories): acute 1; acuminate 2 and obtuse 3.

Corolla shapes (3 categories): rotate 1; funnel- shaped 2 and stellate shaped 3.

Petals lobes united (3 categories): complete 1; shallow 2 and deep 3.

color (4 categories): white 1; yellow 2; purple 3, with various color 4.

Petals apex (3 categories): acute 1; acuminate 2 and obtuse 3.

Anther colors (4 categories): white1; purple 2 bluish 3 and yellow 4.

texture (3 categories): glabrous 1; hairy 2 and papillate 3.

Ovary shapes (3 categories): ovate 1; oblong 2 and globular 3.

touch (3 categories): glabrous 1; hairy 2 and spiny 3.

Stigma shapes (3 categories): capitate 1; lobed 2 and linear 3.

Fruit shapes (5 categories): ovate 1; obovate 2; cylindrical 3; oblong 4; and globose 5.

colors (6 categories): pale green 1; black 2; red 3; brown4; yellow 5 and orange 6.

Seed shapes (4 categories): ovoid 1: oblong 2; reniform 3 and globose 4.

colors (3 categories): blackish 1; yellowish2 and brownish 3.

texture (3 categories): smooth 1; curly2 and hairy 3.

Numerical characters

Stamens filament length in mm.

Style length in mm.

Pollen grains dimension in μ .

Seeds dimension in mm.

The previous results are used to construct an indented key for distinguishing the 18 studied species as follows:

Flowers solitary
 +Fruit fleshy berry
 *Calyx plate-shaped
 Fruit oblong *Capsicum annuum*
 Fruit cylindrical *Capsicum frutescens*
 ** Calyx campanulate shaped
 Pedicle glabrous, stigma capitate
 Pollen grains 4-colporate *Physalis angulata*
 Pollen grains 3-colporate *Physalis ixocarpa*
 Pedicle hairy, stigma linear
 Fruit orange *Physalis peruviana*
 *** Calyx cup- shaped
 Fruit black *Lycium schweinfurthii*
 Fruit orange-red *Lycium shawii*
 ++ Fruit dry capsule
 * Corolla white
 Fruit ovate, black seed *Datura stramonium*
 Fruit globose, brown seed *Datura innoxia*
 ** Corolla with various colors
 Fruit globose, black seed *Datura metel*
 •• Flowers in an inflorescences
 + Fruit dry capsule
 *Pedicle hairy, anther white-yellow *Hyoscyamus albus*
 **Pedicle glabrous, anther purple *Hyoscyamus muticus*
 ++ Fruit fleshy berry
 *Pedicle glabrous
 Calyx campanulate, corolla rotate
 Corolla whit, anther united, fruit pale green *Solanum tuberosum*
 Corolla purple, anther free, fruit black *Solanum melongena*
 Calyx cup-shaped, corolla stellate
 Anther free, style hairy, fruit black *Solanum nigrum*
 **Pedicle hairy
 Corolla (5) petals

Corolla stellate, white, ovary glabrous *Solanum villosum*
 Pedicle hairy and spiny, corolla purple, ovary hair. *Solanum elaeagnifolium*
 Corolla (5)-more than petals
 Corolla stellate, yellow, anther united *Solanum lycopersicum*

REFERENCES

- Ara, T., Khokan, E.H., Rahman, A.M. 2011: Taxonomic Studies on the Family Solanaceae in the Rajshahi University Campus. J. Bio.& Env. Sci. Vol. 1(4) pp.29-34.
- Bhat, N.A., Jeri, L., Puranjy, M., Yogendra, K. 2018: Systematic studies (micro-morphological, leaf architectural, anatomical and palynological) of genus *Physalis* L. (Solanaceae) in Northeast India. Plant Archives. Vol. 18. (2). pp. 2229-2238
- Boulos, L. 2002: Flora of Egypt. AL-Hadara publishing Cairo-Egypt. Vol.3. pp. 35-54.
- Burrows, E.G., Tyrl, J.R. 2013: Toxic plants of North America, second edition. Vol.69.pp. 1130-1176.
- EL-Sayed, Z.A. 1986: Morphological and anatomical studies on some Solanaceae. For The Ph. D. Thesis. Alazher Univ. Fac. of Agric., Bot. Dep.
- Fawzi, N.M., Habeeb, R.H. 2016: Taxonomic study on the wild species of genus *Solanum* L.in Egypt. Annals of Agricultural Science.Vol.61. pp.165-173.
- Franks, J.W., Watson, L. 1963: The Pollen morphology of some critical ericales, Pollen et Spores. pp. 51-88.
- Hunziker, A.T. 2001: Genera Solanacearum: the Genera of Solanaceae. Illustrated, Arranged According to a New System. A. R. G. Gantner, Königstein, Germany.
- Jagatheeswari, D. 2014: Morphological studies on flowering plants (Solanaceae). International Letters of Natural Sciences Vol. 15. pp. 36 - 43.
- Kadereit, W.J. Bittrich, V. 2016: Flowering plants. Eudicots; the Families and genera of vascular plants. Springer International Publishing. Switzerland. Vol.14. pp. 295-391.
- Khafagi, A.A.F., El- Ghamery, A.A., Ghaly, O.N., Ragab, O.G. 2018: Fruit and seed morphology of some species of Solanaceae. *Taekholmia*, Vol. 38. pp. 123-140.
- Knapp, S., Sagona, E., Carbonell, A.K.Z., Chiarini, F. 2017: A Revision of the *Solanum elaeagnifolium* clade (Elaeagnifolium clade; subgenus *Leptostemonum*, Solanaceae). Research PhytoKeys. Vol. 84,pp. 1-104.
- Kumari, M.R. 2004: A Taxonomic Revision of the Indian Solanaceae. Ph.D. thesis in Botany. pp. 17-437.

Landrum, L.R., Barber, A., Barron, K., Coburn, F.S., Sanderford, K., Setaro, D. 2001: Vascular plants of Arizona: Solanaceae part four: *Physalis* L. and *Quincula* Raf. ground cherry, Tomatillo. pp.1-12.

Lashin, A.M.G. 2011: Palynology of Six Species of *Solanum* (Solanaceae). Life Science Journal, Vol. 8(4): pp.687-697.

Olmstead, R.G., Lynn, B., Hala, A.M., Eugenio, S.V., Vicente, F.G., Sarah, M.C. 2008: A

molecular phylogeny of Solanaceae. Taxon. 57, (4). pp.1159-1181.

Sharma, R., Bharali, P., Devi, N., Sarma, G.C. 2017: Studies on foliar micro-morphology and pollen morphology of some members of Solanaceae from the Jalukbari area of Guwahati in Assam, India. Pleione. Vol. 11(1): pp.125 - 136.

Sneath, D.H., Sokal, R.R. 1973: *Numerical Taxonomy*. W.H. Freeman & Co., San Francisco.

Table 1: Scientific names and sites of collection of 18 species representing 6 genera belonging to Solanoideae.

N.	Scientific names	Sites of collection
1	<i>Capsicum annuum</i> L.	Al-Buhyrah
2	<i>C. frutescens</i> L.	“
3	<i>Datura innoxia</i> Miill.	Cairo
4	<i>D. metel</i> L.	Sharqia
5	<i>D. stramonium</i> L.	Cairo
6	<i>Hyoscyamus albus</i> L.	Matrouh
7	<i>H. muticus</i> L.	“
8	<i>Lycium schweinfurthii</i> Dammer.	Al-Buhyrah
9	<i>L. shawii</i> Roem.	“
10	<i>Physalis angulata</i> L.	“
11	<i>P. ixocarpa</i> Brot.	“
12	<i>P. peruviana</i> L.	“
13	<i>Solanum elaeagnifolium</i> Cav.	“
14	<i>S. lycopersicum</i> L.	“
15	<i>S. melongena</i> L.	“
16	<i>S. nigrum</i> L.	“
17	<i>S. tuberosum</i> L.	“
18	<i>S. villosum</i> Mill.	“

Table (2) Data matrix of 18 species representing 6 genera belonging to Solanoideae.

P Ch	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	+	+	+	+	+	-	-	+	+	+	+	+	-	-	-	-	-	-
2	*	*	*	*	*	-	-	*	*	*	*	*	+	+	+	+	+	+
3	-	-	-	-	-	-	-	+	+	-	-	-	-	-	-	-	-	-
4	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+
5	±	±	+	+	+	+	+	+	+	+	+	+	+	±	+	+	+	+
6	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+
7	±	±	+	+	+	+	+	+	+	+	+	+	+	±	+	+	+	+
8	+	+	+	+	+	-	-	+	+	+	+	+	+	+	+	+	+	+
9	±	±	+	+	+	+	+	+	+	+	+	+	+	±	+	+	+	+
10	-	-	+	-	+	-	-	-	-	-	-	-	-	-	-	-	-	-
11	+	+	+	+	+	-	-	-	-	-	-	-	+	+	+	+	+	+
12	+	+	-	-	-	-	-	+	+	+	+	+	+	+	+	+	+	-
13	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+	-	-	+
14	-	-	+	+	+	+	+	+	+	-	-	-	+	+	+	+	+	+
15	+	+	+	+	+	+	+	+	+	+	+	+	-	+	-	-	-	-
16	-	-	+	+	+	-	-	-	-	+	+	+	+	+	+	+	+	+
17	+	+	+	+	+	+	+	+	+	-	+	+	+	+	+	+	+	+
18	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
19	-	-	-	-	-	+	+	+	+	+	+	+	+	-	-	+	+	+
20	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
21	+	+	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	-
22	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	-	+
23	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
24	-	-	+	+	+	-	-	-	-	+	+	+	-	-	-	-	-	-
25	-	-	-	-	+	+	+	-	-	-	-	-	-	-	-	-	-	-
26	-	-	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-
27	-	-	+	+	+	+	+	-	-	-	-	-	-	-	-	-	-	-
28	*	*	+	+	+	-	-	*	*	*	*	*	*	*	*	*	*	*
29	+	+	-	-	-	+	+	+	+	+	+	+	+	+	+	+	+	+
30	1	1	2	2	1	2	2	2	1	1	1	2	2,3	2	2	1	1	2
31	4	4	2	2	2	1	1	3	3	1	1	1	1	1	1	3	3	3
32	3	3	2	2	2	1	1	3	3	1	1	2	2	2	1	1	2	3
33	3	3	2	2	2	2	2	2	2	1	1	1	1	3	1	3	1	3
34	3	3	1	1	1	2	2	2	2	2	2	2	2	3	2	3	3	3
35	1	1	1	4	1	1,2	2,4	3	3	4	4	4	3	1	3	1	1	1
36	3	3	2	2	2	3	3	3	3	3	3	3	2	2	1	1	2	1
37	3	3	1	1	1	2	2	1,4	2	1	4	1	4	4	4	4	4	4
38	1	1	2	2	2	3	3	3	3	1	1	1	2	2	1	1	2	1
39	3	1	3	3	1	2	2	3	3	3	3	3	1	3	3	1	1	3
40	1	1	3	3	3	1	1	1	1	1	1	1	2	1	1	1	1	1
41	2	2	2	2	2	3	3	1	1	1	1	3	1	1	1	1	1	1
42	4	3	5	5	1	4	4	5	5	5	5	5	5	4,5	2	5	5	5
43	3	3	4	4	4	4	4	2	2,6	1	1	5	5	3	2	2	1	3,6
44	3	3	3	3	3	2	2,3	2,3	3	4	4	4	1	1	3	1	3	1
45	2	2	3	3	3	1	1	1	1	2	2	2	1	2	1	1	2	1
46	2	2	2	2	2	2	2	2	2	1	2	2	1	2	2	3	1	2

P Ch	1	2	3	4	5	6	7	8	9
47	4	5	110	120	125	17.8	20	10.5	8.6
48	4	5	115	127	123	19	30	12	10
49	28.7×20.4	25.9×16.4	50.6×50.6	18.4×18.4	67.7×67.7	42.1×32.8	41×28.7	24.6×16.4	24.6×16.4
50	4.437×3.744	4.437×3.601	4.524×3.307	3.244×3.203	3.022×2.496	1.467×1.190	1,439×1105	4.550×3.800	2.315×2.080

P Ch	10	11	12	13	14	15	16	17	
47	3.5	3	3	2	3	3	2	2	
48	5	3	3	5	7	11	3	7	
49	26.7×26.7	32.8×32.8	32.8×32.8	26.6×26.6	57.4×57.4	26.6×26.6	24.6×24.6	24.6×24.6	2
50	1.469×1.192	2.274×1.844	1.955×1.106	2.838×2.814	4.070×3.078	3.397×2.556	1.241×1.386	2.176×1.358	2.1

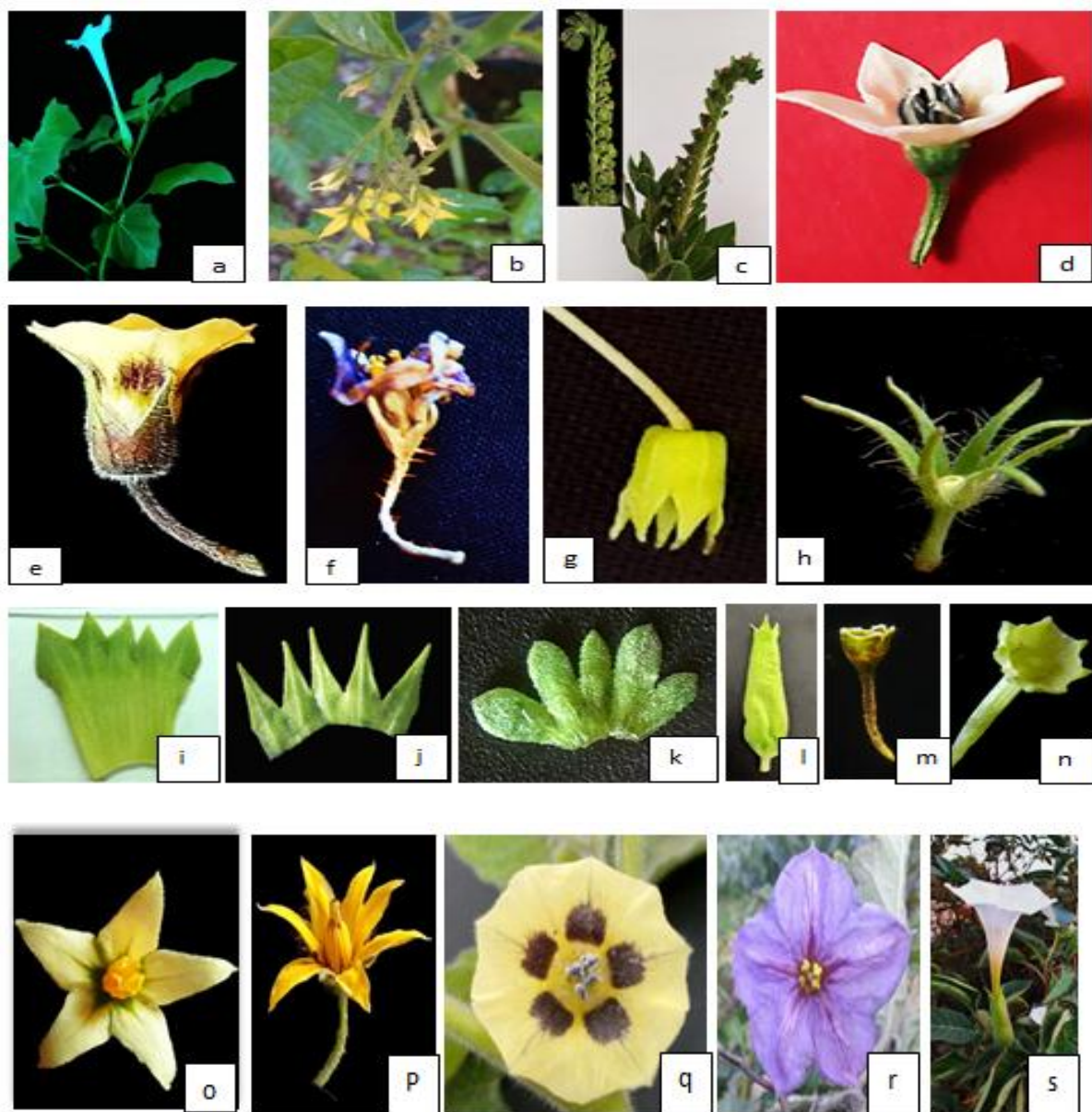


Figure1: shows types of Inflorescences and flower structure: (a) solitary flowers and lateral position in *Datura metel*, (b) scorpioid inflorescences in *Solanum lycopersicum*, (c) helicoid inflorescences in *Hyoscyamus muticus*, (d), glabrous pedicel in *Capsicum frutescence*, (e) hairy pedicel in *Physalis peruviana*, (f) spiny and hairy pedicel in *Solanum aelagnifolium*, (g) calyx campanulate with five sepals in *Physalis angulate*, (h) calyx with more than five sepals in *Solanum lycopersicum*, (i) sepals with acute apex in *Hyoscyamus muticus*, (j) sepals with acuminate apex in *Physalis angulate*, (k) sepals with obtuse apex in *Solanum villosum*, (l) tubular calyx in *Datura innoxia*, (m), cub-shaped calyx in *Lycium shawii*, (n) plate-shaped calyx in *Capsicum annuum*. (o) corolla 5, stellate shaped and deep-fused in *Solanum nigrum*, (p) corolla more than 5 petals, with acuminate apex and yellow color *Solanum lycopersicum*, (q) rotate-shaped corolla and petals complete -fused in *Physalis peruviana*, (r) petals shallow-fused and purple color in *Solanum melomgena* and (s) funnel-shaped corolla and white color in *Datura innoxia*.

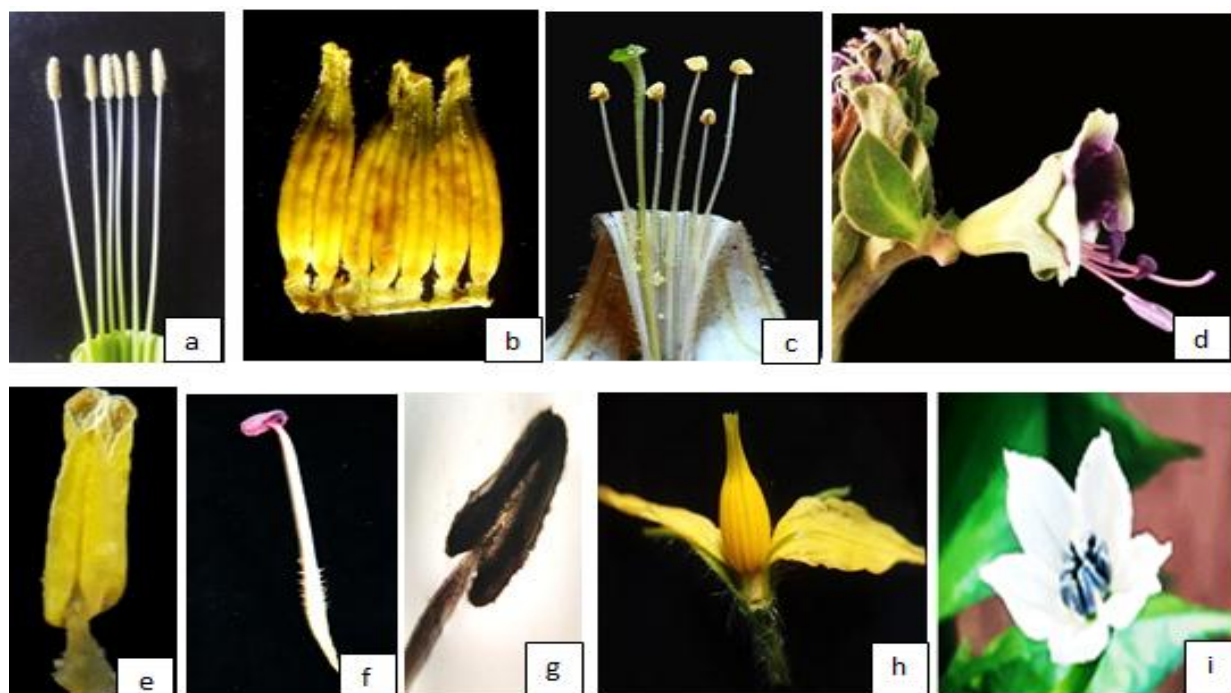


Figure 2: Shows structure of flower: (a) androecium with equal five stamens and anther free connected with filament basifixed *Datura stramonium*. (b) androecium with more than five *Solanum lycopersicum* ($x = 40$), (c) stamens unequal in length in *Lycium schweinfurthii*, (d) stamens exerted from corolla in *Hyoscyamus muticus*, (e), filament with glabrous base and glabrous anther, dehiscent by terminal pores *Solanum nigrum* ($x = 60$), (f) filament with hairy base and purple anther in *Hyoscyamus muticus* ($x = 40$), (g) anther connected dorsifixed in *Physalis angulata* ($x = 60$), (h) united anthers (cone-like) with yellow color in *Solanum lycopersicum* and (i) bluish anther in *Capsicum annum*.

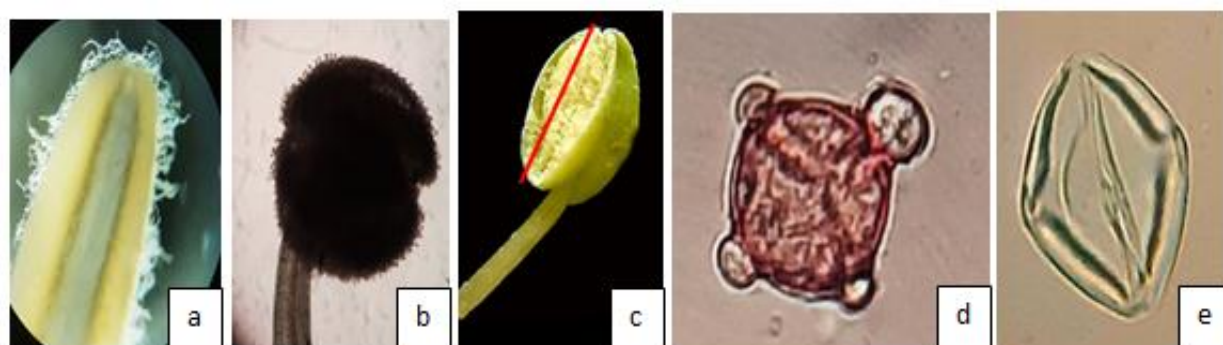
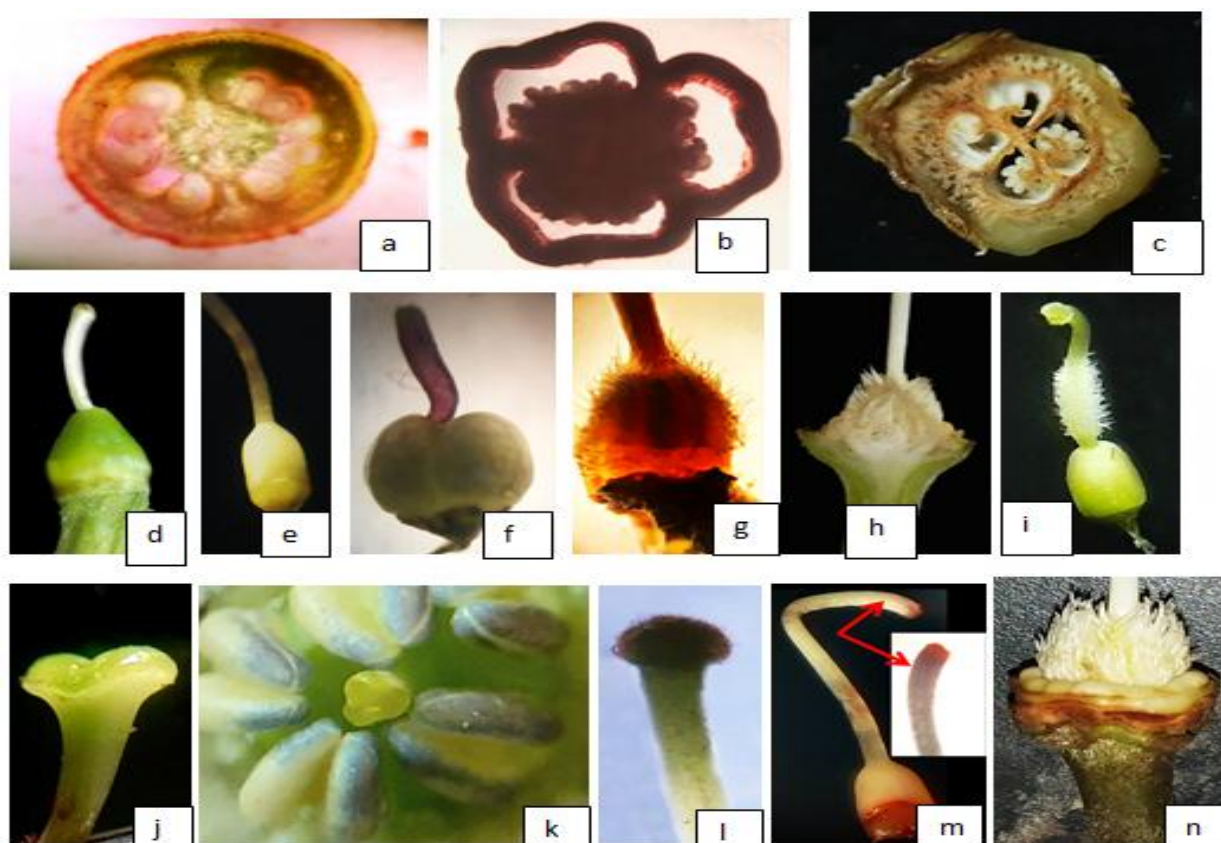


Figure 3: Shows structure of flower: (a) hairy anther in *Datura metel* ($x = 200$), (b) papillate anther in *Lycium shawii* ($x = 100$), (c) anthers dehiscent by longitudinal slits in *Physalis ixocarp* ($x = 60$), (d) pollen grains in *Physalis angulata*, spherical with 4 - colpi (x=400) and (e) pollen grains in *Hyoscyamus muticus*, oblate with 3 - colpi (x=400).



Figures 4: Shows gynoecium structures: (a) two carpels with two locules in *Solanum nigrum* ($x = 40$), (b) three carpels with three locules in *Capsicum annuum* ($x = 40$), (c) four locules in *Datura metel* ($x = 40$), (d) ovate ovary and glabrous in *Capsicum frutescens* ($x = 40$), (e) oblong ovary in *Hyoscyamus muticus* ($x = 40$), (f) globular ovary with style glabrous in *Physalis peruviana* ($x = 40$), (g) hairy ovary in *Solanum elaeagnifolium* ($x = 40$), (h) spiny ovary in *Datura stramonium* ($x = 40$), (i) hairy style in *Solanum nigrum* ($x = 40$), (j) number of stigmas is two (stigma lobed) in *Datura metel* ($x = 60$), (k) number of stigmas is three in *Capsicum annuum* ($x = 100$), (l) capitate stigma in *Lycium shawii* ($x = 100$), (m) papillate stigma in *Hyoscyamus muticus* ($x = 60$) and (n) nectariferous in *Datura stramonium* ($x = 40$).

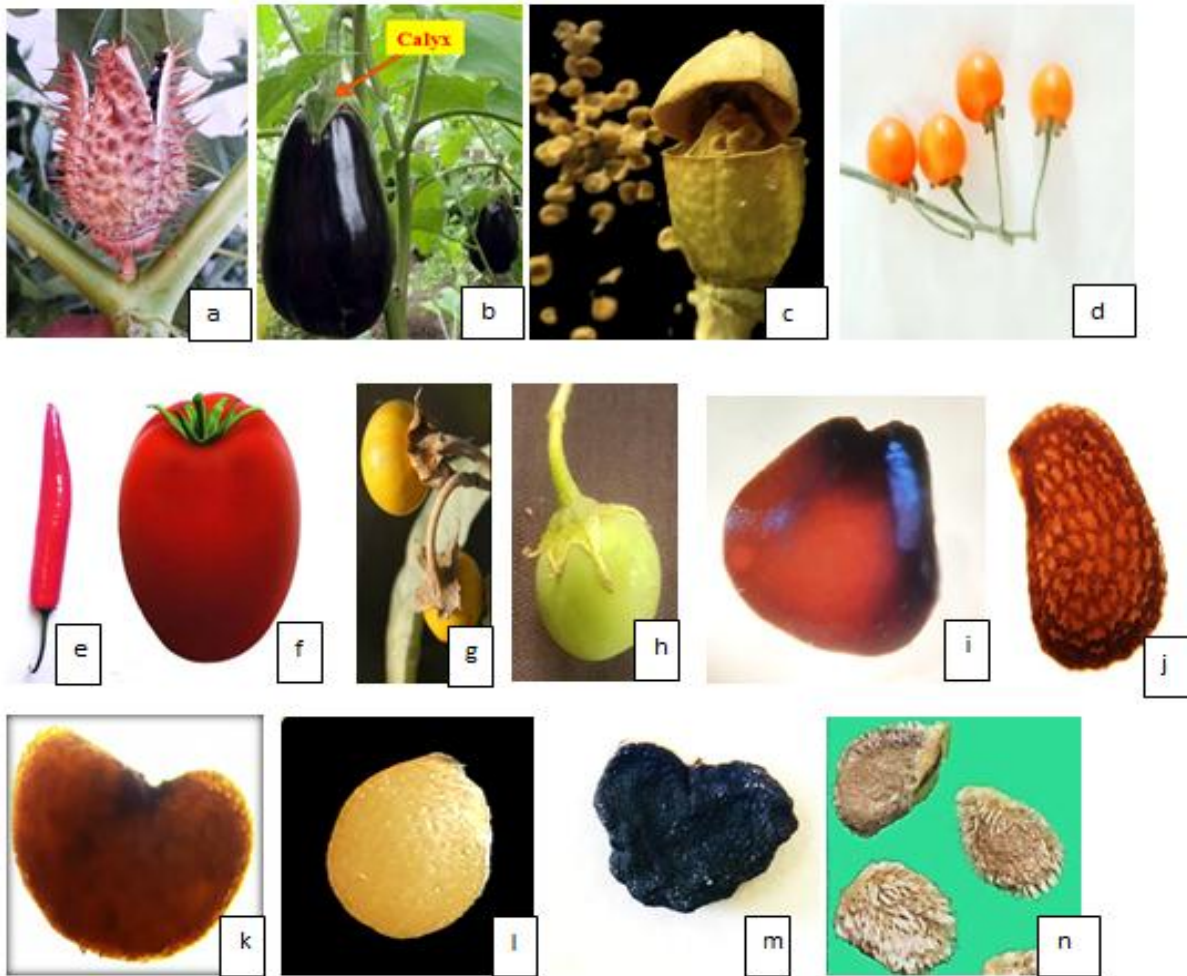


Figure 5: Shows type of fruits in Solanoideae : (a) capsule, ovate, erect and spiny fruit in *Datura stramonium*, (b) berry, pendulous, glabrous black and obovate fruit in *Solanum melongena*, (c) capsule, oblong and brown fruit, dehiscence by pyxidium in *Hyoscyamus muticus* (x = 40), (d) globose and orange fruit in *Solanum villosum*, (e) cylindrical fruit in *Capsicum frutescens*, (f) red fruit in *Solanum lycopersicum*, (g) yellow fruit in *Solanum elaeagnifolium*, (h) pale green fruit in *Solanum tuberosum*, from (i-n) Show types of seeds; (i) ovate and smooth seed in *Solanum elaeagnifolium* (x = 40), (j) oblong and brown seed in *Hyoscyamus muticus* (x = 40), (k) reniform seed in *Lycium schweinfurthii* (x = 40), (l), globose and yellowish seed in *Physalis peruviana* (x = 40), (m) black and curly seed in *Datura metel* (x = 40) and (n) hairy seed in *Solanum lycopersicum* (x = 40).

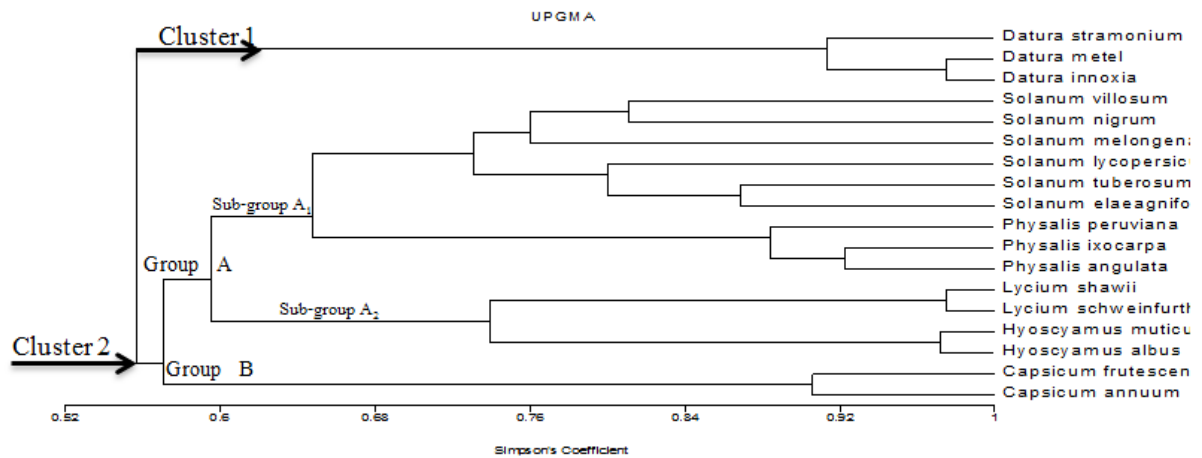


Figure 6: Dendrogram based on 50 morphological of flowers, fruits and seeds characters, recorded by comparatively for 18 samples representing to Solanoideae (Solanaceae) and analyzed by the UPGMA option from program of (MVSP).

دراسات تسمية على أزهار وثمار بعض نباتات تحت الفصيلة الباذنجانية في مصر.

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الملخص العربي

أجريت هذه الدراسة على 18 نوعا تقع تحت 6 أجناس تابعة لتحت الفصيلة الباذنجانية (الباذنجانية) هذه الأجناس هي الفلفل (2 نوع)، الداتورا (3 أنواع)، السكران (2 نوع)، العوسج (2 نوع)، الحرنكش (3 أنواع) والسولانم (6 أنواع). جُمعت الأنواع محل الدراسة من مناطق مختلفة في جمهورية مصر العربية. أجريت الدراسة على الصفات المورفولوجية للأزهار والنورات وكذلك الثمار والبذور التي استخدمت كمقارنة بين النباتات محل الدراسة وأظهرت النتائج أن الأزهار إما مفردة كما في الحرنكش *Physalis peruviana* أو في نورات كما في السكران *Hyoscyamus muticus*. يتكون الكأس غالبا من خمس سبلات ملتحمة كما في عنب الذئب *Solanum nigrum* ونادرا أكثر من خمس سبلات كما في الطماطم *Solanum lycopersicum*. ويأخذ الكأس أشكالا مختلفة منها الجرسية، الأنبوبي، الفنجاني وكذلك طبقي الشكل، والكاس مستديم مع الثمرة. وحدات التويج تكون مساوية تماما لنفس وحدات الكأس ويكون التويج ملتحم البتلات يأخذ أشكالا مختلفة منها القمعي، أو الدائري أو نجمي الشكل، تكون البتلات إما متساوية في الحجم والطول أو غير متساوية. الأسدية فوق بتلية وعدد الأسدية مساوٍ لعدد البتلات، وتكون الأسدية متساوية أو غير متساوية في الطول. ينفخ المتك إما طوليا أو بواسطة ثقب في القمة. حبوب اللقاح مفردة كروية الشكل كما في الحرنكش البري *Physalis angulata* أو مفصحة الشكل كما في السكران *Hyoscyamus muticus*. وفتحات الانبات تكون مركبة (شق- ثقب) ثلاثية في كل النباتات محل الدراسة فيما عدا *Physalis angulata* فكانت رباعية ومركبة أيضا. يأخذ المتاع أشكالا مختلفة إما بيضى كما في الفلفل الحلو *Capsicum annum* أو مستطيل كما في السكران *Hyoscyamus muticus* أو كروي كما في الحرنكش *Physalis peruviana*، ويكون سطح المبيض إما أملس أو شعري أو شوكي. الوضع المشيمي محوري في كل النباتات محل الدراسة فيما عدا جنس الفلفل فهو مركزي سائب. الثمار تكون إما جافة علبة متفتحة كما في الداتورة *Datura stramonium* أو طرية غير متفتحة عنبية كما في العوسج *Lycium shawii*. البذور تأخذ اشكالا مختلفة منها الكلوي، المستطيل، البيضي أو الكروي، ملساء، مجمدة أو شعرية الملمس. جميع هذه الصفات سجلت بطريقة مقارنه لـ 18 نوعا محل الدراسة من نباتات تحت الفصيلة الباذنجانية وأثبتت النتائج وجود بعض الفروق التي يمكن عن طريقها تمييز وتعريف هذه الأنواع. كما ساعدت نتائج هذه الدراسة في تصميم مفتاح تعريفي مسنن لوصف وتمييز الأجناس وكذلك الأنواع محل الدراسة.

الكلمات الاسترشادية: الصفات الزهرية، الثمرة، البذرة، علم حبوب اللقاح، الباذنجانية.