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Biosystematic Studies in the Genus *Abutilon* from Pakistan

I. Taxonomy

By

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With 4 Figures

The genus *Abutilon* Miller comprises more than 400 species which are distributed in the tropics and subtropics of both hemispheres (Hutchinson 1967: 554). This genus achieved considerable importance because of its medicinal properties and the fiber which could be exploited as a substitute for jute. Although an intensive monographic investigation is lacking various workers have reported the following ten species from time to time, while studying the flora of different regions of Pakistan. A considerable confusion exists with regard to the systematic position of some taxa of this genus and the present paper is an attempt to throw some light on the taxonomy of the genus *Abutilon* Miller. The ten species are: *A. avicennae* Gaertn., *A. polyandrum* Wight & Arn., *A. indicum* (L.) Sweet, *A. bidentatum* Hochst. ex A. Rich., *A. glaucum* (Cav.) Guill., *A. hirtum* (Lam.) Sweet, *A. ramosum* (Cav.) Guill., *A. fruticosum* Guill., *A. molle* Sweet. *A. pakistanicum* Jafri & Ali.

Among the above 10 species the occurrence of *A. avicennae* (= *A. theophrasti)* and *A. polyandrum* is considerably doubtful in this region as the former species was collected only once from Sind (Masters 1874) while the latter was reported only twice: once from N. W. Provinces (Masters 1874) and once from Sind (Blatter & al. 1929). None of the later workers, including the present authors, collected these two species since then. However some specimens of *A. avicennae* have been collected recently from Chitral area by Mr. Sultan of Karachi University but that region is beyond the scope of our present investigation. Besides these two species, Chaudhri & Chuttar 1966 reported *A. neilgherrense* Munro from Thar desert which appears to be most unlikely as this species is distributed only in Nilgirihills and western

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peninsula (MASTERS 1874). The present investigation shows that apart from the remaining eight species, five new species of *Abutilon* namely *A. malirianum, A. lanatum, A. sepalum, A. karachianum* and *A. badium* occur in Pakistan (excluding Kashmir area) which are reported here for the first time. These five new species have been described here in detail along with their Latin diagnosis, distribution and range of variation. During the course of this investigation various floras and other taxonomic works were consulted which have been listed in the reference at the end.

Regarding the identification of *A. indicum, A. bidentatum, A. fruticosum, A. ramosum, A. molle* and *A. pakistanicum* there is no confusion as the characters of these species are distinct and can be found in all the local floras. The species *A. glaucum* and *A. hirtum* although do not cause any difficulty in their respective identification but are confused individually with their allied species and that was probably the reason why these related species were either overlooked or grouped together with either *A. glaucum* or *A. hirtum.* The species *A. malirianum* and *A. lanatum* lie near *A. glaucum* (Fig. 1) whereas *A. karachianum* and *A. sepalum* are related to *A. hirtum* (Fig. 2) The species *A. badium* is apparantly related to *A. indicum* (Fig. 3). In order to confirm that these five newly recorded species are not only variants of *A. glaucum, A. hirtum* or *A. indicum* respectively, seeds of these species were collected separately and grown in uniform ecological condition in the P. C. S. I. R. experimental plot and it was found that they breed true and retain their characters in the coming generation. This experimental evidence lead to the conclusion that these species are not the ecological forms but can achieve the status of full species. Some doubtful specimens of *A. glaucum* and *A. hirtum* were sent to Museum National D' Histoire Naturelle, Laboratoire de Phanerogamie, Paris for identification and comparison with their t y p e specimens. Out of these specimens only one was identified as *A. glaucum* and one as *A. hirtum* while the others were found to be differing markedly from the type which also confirmed our observations.

The authors are indebted to Dr. G. AYMONIN, Museum National D'Histoire Naturelle, Laboratories de Phanerogamie, Paris, for his useful suggestions regarding indentification of *A. glaucum* (= *Sida glauca* and *A. hirtum (= Sida hirta)* besides the latin description and photographs of original drawings of *Sida glauca.* We are indebted to Dr. S. I. ALI, University of Karachi, for going thorough the manuscript and valuable suggestions and to Mr. SULTAN, Karachi University, for his help during the preparation of this work. To Prof. PAUL, University of Bonn, W. Germany we are thankful for the latin translation of the description of the five new species reported here. We also thank Mr. E. NASIR, Gordon College, Rawalpindi, Dr. A. A. QURESHI and Dr. A. A. KHAN, Forest Research Institute, Peshawar, for their cooperation in allowing us to use their herbarium specimens and to Mr. Abid ASKARI for the Fruit sketch (Fig. 4).

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Abutilon MILLER 1754.

Lectotypus: *A. avicennae* GAERTNER 1790 („1791"): 251. (*Sida Abutilon* LINNAEUS). Vide BRITTON & MILLSPAUCH 1920: 264.

Key to the Pakistan species

1. Carpels obtuse, not pointed
   2. Carpels more than 26 (27—34), leaves 7-nerved, flower diameter up to 2.6 cm . . . . . *A. malirianum*
   2. Carpels up to 26 (20—26), leaves 9-nerved, flower diameter more than 2.6 cm
      3. Inflorescence pseudoraceme, carpels longer than calyx in fruit, sepals shortly acuminate . . . . . *A. glaucum*
      3. Inflorescence solitary axillary, carpels shorter than calyx in fruit, sepals terminate in a long mucro . . . . . .*A. lanatum*

1. Carpels pointed or mucronate
   4. Carpels more than 10
      5. Carpels more than 25, shorter than calyx in fruit . *A. sepalum*
      5. Carpels not more than 25, longer than calyx in fruit
         6. Carpels 20—24
            7. Corolla more than 3 cm in diameter, stem and petiole covered with long spreading hairs, visible with naked eyes . . . . . *A. hirtum*
            7. Corolla not more than 3 cm in diameter, long hairs not visible with naked eyes . . . . . *A. karachianum*
         6. Carpels not more than 20
            8. Corolla diameter up to 2.2 cm, light yellow, carpels beaked and less than 1 cm long . . . . . *A. bidentatum*
            8. Corolla diameter more than 2.2 cm, orange yellow, carpels more than 1 cm long
               9. Carpels shortly acuminate and appear truncate in fruit, stem green or ash coloured . . . . . *A. indicum*
               9. Carpels terminate into 1—2 mm long and sharp spreading tip, stem brown . . . . . *A. badium*
   4. Carpels usually 8—10
      10. Length of carpels and diameter of fruit less than 1 cm
         11. Carpels truncate, not- beaked or not- awned, leaves 7-nerved . . . . . *A. fruticosum*
         11. Carpels beaked or awned, leaves 9-nerved *A. ramosum*
      10. Length of carpels and diameter of fruit 1 cm or more
         12. Flowers more than 2 cm across, orange yellow, calyx much exceeding the mericarp, plant covered with markedly long hairs . . . . . *A. molle*

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12. Flowers less than 2 cm across, yellow, calyx not exceeding the mericarps, markedly long hairs not present
A. pakistanicum

Abbreviations: — CLH : P. C. S. I. R. Labs. Herbarium, Karachi
RAW : Gordon College Herbarium, Rawalpindi
PFI : Forest Research Institute Herbarium, Peshawar
KUH : Karachi University Herbarium, Karachi
LAH : Panjab University Herbarium, Lahore

1. *A. malirianum* S. Afaq Husain and S. R. Baquar sp. nov. Fig. 4/*10*.

Frutex ad 3 m altus, caulis albo-tomentosus sine pilis unicellularibus. Folia ad 16.6 cm longa, ad 18.3 cm lata, cordata, ovata, irregulariter grosseque dentata, interdum ± integra, breviter acuminata, plerumque 7-nervata, superiore facie hispida vel aspera; petiolus ad 18 cm longus; stipulae lineares, 0.6—0.8 cm longae, basi 0.1 cm latae. Inflorescentia axillaris fasciculata, pedicelli ad 2.3 cm longi. Flores cadmio-lutei, 1.5—2.6 cm diametientes. Sepala 0.8—1.1 cm longa, 0.4—0.5 cm lata, breviter acuminata, tomentosa. petala ad 1.2 cm longa et lata. Fructus globosus, 1.0—1.4 cm diametro, pedicello 0.8—2.3 cm longo; mericarpia 27—34, obtusa, 0.7—0.8 cm longa, 0.5—0.6 cm lata, matura ochracea, post diuturnam maturationem in situ dehiscentia. Semina minuta, reniformia, pilosissima.

Erect shrub, upto 3.0 m tall, stem whitish, tomentose, long unicellular hairs not present; leaves upto 16.6 cm long and 18.3 cm broad, cordate, ovate, irregularly and coarsely toothed, sometimes more or less entire, shortly acuminate, usually 7-nerved, upper surface hispid or rough to touch, lower surface soft; petiole upto 18 cm long; stipule linear, 0.6—0.8 cm long and 0.1 cm broad a the base; inflorescence solitary axillary but look apparantly clustered in the axil of leaf; pedicel upto 2.3 cm long; corolla cadmium yellow, 1.5—2.6 cm across; sepal 0.8—1.1 cm long and 0.4—0.5 cm broad, shortly acuminate, tomentose; petal length and breadth upto 1.0—1.2 cm; fruit globose, 1.0—1.4 cm in diameter, stalk 0.8—2.3 cm long; carpels 27—34, obtuse, 0.7—0.8 cm long and 0.5—0.6 cm broad, turn yellow ocher when ripe; dehiscence starts after a long time of maturation and before breaking away from the central axis; seed small, reniform and very much hairy.

Holotypus: Malir, Karachi, 30. 9. 69, S. A. Husain (CLH).

Representative specimens: Darsano Chano, 19. 3. 69, Sultanula-bidin (KUH); University Campus, Karachi, 24. 12. 66, Y. Nasir (KUH), 29. 9. 67, Miss K. Cull (KUH), 1. 5. 64, Y Ahmad (KUH), 6. 9. 63, K. Fatima (KUH), 1964, F. Khatoon (KUH), 22. 11. 63, A. Wahid (KUH); Thatta, 16. 12. 64, A. M. Khan (KUH); Nazimabad, Karachi, 3. 3. 64, R. Asif (KUH), 9. 8. 58, T. R. Naqvi (KUH); Malir, Karachi, 10. 11. 58, S. A. Naqvi (KUH), 16. 8. 66, S. A. Husain 46 (CLH), 24. 3. 70, S. A. Husain 1150 (CLH), 1. 7. 38, M. Nath 16579 (RAW); Drigh Road, Karachi, 26. 8. 55, S. R. Baquar (KUH), 26. 10. 66, S. A. Husain 67 (CLH); P. E. C. H. S. Karachi, 6. 1. 61, S. A. Khan (KUH); P. N. H. Karachi, 14. 2. 62, Tasnif 576 (CLH), 19. 12. 64, A. Zaman 621 (CLH);

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Memongot, 20. 7. 66, S. A. HUSAIN 45 (CLH); Jamgot, Karachi, 16. 8. 66, S. A. HUSAIN 46. 1 (CLH); Malir, Karachi, Railway side, 16. 8. 66, S. A. HUSAIN 46. 2 (CLH); Jamia College, Malir, Karachi, 16. 8. 66, S. A. HUSAIN 46. 4 (CLH); Malir Halt, Karachi, 4. 11. 68. S. A. HUSAIN 68 (CLH), 28. 8. 70, S. A. HUSAIN (CLH); P. C. S. I. R. Karachi, 21. 8. 69, S. A. HUSAIN 71 (CLH), 1. 10. 69, S. A. HUSAIN 74 (CLH), 4. 2. 69, S. A. HUSAIN 75 (CLH), 20. 2. 70, S. A. HUSAIN 1149 (CLH); Multan, 8. 9. 69, S. A. HUSAIN 73 (CLH); Pipri, 2. 12. 69, S. A. HUSAIN 1146 (CLH); Landhi, 1. 1. 70, S. A. HUSAIN 1147 (CLH), 5. 7. 70, S. A. HUSAIN (CLH); Mangopir, Karachi, 15. 2. 70, S. A. HUSAIN 1148 (CLH); Dera Ismail Khan, 11. 3. 56, 1190 (RAW); Hyderabad, 1. 7. 38, M. NATH 16597 (RAW).

Distribution: Presently it is known from Karachi, Sind and Punjab.

2. *A. glaucum* (CAV.) SWEET 1827: 54.

Basionym: *Sida glauca* CAVANILLES 1791: 8. t. 11.

Synonyms: *Sida mutica* DELILE 1812: 60. n. 45.

A. muticum (DELILE) SWEET 1830: 65.

A. tomentosum WIGHT & WALKER-ARNOTT 1834: 56.

Representative specimens: Malir Halt Karachi, 16. 8. 66, S. A. HUSAIN 47 (CLH); Malir Karachi, 16. 8. 66, S. A. HUSAIN 50. 2 (CLH); Jamgot Karachi, 16. 8. 66, S. A. HUSAIN (CLH); P. C. S. I. R. Campus Karachi, 22. 12. 66, 29. 12. 66, 14. 6. 67, 12. 12. 68, 23. 7. 69, 26. 7. 69, 2. 10. 69, S. A. HUSAIN 51.1, 52.1, 59, 62, 64, 65, 66 (CLH); University Campus Karachi, 14. 1. 70, S. A. HUSAIN 2001 (CLH).

Distribution: India, Afghanistan, Ceylon and Africa. In Pakistan it appears to be localized in Karachi and adjoining areas. Present authors have neither seen nor collected any specimen of this species from any other part of Pakistan.

3. *A. lanatum* S. Afaq HUSAIN & S. R. BAQUAR sp. nov. — Fig. 4/*11*.

Frutex ad 1.5 m altus; caulis viridis, dense pubescens, pilis unicellularibus non observatis. Folia plerumque magna, ad 14.0 cm longa ad 17.0 cm lata, cordato-ovata, dentata, breviter acuminata, plerumque 9-nervata; petiolus ad 18.0 cm longus; stipulae lineares, minus quam 1.0 cm longae, basi ad 0.2 cm latae, Inflorescentia axillaris solitaria pedicelli 1.1—4.0 cm longi. Flores aurantiacolutei, 2.8—3.6 cm diametientes. Sepala 1.2—1.4 cm longa, 0.5—0.6 cm lata, acuminata, dense pubescentia. Petala 1.1—1.6 cm longa, ad 1.3 cm lata. Fructus globosus, 1.5—1.6 cm diametro, plerumque longe (2.5—5.2 cm) pedicellatus, sepalorum pilosorum acuminibus superatus; mericarpia 22—26, obtusa, circa 0.8 cm longa, 0.6 cm lata, extus pilis longis nitidis lanuginosa, in situ dehiscentia. Semina parva, reniformia, pilosa.

Erect shrub, up to 1.5 m tall; stem green, densely pubescent, unicellular hairs not present; leaves usually large, upto 14.0 cm long and 17.0 cm broad, cordate-ovate, dentate and shortly acuminate, usually 9-nerved, petiole upto 18.0 long, stipule more or less linear, less than 1.0 cm long and upto 0.2 cm broad at the base; inflorescence solitary axillary, pedicels 1.1—4.0 cm long; corolla orange yellow, 2.8—3.6 cm across; sepal 1.2—1.4 cm

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long and 0.5—0.6 cm broad; acuminate and densely pubescent; petal 1.1—1.6 cm long and upto 1.3 cm broad; fruit globose, 1.5—1.6 cm in diameter and usually long stalked (2.5—5.2 cm), in fruit the sepals are densely hairy and they bear markedly elongated apical points which emerge above the carpels; carpels 22—26, obtuse, 0.8 cm long and 0.6 cm broad, on outer side cevered with comparatively long and shining hairs due to which the fruits appear to be wooly; dehiscence before breaking away from the central axis. Seed small, reniform and hairy.

Holotypus: University Campus Karachi, 5. 11. 70, S. A. Husain (CLH).

Representative specimens: University Campus Karachi, 12. 10. 70, 5. 11. 70, 28. 9. 70, 21. 10. 70, 5. 11. 70, S. A. Husain (CLH); Sonmiyani Beach, 27. 8. 68, S. A. Husain (CLH).

Distribution: Presently it is known only from Karachi and adjoining areas.

The above mentioned three species namely: *A. malirianum*, *A. lanatum* and *A. glaucum* lie close to each other but can easily be distinguished on a closer examination. A comparison of different characters has been graphically represented in Fig. 1. All these species have globose fruits with obtuse carpels but in *A. malirianum* the carpels are always more than 26 and the flowers are upto 2.6 cm in diameter. In the latter two species (*A. lanatum* and *A. glaucum*) the number of carpels per fruit never exceeds 26 while the diameter of the corolla is always more than 2.6 cm. No doubt in all the species of *Abutilon* the inflorescence is solitary axillary but in *A. glaucum* it appears to be a terminal raceme (pseudoraceme) due to fast development of floral buds as well as internodes and very slow development of leaves. On the contrary it appears to be an axillary cluster in *A. malirianum* due to very slow development of internodes and floral buds and fast development of leaves. In *A. lanatum* the development of floral buds, leaves and internodes is proportional and therefore the inflorescence is simply solitary axillary. Moreover *A. lanatum* can easily be identified from the remaining two species by the presence of a thick coat of comparatively long hairs on the outer surface of carpels.

The flowering time of *A. malirianum* is also different from that of *A. lanatum* and *A. glaucum*. The buds of latter two species start opening at noon (at about 1 PM in summer) while in the former species the opening begins in the evening (at about 5 PM in summer) and thus the flower life of *A. malirianum* is shorter than that of *A. lanatum* and *A. glaucum*. It has also been noted that the upper surface of leaves is rough to touch (or hispid) in *A. malirianum* while it is not so in the remaining two species.

4. *A. sepalum* S. Afaq Husain and S. R. Baquar sp. nov. — Fig. 4/*8*.

Frutex erectus ad 2.0 m altus; caulis viridis, pubescens sine pilis unicellularibus; rami et petioli ad tactum velveto similes. Folia ad 16 cm longa, 13 cm lata, cordato-ovata, dentata, breviter acuminata, superne leviter

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hispida, 9-nervata; petiolus ad 14 cm longus stipulae parvae, lineares, mox deciduae, minus quam 1 cm longae. Inflorescentia axillaris solitaria, quae primo aspectu racemus terminalis sive fasciculi axillares esse videtur; pedicelli plerumque crassi breves (1.0—1.4 cm). Flores aurantiaco-lutei, 3.5—4.2 cm diametientes. Sepala 1.2—1.3 cm longa 0.5—0.6 cm lata, acuminata, fructu longiora, eius majorem partem obtegentia. Petala 1.6—2.0 cm longa, 1.7—

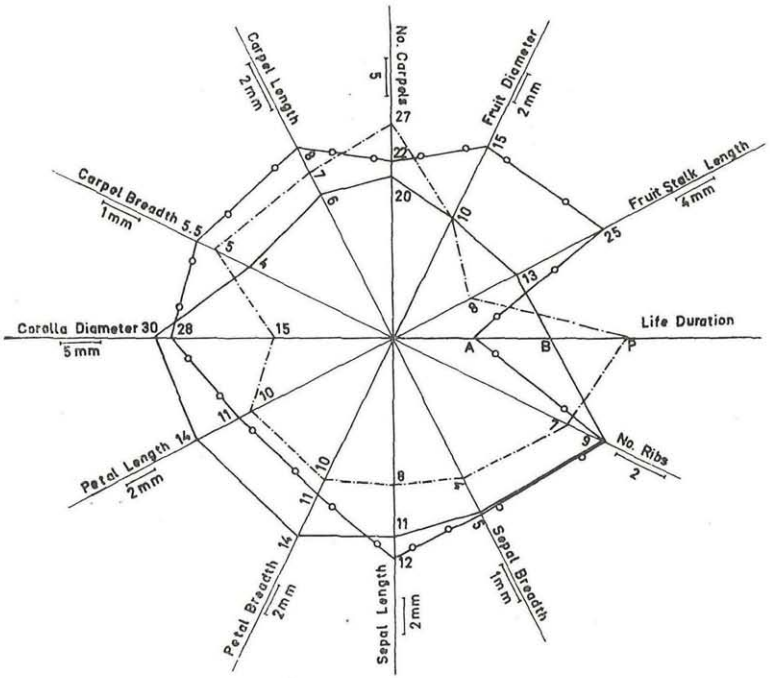


Fig. 1. Diagrammatic representation of the lowest dispersion value of different characters in the species *A. lanatum* (— . — . — . —), *A. glaucum* (————) and *A. malirianum* (— o — o — o —).

2.2 cm lata. Fructus apice planus, 1.2—1.4 cm diametro, pedicello crasso, brevi 1.1—2.8 cm longo; mericarpia 27—33, leviter acuta, 0.7—0.8 cm longa, 0.5—0.6 cm lata; mericarpia, sepala, pedicellus dense pilosa, in situ dehiscentia. Semina parva, reniformia, parce pilosa.

Erect shrub, up to 2.0 m tall; stem green, pubescent with no unicellular hairs; stem and petiole velvety to touch; leaves up to 16.0 cm long and 13.0 cm broad, cordate, ovate, dentate and shortly acuminate, upper surface slightly hispid, 9-nerved, petiole up to 14.0 cm long. Inflorescence a pseudoraceme and/or axillary clusters, pedicel usually short (1.0—1.4 cm) and

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stout; corolla orange yellow, 3.5—4.2 cm across; sepal 1.2—1.3 cm long and 0.5—0.6 cm broad, acuminate, longer than the carpels in fruit and cover most of the fruit surface; petal 1.6—2.0 cm long and 1.7—2.2 cm broad; fruit truncate, 1.2—1.4 cm in diameter, stalk 1.1—2.8 cm, usually short and stout; carpels 27—33, slightly pointed, 0.7—0.8 cm long and 0.5—0.6 cm broad. Sepal, carpel and stalk densely hairy; dehiscence before breaking away from the central axis; seed small, reniform and sparingly hairy.

Holotypus: P. C. S. I. R. Campus, Karachi, 27. 10. 70, S. A. Husain (CLH).

Representative specimens: University Campus Karachi, 11. 10. 69, S. A. Husain (CLH), 3. et 17. 10. 70. S. A. Husain (CLH); P. C. S. I. R. Campus Karachi, 15. 9., 20. 10., 2., 5. et 13. 11. 70, S. A. Husain (CLH); Manghopir Karachi, 3. 9. 69, S. A. Husain (CLH).

Distribution: Presently it is known only from Karachi.

5. *A. hirtum* (Lamarck) Sweet 1827: 53; Don 1831: 503.

Basionym: *Sida hirta* Lamarck 1783: 7.

Synonyms: *Sida graveolens* (Roxburgh 1814: 50) Roxburgh 1832: 179.

Abutilon graveolens (Roxburgh) Wight & Walker-Arnott 1834: 56.

Representative specimens: Road to Cape Monz, 6. 4. 65, Col. J. Lamond 264 (RAW); P. C. S. I. R. Campus Karachi, 12. 1. 70, 14. 1. 70, 16. 10. 68, S. A. Husain 2002, 2003, 76 (CLH); Malir Halt Karachi, 4. 11. 69, S. A. Husain 80 (CLH); Malir, Karachi, 16. 8. 66, S. A. Husain 78.1 (CLH); P. C. S. I. R. Experimental Plot Karachi, 30. 9. 69, 6. 10. 69, S. A. Husain 78, 79 (CLH); Manghopir Karachi, 28. 2. 68, 3. 9. 66, S. A. Husain 80, 791 (CLH); Jamgot, —, S. A. Husain 76.1 (CLH).

Distribution: Pakistan, Ceylon, Tropical Africa and Australia.

6. A. *karachianum* S. A. Husain & S. R. Baquar sp. nov. — Fig. 4/7.

Frutex ad 2.0 m altus; caulis viridis, pilis longis unicellularibus pubescens. Folia ad 13.0 cm longa, 15.0 lata, ovata cordata, acuminata, dentata, superne leviter hispida, 7—9 nervata; petiolus ad 16.5 cm longus; stipulae lineares, ad 1.0 cm longae. Inflorescentia axillaris solitaria; pedicelli 1.3—2.0 cm longi. Flores aurantiaco-lutei, 2.2—3.0 cm diametientes. Sepala 1.1—1.2 cm longa, 0.5 cm lata. Petala 1.0—1.3 cm longa, 1.1—1.4 cm lata. Fructus ± cylindricus, apice applanatus, 1.2—1.6 cm diametro, pedicello ad 3.5 cm longo. Mericarpia 20—24, 0.8—1.1 cm longa and 0.5—0.7 cm lata, leviter acuta sive breviter mucronata, matura ochracea, tandem in situ dehiscentia. Semina parva, reniformia, pilosa.

Erect shrub, up to 2.0 m tall; stem green, pubescent with long unicellular hairs; leaves up to 13.0 cm long and 15.0 cm broad, cordate-ovate, acuminate, dentate, upper surface somewhat hispid, 7—9 nerved, petiole up to 16.5 cm long, stipules linear, up to 1.0 cm long; inflorescence solitary axillary,

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pedicel 1.3—2.0 cm long; corolla orange yellow, 2.2—3.0 cm across; sepal 1.1—1.2 cm long, 0.5 cm. broad; petal 1.0—1.3 cm long and 1.1—1.4 cm broad; fruit somewhat cylindric and flat on top, 1.2—1.6 cm in diameter, fruit stalk up to 3.5 cm long; carpels 20—24, slightly pointed or shortly mucronate, 0.8—1.1 cm long and 0.5—0.7 cm broad, turn yellow ocher when ripe, dehiscence before breaking away from the central axis and after a long time of maturation; seed small, reniform and hairy.

Holotypus: Unversity Campus Karachi, 17. 10. 70, S. A. Husain (CLH).

Representative specimens: University Campus Karachi, 23. 9. 70, 7. 10. 70, 17. 10. 70, 5. 11. 70, 27. 11. 70, S. A. Husain (CLH); Manghopir Karachi, 11. 9. 69, S. A. Husain (CLH); Malir Karachi, 9. 11. 69, S. A. Husain (CLH).

Distribution: Presently it is known only from Karachi.

The fruits of *A. sepalum*, *A. hirtum* and *A. karachianum* are ± flat (or truncate) on top and the carpels remain adpressed to each other in fruits and are slightly pointed. Among the above three species *A. hirtum* can easily be identified by the presence of long, spreading hairs on the entire stem, petiole and pedicel. In *A. sepalum* the sepals are longer than the carpels in fruit. The number of carpels ranges from 27—33 in *A. sepalum* whereas in *A. hirtum* and *A. karachianum* it ranges from 20—26 only (Fig. 2).

7. *A. bidentatum* Hochst. ex Richard 1847: 68; Masters 1874: 326. — Fig. 4/5.

Representative specimens: Topi Park, Sept. 37, J. Singh 21612 (RAW), Sept. 35, Stewart 15106 (RAW), 27. 9. 35, M. Nath 1157 (RAW), 4. 12. 16, Stewart 349 (RAW), W. U. Malik 37 (RAW); Ayub Park, Rawalpindi, 22. 9. 62, Siddiqui 1115 (RAW), 12. 9. 69, S. A. Husain 993 (CLH); Kalar Kahar, R. R. Stewart 329 (RAW); Khairi Murat, 13. 4. 57, R. R. Stewart 27917 (RAW); Muzaffarabad, 13. 4. 56, J. Mohd. 143 (RAW); Aira, 23. 4. 54, R. R. Stewart 21610 (RAW); Rawalpindi, 27. 3. 28, Stewart 21614 (RAW), 6. 5. 39, M. Charles 41 (RAW); Ajnada, May 34, Elarn 22 (RAW); Mangora, 10. 8. 52, R. R. Stewart 24327 (RAW); Lahore, 3. 5. 22, Stewart 7087 (RAW); Sangle Hills, 7. 3. 17, Stewart 1384 (RAW); Gujaranwala, May 27, Stewart 9144 (RAW); Sangla Hills, 7. 8. 40, M. B. Raizada 11508 (PFI); Changa Manga, 21. 12. 51, A. H. Khan (PFI); Chichawatany, 30. 6. 59, A. H. Khan (PFI); Baradari Lahore, 21.12. 51, A. H. Khan 134 (PFI); Sargodha, 11. 7. 54. —, 1695 (LAH); Ravi Band Lahore, 18. 4. 58, M. Shafi 1692 (LAH); Multan, 21. 9. 69, S. A. Husain 991 (CLH); Rawal Dam Rawalpindi, 11. 9. 69, S. A. Husain (CLH); Wah Rawalpindi, 9. 9. 69, S. A. Husain 922 (CLH); Jahangir Tomb Lahore, 9. 9. 69, S. A. Husain 995 (CLH); Lahore Airport, 8. 9. 69, S. A. Husain 998 (CLH); P. C. S. I. R. Campus Karachi, 21. 8. 69, 13. 3. 69, S. A. Husain 81, 70 (CLH); Manghopir Karachi, 6. 9. 66, 28. 2. 68, S. A. Husain 58, 61 (CLH).

Distribution: Pakistan, India, Arabia and Tropical Africa. In Pakistan it is rare in Karachi and Sind but abundant in upper Punjab, specially in the suburb of Lahore and Rawalpindi.

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8. *A. indicum* (L.) SWEET 1827: 54; MASTERS 1874: 326. — Fig. 4/2.
Basionym: *Sida indica* LINNAEUS 1756: 26; 1759: 323.

Representative specimens: Off University Road Karachi, 13. 11. 70, S. A. HUSAIN (CLH); P. C. S. I. R. Campus Karachi, 28. 1. 69, 14. 1. 70, 18. 8. 70, S. A. HUSAIN (CLH); Memongot Karachi, 18. 11. 68, S. A. HUSAIN

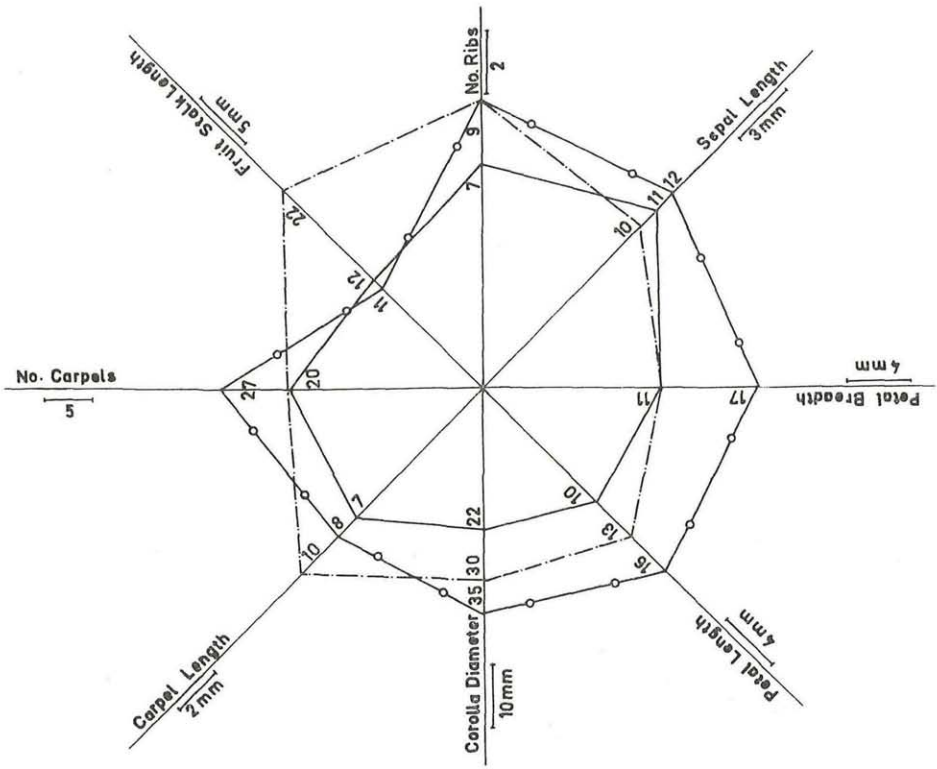


Fig. 2. Diagrammatic representation of the lowest dispersion value of different characters of the species *A. hirtum* (— . — . — . —), *A. karachianum* (————) and *A. sepalum* (— o — o — o —).

(CLH); Malir Karachi, 13. 7. 66, S. A. HUSAIN (CLH), Miss Q. SULTANA (KUH); Malir River Off Jamgot, 3. 9. 66, S. A. HUSAIN (CLH); Jamgot Karachi, 11. . S. QURESHI (KUH), 20. 7. 66, S. A. HUSAIN (CLH); Drigh Road Karachi, 16. 5. 68, S. R. BAQUAR (CLH); Malir, 7. 9. 57, S. R. BAQUAR (CLH); Memongot, —, S. M. H. JAFRI (KUH); Malir Garden, 23. 7. 55, S. R. BAQUAR (KUH) Malir, — 63, Miss F. BEGUM (KUH); Lahore, 11. 4. 49, S. M. A. MAKHDOOM 1696 a & b (LAH); Chichawatany, 30. 6. 59, A. H. KHAN (PFI); Changa Manga, 20. 8. 56. S. B. AKHTAR (PFI).

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Distribution: Tropics generally. In Pakistan it is very common in Karachi, less common in Panjab. It appears that it is rare or completely absent in the northern region as the specimens of this species could not be found in Peshawar region inspite of a thorough search nor any herbarium sheet is available in any of the country herbariums based on the collection from the northern region.

9. *A. badium* S. A. Husain & S. R. Baquar sp. nov. — Fig. 4/*1*.

Frutex erectus, circa 3.0 m altus, parce ramosus minus quam *A. indicum;* caulis brunneus vel castaneus, pilis longis unicellularibus pubescens. Folia ad 18.5 cm longa, 16.0 cm lata, 9-nervata, pubescentia, cordata, acuminata, dentata, dentibus longis acutis, eis *A. indicum* regularioribus, petiolus ad 17.6 cm longus; stipulae lineares, 0.5—0.9 cm longae. Inflorescentia axillaris solitaria; pedicelli 1.4—8.0 cm longi. Flores aurantiaco-lutei, 2.4—3.2 cm plerumque 3.0 cm diametientes. Sepala 0.8—1.3 cm longa, 0.4—0.7 cm lata. Petala 1.1—1.4 cm longa, 0.9—1.5 cm lata, marginibus sese tangentibus. Fructus ± cylindricus, 1.5—1.9 cm diametro; mericarpia 14—20, 1.1—1.5 cm longa, 0.6—0.9 cm lata; unumquisque in acumen extus versum acutum 0.1—0.2 cm longum desinens, mericarpia matura ab axe solventia et plerumque postea dehiscentia. Semina mamillis rotundis obtecta, pilis destituta.

Erect shrub, about 3.0 m tall, sparingly branched as compared to *A. idicum,* stem brown or redish brown, pubescent with long unicellular scattered hairs; leaves up to 18.5 cm long, 16.0 cm broad, pubescent, cordate, acuminate and toothed, dentation deep, pointed and more regular than in *A. indicum,* 9-nerved, petiole up to 17.6 cm long; stipule linear, 0.5—0.9 cm long; inflorescence solitary axillary, pedicel 1.4—8.0 cm long; corolla orange yellow, 2.4—3.2 cm across (mean diameter of corolla = 3.0 cm); sepal 0.8—1.3 cm long and 0.4—0.7 cm broad; petal 1.1—1.4 cm long and 0.9—1.5 cm broad, more or less valvate in flower; fruit more or less cylindric, 1.5—1.9 cm in diameter; carpels 14—20, 1.1—1.5 cm long and 0.6—0.9 cm broad, terminating into, outwardly directed 0.1—0.2 cm long, pointed apices. Carpels start breaking away from the central axis shortly after their maturation and dehiscence usually takes place after breaking away from the central axis; seed covered with rounded projections, no hairs.

Holotypus: Manghopir, 23. 7. 70. S. A. Husain (CLH).

Representative specimens: Sialkot, Sept. 35, R. R. Stewart 15060 (RAW); Changa Manga, 28. 5. 57, S. A. Khan (PFI); P. C. S. I. R. Campus Karachi, 21. 8. 69, 23. 8. 69, 27. 1. 70, 14. 1. 70, S. A. Husain (CLH); Pak Secretariat, Block-95 Karachi, 30. 9. 68, S. A. Husain (CLH); Multan, 20. 9. 69, S. A. Husain (CLH); Manghopir, 21. 1. 70, S. A. Husain (CLH), 23. 9. 63, M. Tasnif (CLH); University Campus Karachi, 27. 8. 70, S. A. Husain (CLH).

Distribution: It is a rare species. Very few plants were collected from Karachi and Multan only.

A. badium can easily be distinguished from *A. indicum* by its reddish brown stem and pointed carpels which terminate into 0.1—0.2 cm long acute

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points (Fig. 4/*1 & 1 a*). In *A. indicum* the stem is green (younger branches partially brownish) and the carpels are broadly pointed but look truncate in fruits (Fig. 4/*2 & 2 a*). Corolla is usually less than 3.0 cm across and petals are valvate in *A. badium* while in *A. indicum* the corolla is always more than 3.0 cm in diameter and the petals are twisted. The pedicels of *A. badium* are usually longer (mean length 5.0 cm) than those found in *A. indicum* (mean length 3.0 cm). Further more the seeds of *A. badium* bear no hairs where as few slender tapering hairs are seen near the hilum in *A. indicum.*

When these two species were grown in experimental plots they also showed a marked difference in habit. The branching in *A. indicum* was very much profuse and the plant had become very much bushy in contrast to *A. badium* where it was comparatively sparingly branched and not bushy. It was also observed that the carpels in *A. indicum* remained attached to the axis for a considerably long time after maturation while in *A. badium* they fell down soon after their maturation.

A. bidentatum differs from the above mentioned two species in having smaller flowers (upto 2.2 cm across) and fruits (diameter upto 1.2 cm, Fig. 4/*5*). Moreover the stem is completely green in it, the flowers are light yellow coloured, carpels pointed and beaked, less than 1.0 cm in length, (Fig. 4/*5 a*) and the dehiscence takes place before breaking away from the central axis. In *A. indicum* and *A. badium* the number of carpels ranges from 14—20 while in *A. bidentatum* it varies from 10—17. We have also noted a marked variation in the number of carpels per fruit in *A. bidentatum* as we move nothwards from Karachi to Panjab region. In Karachi region the number of carpels per fruit varies from 10—14 (very rarely 9, the most common number being 11 and 12) whereas in Panjab region it ranges from 10—17 (14 and 15 being most common). Fruits with 17 carpels were collected only from Rawalpindi (Fig. 3)

10. *A. fruticosum* Guillemin, Perrottet, Richard 1830: 70. — Fig 4/6.

Synonyms: *A. albidum* Webb, Berthelot & al. 1836: 39, t. 2.
A. microphyllum Richard 1847: 70, 1850: t. 15.

Representative specimens: University Campus, Karachi, 4. 10. 67, Miss. K. Gul (KUH), 2. 11. 64, A. M. Khan (KUH), 1. 2. 63, Y. Ahmad (KUH), 1963, A. S. Bhatty (KUH); Manghopir Karachi, 19. 9. 67, — (KUH), 20. 9. 67, S. A. Husain 625 (CLH); Malir Karachi, 16. 2. 63, Miss F. Begum (KUH), 30. 1. 69, S. A. Husain 1002 (CLH), 16. 8. 66, S. A. Husain 624 (CLH), 3. 2. 60, A. Jalis 21623 (RAW); Malir Halt, 12. 5. 68, S. A. Husain 999 (CLH); Nazimabad, Karachi, 23. 7. 61, Jafri (KUH); Thana Bulle Khan, 12. 5. 61, Jafri (KUH), 1. 4. 61, Miss F. Firoz (KUH); Jamshoro, 14. 7. 69, S. A. Husain 1004 (CLH); P. C. S. I. R. Campus Karachi, 30. 1. 69, S. A. Husain 1003 (CLH); Korangi, 15. 12. 68, S. A. Husain 1000 (CLH); Damloti well No. 1, 1. 3. 65, S. A. Husain 622, 623 (CLH); Kalri Lake, 10. 11. 59, A. Jalis 21626 (RAW); Thal, 6. 9. 56, S. Masih 21627 (RAW); Jhelum, 10. 4. 57, I. Ahmed 21628 (RAW); Attock District, 19. 9. 59, Stewart 28492 (RAW); Karachi, 8. 2. 59, Stewart 21625 (RAW), March 52, Stewart 24800 (RAW), 2. 9. 52, Stewart 24767 (RAW), 29. 8. 53, A. Rehman

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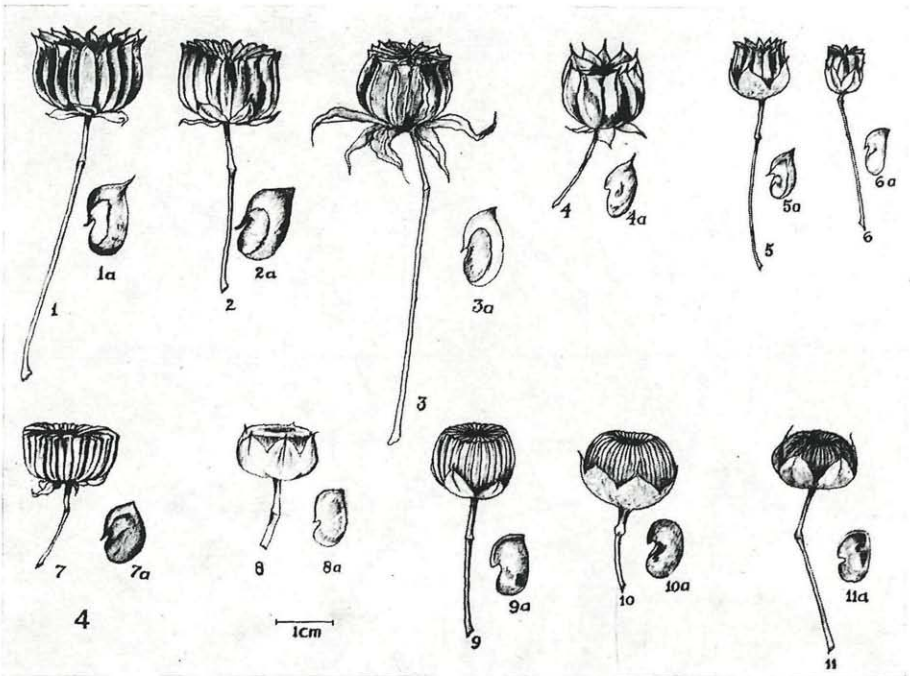


Fig. 4. Shape and size of the fruit and carpel (a) in different species of Abutilon *1.A. badium, 2. A indicum, 3. A. molle, 4. A. pakistanicum, 5. A. bidentatum, 6. A. fruticosum, 7. A. karachianum, 8. A. sepalum. 9. A. hirtum, 10. A. malirianum, 11. A. lanatum.*

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25673 (RAW); Mach, Sept. 61, M. Iqbal 922 (RAW); Kohat Pass, 5. 5. 35, N. Ali 1078 (RAW); Kohat, 21. 4. 54, A. Rehman 25872 (RAW).

Distribution: India, Pakistan (very common), Westward to Arabia and tropical Africa, also in Java.

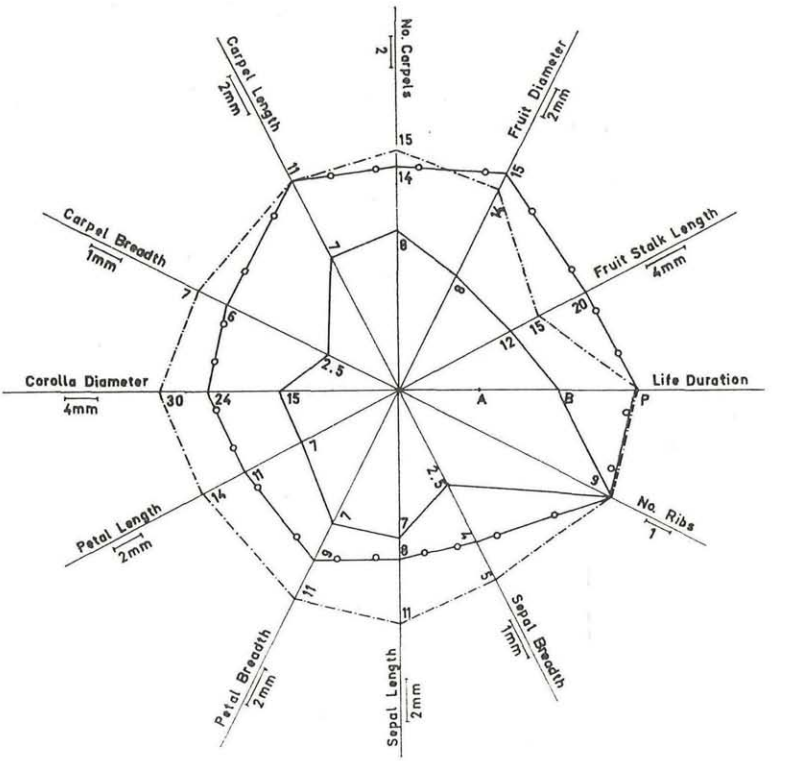


Fig. 3. Diagrammatic representation of the lowest dispersion value of different characters of the species *A. indicum* (— . — . — . —), *A. bidentatum* (————) and *A. badium* (— o — o — o —).

11. *A. ramosum* (Cavanilles) Guillemin, Perrottet, Richard 1830: 68; Masters 1874: 328.

Basionym: *Sida ramosa* Cavanilles 1785: 28, t. 6, f. 1.

Representative specimens: Topi Park Rawalpindi, Sept. 35, Stewart 15113 (RAW); Ahmadabad, June 23, 27, W. T. Saxton 2862 (RAW); Zafarwal Sialkot, 29. 12. 16, — 6604 a (RAW); Tanaza Dam, 5. 10. 69, Y. Nasir & Z. Ali (RAW).

Distribution: India, Pakistan, Arabia and tropical Africa. Although we were not able to collect *A. ramosum* inspite of a thorough search

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but it seems to be rare species of upper Panjab. It has been reported from Karachi by COOKE 1903: 95—99 and from Sind by SABNIS 1923: 227, but its occurrence in this region is doubtful.

12. *A. molle* SWEET 1830: 65. — Fig. 4/*3*.

Representative specimens: Rawal Dam Rawalpindi, 14. 11. 62, NASIR & SIDDIQUI 911 (RAW); Rawalpindi, 11. 10. 62, SIDDIQUI 911 (RAW), 8. 3. 22, M. SINGH 21642 (RAW), 10. 5. 57, M. SINGH 21641 (RAW); Chattar Muree Road, 27. 6. 38, R. R. STEWART 16545 (RAW); University Campus Peshawar, 22. 9. 69, S. A. HUSAIN 105 (CLH); P. C. S. I. R. Campus Experimental Plot Karachi, 8. 10. 70, S. A. HUSAIN (CLH).

Distribution: India, Pakistan, Arabia and tropical Africa. In Pakistan it is reported only from Panjab and Peshawar region.

13. *A. pakistanicum* JAFRI & ALI in JAFRI 1966: 220. — Fig. 4/*4*.

Synonym: *A. cornutum* COOKE 1903: 988 — non (H. & B. ex WILLD.) SWEET 1830: 65.

Representative specimens: Malir, June 38, D. NATH 216 (RAW); Malir Halt, 30. 10. 66, S. A. HUSAIN 84 (CLH); Malir River near Jamgot, 4. 10. 66, S. A. HUSAIN 83 (CLH); Jamgot, 10. 9. 68, S. A. HUSAIN 102 (CLH), 3. 9. 66, S. A. HUSAIN 82 (CLH); Beyond Hab River, 30 miles of Karachi, 1. 9. 68, S. A. HUSAIN 101 (CLH); Near Sonmiyani, 18. 11. 67, S. A. HUSAIN 100 (CLH); Nawabshah Sind, 25. 11. 65, S. A. HUSAIN 626 (CLH); Chubecai Nala Lasbella, 5. 10. 62, M. TASNIF 577 (CLH).

Distribution: Most probable endemic.

All the species show a great range of variation in their height as well as the size of leaves and hence it is not possible to rely on vegetative characters only. During unfavourable conditions the size of leaves may remain 3.0 or 4.0 cm and the height of the plant may be restricted to 60.0 to 90.0 cm only. In some species the dentation of leaves may also be variable as in the case of *A. malirianun* and *A. pakistanicum* where it may be denticulate or entire on the same plant.

Summary

Thirteen species of the genus *Abutilon* MILL. have been described from Pakistan (excluding Kashmir area) which include five new species viz 1) *A. malirianum* HUS. & BAQ., 2) *A. badium* HUS. & BAQ., 3) *A. lanatum* HUS. & BAQ., 4) *A. karachianum* HUS., & BAQ., 5) *A. sepalum* HUS., & BAQ. which are reported here for the first time. Their diagnostic characters, latin description, distribution and range of variation have been discussed.

Zusammenfassung

Dreizehn Arten der Gattung *Abutilon* MILL. werden aus Pakistan (ohne das Kashmir-Gebiet) beschrieben, darunter als neue Arten *A. malirianum* HUS. & BAQ., *A. badium* HUS. & BAQ., *A. lanatum* HUS. & BAQ., *A. karachi-*

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anum Hus. & Baq., *A. sepalum* Hus. & Baq., über die hier erstmals berichtet wird. Ihre Merkmale mit lateinischer Beschreibung, Verbreitung und Variabilität werden behandelt.

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