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PLANT DIVERSITY (ANGIOSPERM) OF STRESS SITES OF SULTANPUR (UTTAR PRADESH)

VEENA CHANDRA
Systematic Botany, Botany Division, Forest Research Institute, Dehradun

ABSTRACT

Eighty six species of Angiosperms have been recorded from the Sodic soil affected stress sites of Sultanpur district in U.P.

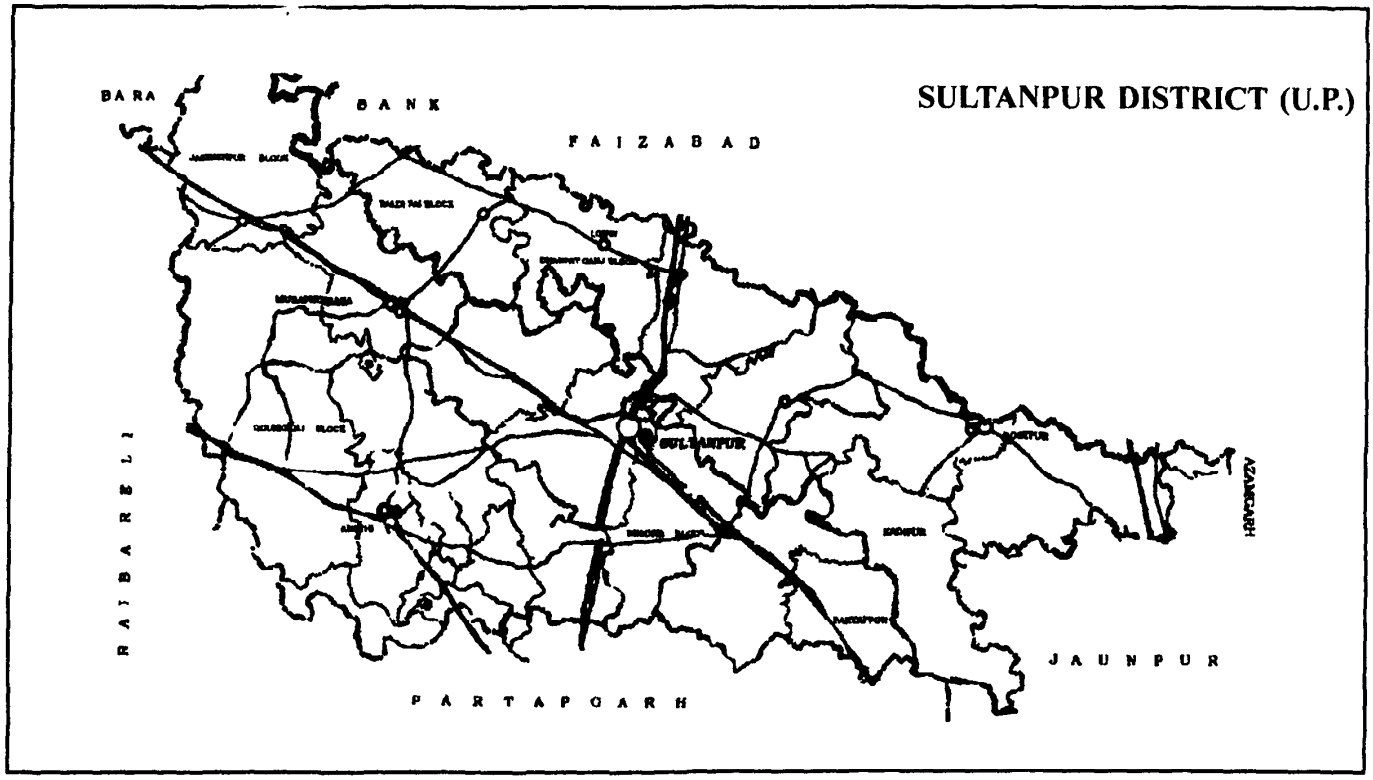
INTRODUCTION

The district of Sultanpur occupying an area of 4436 sq. kms is situated between latitudes 25°59' and 26°40' north and longitude 81°32' and 82°41' east. It is surrounded on north by Faizabad while on the north-west and west by district Barabanki. In the east there are districts Jaunpur and Azamgarh. On southern boundary the districts Pratapgarh and Rae Bareli are co-terminus.

The district lacks natural vegetation except around the ravines of the river Gomti and its tributaries, *nalas*, tanks, lakes and swamps. The area under forest is about 2288 ha. Measures are being taken to develop the forest. A few small dhak jungles are found along the *nalas*. The grove area had been large. But lack of zeal among the rural folks for retaining and maintaining the area under grove is decreasing. The trees most favoured for groves are mango, jamun, mahua, jack fruit, neem and shisham. The other type of trees which usually seen are aonla, gular, kathal, banyan and pipal. The babul is common everywhere. The fruit trees are also most frequently seen. The common varieties are orange, lemon, guava and plaintain.

The sodic 'usar' lands of Sultanpur represent a degraded biological system in which there have been extremely man-induced, environmental impacts. Destruction of forest, improper use/management of land coupled with unthoughtful development activities are contributory towards their formation. The problems encountered in their management are the poor physical, chemical and biological conditions. The physical attributes that render them inhospitable for plants are low infiltration rate, impeded drainage, poor soil structure, very hard consistency when dry, resulting in water logging during rains, severe moisture stress during dry period, and low moisture availability. The constraints regarding chemical properties are poor and unbalanced nutrient status, excess of water soluble salts and dominance of sodium in exchange complex. The sodic soils are calcareous in nature and calcium carbonate contents ranges between 2 to 40%. A hard impervious calcic pan

encountered at a depth of 30 cm to 300 cm acts as a physical barrier for roots, water, etc. Due to high pH and lack of available essential nutrients, the biological activity in sodic soils is very limited, resulting in poor biodiversity. Though a lot of work has been carried out on the study of sodic soils and their reclamation, no effort has been made to study the biodiversity/flora and ethnobotany of sodic soil and reclaimed areas. Due to low nutrient level and high pH of soils the biological activity is very poor and such habitat can sustain very limited flora. No baseline information is available on the flora of sodic soils of Sultanpur.



Exploration-cum-collection surveys were carried out during 1998-2001 in all the three seasons at various places in the districts and flora and ethnobotanical information was gathered. Collection was done in sodic as well as reclaimed sites. Attempts were made to collect the specimens in flowering and fruiting so as to facilitate easy identification. The specimens collected were identified with the help of floras and by matching with earlier collections deposited in the F.R.I. Herbarium (DD). The dried specimens were mounted, labelled and incorporated in the herbarium. The number of plant species found in each locality in each season is shown in Table 1.

ENUMERATION OF SPECIES

1. **Acacia nilotica** (L.) Willd. ex Del. ssp. **indica** (Benth.) Brenan (Mimosaceae)

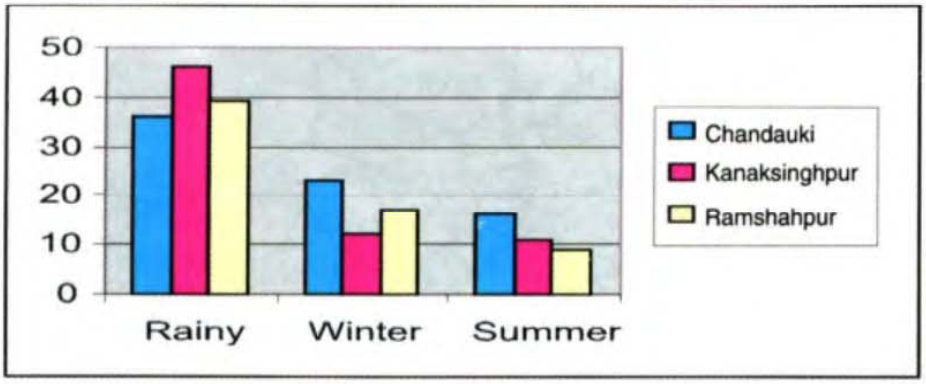
Trees, 3-7 m high with greyish-black fissured bark and large stipular spines. Pinnae 2-7 pairs; leaflets 3-5 x 1 mm. Heads long peduncled, *ca* 1 cm across, bright yellow. Pods 5-12 cm long, velvety, constricted.

Fl.: May-Aug. ; *Fr.*: Oct.-Apr. Chandauki, Kanaksinghpur.

Table 1: No.of plant species in different seasons in various localities

Locality	No. of Plant Species		
	Rainy season	Winter season	Summer season
Chandauki	36	23	16
Kanaksinghpur	46	12	11
Ramshahpur	39	17	9

Bar Diagram showing the above statistics



2. **Achyranthes aspera** L. (Amaranthaceae)

Erect perennial herbs, up to 1 m high with slightly mealy tomentose branches. Leaves ovate, obovate or oblong, 2-10 x 1-5 cm. Spikes 10-40 cm long; bracts acuminate. Flowers 4-6 mm long, glistening whitish green or purple, lower reflexed.

Fl. & Fr. : June Sept. Chandauki, Kanaksinghpur.

3. **Ageratum conyzoides** L. (Asteraceae)

Erect hispid herbs, 30-80 cm high. Leaves long petioled, ovate, 3-8 cm long, coarsely crenate, scented. Heads in terminal corymbs, 3-5 mm broad, blue-purple or white; involucre campanulate. Achenes black, pappus of 5 awned scales.

Fl. & Fr. : Throughout the year. Chandauki, Kanaksinghpur, Ramshahpur.

4. **Alternanthera sessilis** (L.) R. Br. ex DC. (Amaranthaceae)

Erect, ascending or prostrate herbs rooting at the lower nodes. Leaves sessile or shortly petioled, linear-lanceolate or obviate, 1-10 x 0.5- 2 cm, green or purplish. Heads solitary or few, axillary, ovoid-globose or cylindric, white. Utricles equalling the tepals, brown.

Fl. & Fr. : Throughout the year. Chandauki, Kanaksinghpur, Ramshahpur

5. **Alysicarpus monilifer** (L.) DC. (Papilionaceae)

Slender prostrate tufted herbs with 10-50 cm long branches. Leaflet 1, elliptic-oblong, 5-15 x 7-10 mm, with rounded or subcordate base. Racemes dense, few-flowered. Pods

3-6-jointed, 10-18 x 2 mm, joints globose, pubescent.

Fl. & Fr. : Aug.-May. Kanaksinghpur.

6. **Amaranthus spinosus** L. (Amaranthaceae)

Erect annual herbs, 10-50 cm high. Stem yellowish or reddish green. Leaves ovate-oblong or lancelet, the larger ones 3-10 x 1-4 cm. Flower clusters dense, lower axillary, higher collected into axillary and terminal spikes. Tepals 5. Utricles circumscissile.

Fl. & Fr. : Aug.-Jan. Chandauki, Kanaksinghpur, Ramshahpur.

7. **A. viridis** L. (Amaranthaceae)

Annual erect herbs, 10-50 cm high. Leaves ovate-rhomboid or oblong, glabrous or sparingly hairy, the larger ones 3-7 x 2-5 cm. Flowers clustered, green or purplish, *ca* 1.5 mm long; lower clusters axillary, upper in terminal, continuous or interrupted spikes. Utricles subequalling the tepals and falling off with it, beaked.

Fl. & Fr. : May-Aug. Chandauki.

8. **Ammania baccifera** L. (Lythraceae)

Diffusely branched pinkish green herbs with 5-40 cm long quadrangular branches. Leaves elliptic-lanceolate, up to 6 x 1 cm, narrowed at both ends. Flowers in 3-5 mm long cymes, *ca* 2 mm across, purple. Capsules depressed, globose, red.

Fl. & Fr. : Throughout the year. Kanaksinghpur, Ramshahpur.

9. **Anagallis arvensis** L. (Primulaceae)

Slender annual creeping herbs. Leaves opposite, ovate, 10-15 x 5-10 mm, cordate or amplexicaul at the base, palmately 3-nerved. Flowers axillary, on slender pedicels; petals broadly obviate, subequalling the caylx lobes, *ca* 4 mm long. Capsules circumscissile.

Fl. & Fr.: January. Chandauki.

10. **Argemone mexicana** L. (Papaveraceae)

Perennial glaucous green prickly herbs, 30-50 cm high. Leaves sinuately lobed, 5-12 × 2-5 cm, with white stripes along the nerves. Flowers yellow; petals bisriate, soon falling; stigmas red. Capsules *ca* 3 cm long; seeds black.

Fl. & Fr. : Jan.-Sept. Kanaksinghpur, Ramshahpur.

11. **Blumea eriantha** DC. (Asteraceae)

Perennial dichotomously branched herbs, up to 1 m high. Leaves elliptic-obviate, 2-19 cm long, pilose, spinulose-serrate. Heads soiltary or few clustered, ca 5 mm across. Flowers yellow. Achenes subterete, sparsely hairy; pappus white.

Fl. & Fr. : April. Chandauki, Ramshahpur.

12. **B. laciniata** (Roxb) DC. (Asteraceae)

Erect or ascending herbs up to 1.5 m high; stem hollow. Leaves radical and cauline, 5-30 cm long, lower lyrately lobed, upper less lobed, all dentate-margined. Heads 6-8 mm across, in large panicles. Flowers yellow. Achenes ribbed, pubescent.

Fl. & Fr. : May. Chandauki, Kanaksingh-pur.

13. **Boerhavia diffusa** L. (Nyctaginaceae)

Diffuse herbs with up to 1 m long almost prostrate branches. Stems often purple-tinged. Leaves in unequal pairs, ovate-rounded or lancelet, 2-6 cm long, acute or obtuse, subentire-undulate. Flowers 1-several in glandular viscid pubescent cymose panicles. Perianth

bright purple.

Fl. & Fr. : Throughout the year. Chandauki.

14. Calotropis procera (Ait.) R. Br. (Asclepiadaceae)

Shrubs, 0.7-1.5 m high. Leaves ovate-oblong, cordate, acute or sub-mucronate, glabrescent with age, 12-17 × 7-11 cm. Follicles recurved, somewhat sausage-shaped, 8-10 × 4-5 cm; seeds obviate, *ca* 6 mm long, comose.

Fl. & Fr.: Throughout the year. Chandauki, Kanaksinghpur.

15. **Capparis decidua** (Forssk.) Edgew. (Capparaceae)

Much branched shrubs or small trees; branches slender, nearly glabrous; stipular spines straight. Leaves when present , 0.5-1.2× 0.2-0.4 cm. Flowers in corymbose racemes or in fascicles. Berries ovoid to subglobose, many-seeded, scarlet red when ripe.

Fl. & Fr. : June, often Sept.-Dec. Ramshahpur

16. **Capparis sepiaria** L. (Capparaceae)

Much-branched, sub-scandent or scandent, armed shrubs. Leaves 1.5-4.0 × 1.5-3.0 cm, ovate, elliptic, oblong or oblong-lanceolate, glabrous above and downy beneath. Flowers in umbels at the ends of the branches, white. Berries globose, smooth, glabrous, dark purple to black when ripe, 1-seeded.

Fl. : Feb.-Apr.; *Fr.* : Apr.- June. Chandauki.

17. **Cassia pumila** Lamk. (Caesalpiniaceae)

Decumbent or erect annual herbs, 10-40 cm high, branches clothed with rather curled hairs. Leaves 3-6 cm long; leaflets 6-25 pairs, obliquely linear-oblong, 5-13× 1-3 mm. Flowers 1-3 together, *ca* 5 mm long, yellow. Pods 20-45× 3-5 mm, pilose, 6-16-seeded.

Fl. & Fr. : Aug.-Nov. Kanaksinghpur.

18. **C.tora** L. (Caesalpiniaceae)

Annual erect herbs or undershrubs, 0.2-1.2 m high. Leaves 5-10 cm long; stipules 8-15 × 1 mm. Leaflets 0.5-5.0 × 0.5-2.5 cm, with glands between two lower pair of leaflets. Peduncles 1-2-flowered. Flowers yellow; pedicels 4-10 mm long; petals 8-10 mm long. Pods subterragonal, 10-20 cm long, *ca* 5 mm broad, on 5-15 mm long pedicel.

Fl. & Fr. : Aug.-June. Chandauki.

19. **Celosia argentea** L. (Amaranthaceae)

Annual erect herbs, 30 - 80 cm high with green or reddish stem. Leaves linear, *ca* 3.5 × 0.3 cm. Spikes terminal, ovoid or subcylindric, 2 - 10 cm long, glistening white with pink tips. Flowers white with pink tips, bracts and bracteoles persistent: Utricles obovoid, *ca* 3 mm long.

Fl. & Fr. : Aug.- June. Kanaksinghpur.

20. **Centipeda minima** (L.) A. Br. & Aschers. (Asteraceae)

Prostrate or ascending annual herbs. Leaves elliptic-obviate, entire or pinnatifid, 5-15 × 1-4 mm. Heads solitary, 2-3 mm across; marginal flowers white, disk flowers yellow. Achenes quadrangular, hairy.

Fl. & Fr. : Sept. Chandauki.

21. **Cenchrus ciliaris** L. (Poaceae)

Perennials, 15-40 cm high. Leaves 3-5 mm broad. Spikes terminal, 3-5 cm long; spikelets *ca* 5 mm long; involucral bristles 6-15 mm long, antrorsely scabrid, inner rather slender, ciliate-margined.

Fl. & Fr. : Oct. Ramshahpur.

22. **Chenopodium album** L. (Chenopodiaceae)

Erect annual herbs, clothed with white powdery vesicles. Leaves very variable in size and shape, 0.5-5.5 × 0.3-3.5 cm. Flowers in clusters borne in dense or lax paniculate ebracteate spikes, pale gren. Seeds orbicular, compressed, with a blunt margin.

Fl. & Fr. : Oct.-Apr. Kanaksinghpur.

23. **Chloris barbata** Sw. (Poaceae)

Tufted, geniculately ascending, stoloniferous perennials, 50-100 cm high. Leaves 10-40 × 0.25-0.35 cm, flat or convolute, narrowly linear, ligule a membrane. Spikes 5-15 digitate, tinge with purple. Spikelets 3-flowered

Fl. & Fr.: July-Sept. Chandauki, Kanaksinghpur, Ramshahpur.

24. **Chloris montana** Roxb. (Poaceae)

Erect or geniculately ascending perennial, up to 50 cm high. Leaves 7-20 x 0.25-0.5 cm, narrowly linear, ligules very short. Spikes 1-4, erect, up to 7 cm long. Spikelets *ca* 2.5 mm long.

Fl. & Fr. : Aug.-Oct. Ramshahpur.

25. **Chrozophora rottleri** (Geiss) A. Juss. (Euphorbiaceae)

Greyish-green, annual, or sometimes perennial herbs. Leaves and stems scabrous which gives itching sensation on touch. Leaves orbicular with 3 rounded lobes, 3-8 cm broad, undulate-crenate, long-petioled. Flowers yellow. Fruits clothed with stellate hairs.

Fl. & Fr. : Apr. Chandauki, Kanaksinghpur.

26. **Chrysopogon aciculatus** (Retz.) Trin. (Poaceae)

Erect or ascending perennial grass, with woody and creeping rootstock. Leaves 2-12 × 0.25-0.5 cm, flat, linear-lanceolate; ligule membranaceous. Panicles 2-7 cm long, green with purplish tinge. Spikelets in threes. Glumes aristulate. Caryopsis linear.

Fl. & Fr. : Aug.-Oct. Chandauki, Kanaksinghpur

27. **Coccinea grandis** (L.) Voigt (Cucurbitaceae)

Perennial, scandent dioecious herbs. Leaves 3-10 cm long, entire to palmately lobed, bright green above, with few glistering glands beneath. Male flowers white. Female flowers: Ovary 10.0-12.5 x 2.0-3.5 mm. Fruits 2.5-5.0 x 2-3 cm, subglabrous, fusiform-ellipsoidal, streaked with white when immature, bright scarlet and fleshy when mature.

Fl. & Fr. : Almost throughout the year. Ramshahpur.

28. **Commelina benghalensis** L. (Commelinaceae)

Slender ascending herbs with stems up to 1 m long. Leaves sessile or petioled, elliptic, ovate or suborbicular, 1-8 × 1-4 cm. Spathes terminal or leaf-opposed, 8-17 mm long and equally broad, gibbous. Flowers blue or liliac, sometimes there are subterranean leafless branches bearing white cleistogamous flowers.

Fl. & Fr. : Aug.-Jan. Kanaksinghpur.

29. **Convolvulus arvensis** L. (Convolvulaceae)

Prostrate, creeping or twining perennial herbs. Leaves 1.58.0 × 0.5-5.0 cm, ovate-lanceolate to oblong, mucronate, subentire-repand, hastate or sagittate at base. Flowers in axillary, 1 to 3-flowered cymes. Capsules 5-6 mm in diam., ovoid-globose.

Fl. & Fr. : Dec.-Apr. Chandauki, Ramshahpur

30. **Croton bonplandianum** Baill. (Euphorbiaceae)

Woody herbs, 10-50 cm high, profusely branched from the base. Leaves ovate-lancelet, with 2 glands at the base. Flowers spicate, white, or pale yellow on drying. Fruits green, glandular hairy; seeds strophiolate, oblong.

Fl. & Fr. : Apr. Chandauki, Kanaksinghpur (Sultanpur).

31. **Cynodon dactylon** (L.) Pers. (Poaceae)

Stoloniferous perennials with slender underground rhizome; culms 10-40 cm long. Leaves 2-10 cm long, 2-4 mm broad, scaberulous; ligule a short ciliolate rim *ca* 0.3 mm long. Racemes 4-6, whorled, slender, 2-7 cm long; spikelets ca 2 mm long; lemma silky pubescent on the keel.

Fl. & Fr. : Throughout the year. Chandauki, Kanaksinghpur, Ramshahpur.

32. **Cyperus compressus** L. (Cyperaceae)

Annuals or sometimes perennials, 5-10 cm high. Anthela simple, lax; spikelets linear or oblong, compressed, green; glumes ovate, mucronate, strongly keeled, 3-4 x ca 2 mm. Stamens 3. Nuts broadly obovoid, shortly apiculate, ca 1.5 x 1.0 mm, dark brown to blackish.

Fl. & Fr. : Aug.- May. Kanaksinghpur.

33. **C. iria** L. (Cyperaceae)

Annuals, or rarely perennials, 5-50(-80) cm high. Leaves shorter than to exceeding the stem, 3-8 mm broad. Anthela simple or compound; spikelets oblong, 3-8 x 1.5-2.0 mm; glumes broadly ovate, mucronate, keel 3-5-nerved. Stamens 2-3. Nuts obovoid-ellipsoid, stipitate, triquetrous, 1.0-1.5 mm long, dark brown to black.

Fl. & Fr.: Aug.-Apr. Chandauki, Ramshahpur.

34. **C. rotundus** L. (Cyperaceae)

Perennials, 10-40 cm high. Stolons with intermittent ellipsoid aromatic tubers. Stems compressed, trigonous. Leaves 2-5 mm braod. Anthela simple or compound; spikelets 10-35 × 1.5-2.0 mm, red-brown, often curved; rhachilla winged; glumes ovate, 3.0-3.5 mm long. Stamens 3. Nuts 1.5 - 1.7 mm long, blackish.

Fl. & Fr. : Aug.-May. Chandauki, Kanaksinghpur, Ramshahpur.

35. **C. triceps** Endl. (Cyperaceae)

Perennials, 5-40 cm high. Leaves 1-3 mm broad. Inflorescence capitae, of (1-3(-5) dense heads: central head sub-globose, 5-8 × 5 mm, lateral ones globose, somewhat smaller; spikelets oblong, *ca* 2 mm long, pale green to whitish; glumes ovate-oblong. Stamens 2. Nuts oblong, *ca* 1 mm long, yellowish-brown.

Fl. & Fr. : Aug.-Sept. Chandauki, Kanaksinghpur, Ramshahpur.

36. Dactyloctenium aegyptium (L.) Willd. (Poaceae)

Annuals with 3-70 cm long erect or ascending culms rooting at the lower nodes, sometimes

stoloniferous. Leaves papillose-hispid. Spikes 1-9, whorled, 0.5-6.5 cm long, rhachis produced into a pointed extension. Spikelets 2-4 mm long; upper glume with a 1-3 mm long awn. Grains obovoid, transversely rugose.

Fl. & Fr. : Aug.-June. Chandauki, Kanaksinghpur.

37. **Desmodium triflorum** (L.) DC. (Papilionaceae)

Slender trailing annual herbs, frequently rooting at the nodes; stems patently hairy. Leaflets obviate, truncate or emarginate, sparsely hairy beneath. Flowers 1-4 together, axillary, *ca* 3 mm long, white, pink or blue. Pods on filiform pedicels, curved, 3-5-jointed, indented on the ventral sutures, glabrous or hairy.

Fl. & Fr.: Sept.-Apr. Chandauki, Kanaksinghpur, Ramshahpur.

38. **Dicanthium annulatum** (Forsk.) Stapf (Poaceae)

Perennial, geniculately ascending; culms 20-80 cm long. Racemes shortly peduncled, two several, subdigitate, 3 7 cm long; sessile spikelet 2 -6 mm long; lower glumes villous; upper lemmma with 8 20 mm long awn.

Fl. & Fr.: Nov.-June.

39. **Digera muricata** (L.) Mart. (Amaranthaceae)

Annual, erect, diffusely branched herbs, 20-60 cm high, sometimes shortly creeping. Leaves long petioled, ovate-oblong, 2-6 × 1-4 cm. Racemes axillary, rather flexuous, 1-20 cm long. Flowers 3-5 mm long, pink or white, mostly accompanied by a pair of sterile lateral flowers.

Fl. & Fr. : August January. Kanaksinghpur, Ramshahpur.

40. **Eclipta alba** (L.) Hassk. (Asteraceae) Prostrate or ascending appressed pubescent herbs. Leaves elliptic-oblong or lancelet, entire or serrate. Heads peduncled, 5-10 mm across, white; involucral bracts biseriate, 3-6 mm long. Achenes turbinate, *ca* 2 mm long, tubercled.

Fl. & Fr. : Aug.- May. Chandauki, Kanaksinghpur, Ramshahpur.

41. **Enicostemma axillaris** (Lamk.) Raynal (Gentianaceae)

Profusely branched perennial herb with erect or ascending branches. Leaves linear or linear-oblong, up to 6.0 × 1.2 cm, 3-nerved. Flowers white; corolla with a long tube, funnel-shaped above. Capsules ellipsoid.

Fl. & Fr. : Oct. Ramshahpur.

42. **Euphorbia chamaesyce** L. (Euphorbiaceae)

Annual slender diffusely branched herbs, frequently with pinkish branches. Leaves oblong-elliptic, 2-7 × 1-4 mm, crenulate, prominently 3-nerved; stipules ovate, hairy. Involucre hairy outside. Cocci with spreading hairs on the keel; seeds red-brown, 4-angled.

Fl. & Fr. : Aug.-May. Chandauki, Kanaksinghpur, Ramshahpur.

43. **E. hirta** L. (Euphorbiaceae)

Perennial ascending herbs, very hairy, usually purplish green with age, branches up to 60 cm long. Leaves opposite, elliptic-oblong, obviate or oblong-lancelet, 1-3 cm long, serrulate. Involucres minute, crowded, in capitate finally peduncled axillary cymes, hairy. Fruits depressed-globose, appressed-pubescent.

Fl. & Fr. : Aug.-Apr. Chandauki, Kanaksinghpur, Ramshahpur.

44. **Evolvulus alsinoides** (L.) L. (Convolvulaceae)

Prostrate herbs, mostly covered with silky indumentum. Leaves subsessile, 8-26 mm long, acute or rounded at both ends. Sepals ovate-lancelet, 4-5 mm long, corolla campanulate, white. Capsules globose, 3-4 mm long; seeds ovoid.

Fl. & Fr. : Aug.-June. Chandauki, Kanaksinghpur.

45. **E. nummularis** (L.) L. (Convolvulaceae)

Prostrate herbs, rooting at the nodes, pilose to glabrate. Leaves shortly petiolate, 4-15 mm long, glabrous, apex rounded or emarginate. Flowers axillary, solitary or paired; sepals elliptic-ovate; corolla campanulate, 5-7 mm long. Capsules globose; seeds sub-globose.

Fl. & Fr. : Aug.-June. Kanaksinghpur.

46. **Fimbristylis bisumbellata** (Forsk.) Bub. (Cyperaceae)

Annuals, up to 25 cm high. Leaves flat, 1-2 mm broad. Anthela compound or decompound, loose; spikelets solitary, oblong-obovoid, 3-8 mm long; glumes broadly ovate, mucronulate, sharply keeled, *ca* 1.5 mm long. Stamen 1. Nuts obviate, trabeculate, 0.4-0.7 mm long, stramineus, epidermal cells in 5-9 vertical rows on each face.

Fl. & Fr. : Jan.-May. Chandauki, Kanaksinghpur.

47. **F. dichotoma** (L.) Vahl (Cyperaceae)

Annuals or perennials, 10-100 cm high. Leaves flat, 1.5-5.0 mm broad. Anthela simple or subcompound; spikelets ovoid, globose, terete, 5-11 x 2.5-3.0 mm; glumes broadly ovate, mucronulate, scarcely keeled. Stamens 1-3. Nuts obviate, trabeculate with 5-10 longitudnal ribs on either face, whitish to stramineus, ca 1 mm long.

Fl. & Fr. : Aug.-Apr. Kanaksinghpur, Ramshahpur.

48. **F. schoenoides** (Retz.) Vahl (Cyperaceae)

Perennials, 10-50 cm high. Leaves 0.5-1.0 mm broad. Anthela simple or reduced to a solitary spikelet; spikelet broadly ovoid, terete, 4-8 x 3.0-4.5 mm; glumes broadly ovate or suborbicular, muticous or mucronulate, 2.5-3.3 mm long; stamens 3-2. Nuts stipitate, obovoid, ca 1.5 mm long, stramineus.

Fl. & Fr.: Sept.-Oct. Chandauki, Kanaksinghpur.

49. **Glinus lotoides** L. (Molluginaceae)

Slender, prostrate or ascending, annual herbs, greyish green or pinkish with age. Stems 10 -80 cm long. Leaves in fugacious radical clusters and 2-3-nate on the stems, obovate-rotundate, 10 - 30 × 5 - 15 mm. Flowers in axillary fascicles; tepals 6-10 mm long. Capsules 5-valved.

Fl. & Fr. : May-June. Kanaksinghpur, Chandauki.

50. **Gomphrena celosoides** Mart. (Amaranthaceae)

Profusely branched ascending white hairy herbs. Leaves short petioled, oblong-spathulate, 2-5 cm long. Spikes terminal, globose-cylindric; bracts and bracteoles scarious, bracteoles shortly winged at the top. Flowers white; tepals hairy on the back.

Fl. & Fr. : Chandauki, Ramshahpur.

51. **Grangea maderaspatana** (L.) Poir. (Asteraceae)

Slender procumbent herbs with 5-10 cm long hirsute branches. Leaves oblong,

pinnately lobed, 1-7 cm long. Heads button-shaped, *ca* 1 cm across, yellow; involucral bracts 2-3 seriate, herbaceous; calyx tube with a ring of short hairs.

Fl. & Fr. : Apr.-May. Chandauki.

52. **Gymnema sylvestre** (Retz.) R.Br. ex Schult.(Asclepiadaceae)

Climbers with densely yellow pubescent or hirsute branchlets. Leaves ovate or oblong, acuminate, densely pubescent, 3-5 × 2-3 cm. Flowers pale yellow, in corymbose cymes. Follicles usually solitary, 6-7 cm long, gradually tapering from the base.

Fl. : Sept.; *Fr.* : Dec. Chandauki, Ramshahpur.

53. **Hemigraphis latebrosa** (Heyne ex Roth) Nees (Acanthaceae)

Annual hairy herbs, up to 60 cm high. Leaves ovate-oblong, acuminate, 2-11 cm long. Heads usually terminating small axillary branches; bracts ovate or elliptic, petioled. Corolla tube sometimes yellow, lobes rounded, blue; longer filaments bearded with papillose hairs, shorter glabrous. Capsules pubescent, 6-seeded.

Fl. & Fr. : Oct.-Jan. Chandauki, Ramshahpur.

54. **Heteropogon contortus** (L.) P. Beauv. ex R. & S. (Poaceae)

Erect tufted perennials, 30-100 cm high. Racemes usually long exseted, 3-8 cm long, often in pseudo-panicles, awns long, chestnut brown, spirally twisted. Sessile spikelets 6-8 mm long with a pungent rufously bearded callus.

Fl. & Fr. : Oct. Chandauki, Ramshahpur.

55. **Hygrophila auriculata** (Heyne ex Roth) Nees (Acanthaceae)

Annual hairy herbs, up to 60 cm high. Leaves ovate-oblong, acuminate, 2-11 cm long. Heads usually terminating small, axillary branches; bracts ovate or elliptic, petioled. Corolla tube sometimes yellow, lobes rounded, blue; longer filaments bearded with papillose hairs, shorter glabrous. Capsules pubescent, 6-seeded.

Fl. & Fr. : Oct.-Jan. Chandauki, Kanaksinghpur.

56. **Imperata cylindrica** (L.) Raesch. (Poaceae)

Erect rhizomatous perennials 30-80 cm high. Leaves mostly basal, 10-40 cm long, 3-8 mm broad. Panicles spiciform, cylindrical, 7-13 cm long, 15-18 mm across, copiously silky white hairy. Spiketelts ca 5 mm long; glumes as long as the spikelets.

Fl. & Fr. : Aug.- June. Chandauki, Ramshahpur.

57. **Indigofera linifolia** (L.*f.*) Retz. (Papilionaceae)

Prostrate herbs; branches slender, 10-50 cm long, 2- or 4-angled, Grey pubescent. Leaves simple, linear-oblong, 7-20 × 2-4 mm, apiculate, hairy on both surfaces. Flowers racemose, ca 3 mm long, red. Pods globose, ca 1.5 mm dia., silvery silky.

Fl. & Fr. : Aug.-May. Chandauki, Ramshahpur.

58. **Ipomoea aquatica** Forsk. (Convolvulaceae)

Procumbent or floating herbs rooting at the lower nodes. Stems hollow. Leaves mostly hastate, 3-10 cm long, 0.5-6.5 cm broad. Sepals ovate-oblong, 6-7 mm long, glabrous; corolla 2-6 cm long, purple. Capsules ovoid, 7-8 mm long; seeds glabrous.

Fl. & Fr. : Chandauki, Kanaksinghpur.

59. **I. carnea** Jacq. (Convolvulaceae)

Shrubs, 1-6 m tall. Stems woody. Leaves ovate-cordate to lancelet, 4-21 × 3-10 cm.

Flowers in cymose paniculate clusters; corolla deep pink to purple, rarely white, 5-9 cm long; stigma biglobular. Capsules ovoid subglobose, *ca* 15 mm across; seeds covered with long comose brown trichomes.

Fl. & Fr. : Apr.-Jan. Chandauki, Kanaksinghpur.

60. **Launaea asplenifolia** (Willd.) Hook.*f.* (Asteraceae)

Erect or ascending annual or biennial, multicauline herbs, with milky juice. Leaves in basal rosette, 5-12 cm long, obovate-oblanceolate, pinnatifid or pinnately lobed, segments dentate with non-cartilaginous teeth. Heads in terminal panicles, 1.0 1.5 cm long, yellow. Aches columnar, angled and ribbed. Pappus hairs white.

Fl. & Fr.: Dec.-Apr. Chandauki, Kanaksinghpur.

61. **Launaea procumbens** (Roxb.) Ramayya & Rajagopal (Asteraceae)

Perennial succulent herbs with erect or trailing stems and yellow juice. Leaves in a basal rosette, spathulate, 5-20 cm long, lobed or pinnatifid, dentate. Heads subracemose, *ca* 15 mm long, yellow. Achenes ribbed, 3-4 mm long; pappus hairs white, deciduous.

Fl. & Fr. : Chandauki, Kanaksinghpur, Ramshahpur.

62. **Leucas aspera** (Willd.) Link. (Lamiaceae)

Densely hairy erect herbs. Leaves subsessile or shortly petiolate, 1-9 × 0.8-4.5 cm, linear-oblong or oblong lanceolate, entire to crenate, more or less hairy. Flowers in terminal and axillary whorls reaching *ca* 2.5 cm in diam., white. Nutlets oblong, smooth, brown.

Fl. & Fr. : Almost throughout the year. Chandauki, Ramshahpur.

63. **Ludwigia adscendens** (L.) Hara (Onagraceae)

Aquatic or marsh-land herbs with a creeping stem rooting at the nodes and emitting erect branches. Leaves elliptic-oblong, 1-7 cm long. Flowers solitary, axillary, pentamerous; sepals 5-10 mm long; petals obviate, 10-18 mm long. Capsules terete, 10-ribbed, 12-27 mm long; seeds uniseriate in each cell.

Fl. & Fr. : Jan.-June. Kanaksinghpur.

64. **Medicago polymorpha** L. (Papilionaceae)

Annual slender herbs with somewhat spreading branches up to 30 cm long. Leaflets 3, obviate, 10-20 × 7-15 mm, toothed. Racemes 2-8-flowered. Flowers *ca* 4 mm long, yellow. Pods spirally twisted, *ca* 3 mm high, with two rows of short spines.

Fl. & Fr. : Jan. Kanaksinghpur.

65. **Melochia corchorifolia** L. (Sterculiaceae)

Perennial herbs or undershrubs, 15-40 cm high. Leaves ovate-oblong, 2-6 cm long, serrate, plaited. Flowers small, in dense clusters, pink, subtended by 4-5 bracteoles. Capsules depressed-globose, hirsute, 5-valved, green turning reddish-brown.

Fl. & Fr. : May - Sept. Kanaksinghpur, Ramshahpur.

66. **Mukia maderaspatana** (L.) Roem. (Cucurbitaceae)

Slender creeping or climbing annual herbs with hispid branches. Leaves ovate-deltoid, angular or lobed, 4-15 × 3-13 cm, denticulate, scabrous (more on the upper surface). Flowers solitary or a few fascicled, small, yellow. Fruits globose, 5-12 mm across, smooth or sparsely echinate, greenish yellow or ultimately red.

Fl. & Fr. : June - Nov. Chandauki.

67. **Murdania vaginata** (L.) Brueckn. (Commelinaceae)

Erect or ascending herbs. Leaves linear-lanceolate, 4.0-20.0 × 0.4-1.0 cm, sometimes sparsely hairy beneath. Flowers 1-3 together, fascicled in the axils of a few distant 8-15 mm long linear-lancelet bracts, blue-violet, ca 8 mm across; stamens 2, staminodes 4. Seeds rugose.

Fl. & Fr. : Aug.-Oct. Chandauki.

68. **Oldenlandia corymbosa** L. (Rubiaceae)

Slender profusely branched annual herbs, up to 30 cm high. Leaves linear or narrowly elliptic-lanceolate, up to 3 cm long and 2 mm broad. Peduncles solitary, 1-4-flowered; flowers small, white. Capsules globose, greyish white.

Fl. & Fr. : Sept.-Apr. Ramshahpur.

69. **Oxalis corniculata** L. (Oxalidaceae)

Slender tuberous herbs with 5-15 cm long creeping stems. Leaflets 3, digitate, obovate, bilobed, 5-15 mm long and equally broad. Flowers *ca* 7 mm across, in axillary peduncled, clusters; petals oblong-oblanceolate, yellow. Capsules subcylindric, 8-20 mm long, pubescent.

Fl. & Fr. : Sept.-May. Chandauki, Kanaksinghpur, Ramshahpur.

70. **Peristrophe bicalyculata** (Retz.) Nees (Acanthaceae)

Annual erect or suberect hispid herbs, with quadrangular branches. Leaves petioled, ovate-lancelet. Flowers in lax panicles; bracts 2, unequal, linear. Calyx lobes 5, linear-lanceolate with ciliate margins; corolla 2-lipped, ca 12 mm long, pink. Capsules oblong, *ca* 1cm long.

Fl. & Fr.: Jan. Kanaksinghpur.

71. **Phyla nodiflora** (L.) Greene (Verbenaceae)

Perennial creeping herbs, rooting at the nodes. Leaves subsessile, oposite, obovate or spathulate, 0.5-2.8 × 0.2-1.2 cm, serrate in upper part. Flowers in pedunculate, 5-15 mm long cylindric spikes, white or pink. Drupes globose; seeds plano-convex, yellow.

Fl. & Fr. : Apr.-June. Ramshahpur

72. **Phyllanthus fraternus** Webster. (Euphorbiaceae)

Annual herbs, stems terete, glabrous; branchlets scabridulous on the angles. Leaves oblong with obtuse or rounded ends, glabrous, 5-15 × 3-6 mm; stipules lancelet-subulate. Flowers numerous axillary, yellowish; male flowers 1-3; females soliatey. Fruits oblate; seeds brown, longitudnally ribbed on the back.

Fl. & Fr. : May. Chandauki, Kanaksinghpur, Ramshahpur.

73. **Pluchea lanceolata** (DC.) Clarke (Asteraceae)

Erect undershrubs with terete, pubescent stems and branches. Leaves sessile, 2-6 × 0.4-1.0 cm, oblong or oblanceolate, silky-pubescent. Heads in compound coryms, 6-7 mm long, ovoid or campanulate, pinkish-purple. Pappus hairs connate at the base. Achenes minute, oblong.

Fl. & Fr. : Oct.- July. Ramshahpur.

74. **Polygonum glabrum** Willd. (Polygonaceae)

Perennial herbs, creeping at the base, 1.0-2.5 m high. Ochrae tubular. Leaves elliptic-

ovate ot lancelet, up to 16 cm long, acuminate, gland-dotted. Racemes in terminal panicles. Perianth pink-red or whitish. Nuts glistening dark brown.

Fl. & Fr. : Sept.- May. Chandauki.

75. **P. plebium** R.Br. (Polygonaceae)

Small, tufted, deep-rooted, purplish green, white hairy herbs. Leaves whorled, linear-oblong, 1-3 cm long, obtuse or rounded. Perianth white or pink. Nuts glistening, *ca* 1 mm long.

Fl. & Fr. : Jan.- Apr. Chandauki.

76. **Prosopis juliflora** (Swartz) DC. (Mimosaceae)

Large evergren shrubs or small trees with long slender branches; stipular spines solitary or paired. Leaves 1-3 together; rhachis 1-6 cm long; pinnae 3-10 cm long; leaflets 10-25 pairs, elliptic-oblong, 5-10 × 2 mm. Spikes 6-10 cm long, greenish white turning light yellow. Pods straight or falcate, 10-15 × 1 cm, beaked.

Fl. & Fr. : Apr.-Jan. Chandauki, Kanaksinghpur, Ramshahpur.

77. **Rumex dentatus** L. (Polygonaceae)

Annual herbs. Leaves variable, basal much larger than the cauline ones, oblong, obtuse; petioles equalling or shorter than the lamina. Flowers greenish, arranged in laefy or leafless whorls. Nutlets trigonous, brown.

Fl. & Fr. : Kanaksinghpur, Ramshahpur.

78. **Rungia pectinata** (L.) Nees (Acanthaceae)

Annual procumbent herbs. Leaves sessile or petioled, lanceolate or elliptic. Spikes dense; flowering bracts obviate-orbicular, *ca* 4 mm long, broadly scarious margined, barren bracts oblong-lancelet, narrowly scarious margined. Calyx lobes ciliate-margined; corolla light blue with two rows of darker patches in the lower lip.

Fl. & Fr. : Jan.-Apr. Kanaksinghpur, Ramshahpur.

79. **Saccharum benghalensis** Retz. (Poaceae)

Erect perennials up to 3.5 m tall and with solid stem. Leaves up to 80 × 1 cm, flat, channeled, linear with scabrid margins; sheaths very long, hairy at the base and margins, striated. Panicles up to 80 cm long, silvery-white, woolly. Spikelets up to 5.25 mm long, in pairs, one pedicelled and other sessile. Caryopsis oblongish, brown.

Fl. & Fr. : Sept.-Mar. Chandauki.

80. **Setaria pumila** (Poir.) R. & S. (Poaceae)

Slender or rather stout tufted annuals. Culms 5-80 cm high. :leaves 3-30 cm long, smooth or scabrulous. Panicles 1-10 cm long, 4-8 mm thick; bristles 3-12 mm long, yellowish brown. Spikelets 2.0-2.5 mm long; glumes one-third to tw-third the length of the spikelets; upper lemma uaually rugose-corrugate.

Fl. & Fr. : August - October. Chandauki, Ramshahpur.

81. **Sida cordata** (Burm.f.) Boiss. (Malvaceae)

Slender, training or suberect diffusely branched herbs, branches 3-70 cm long. Leaves crenate, on slender petioles about half to as long as the blade. Flowers solitary, few together, or loosely panicled, 5-8 mm across. Mericarps *ca* 2.5 mm long, acute.

Fl. & Fr. : Throughout the year. Kanaksinghpur.

82. **Sporobolus coromandelianus** (Retz.)Kunth (Poaceae)

Densely tufted, erect or ascending annuals, 15-40 cm high. Leaves up to 8.5 × 0.5

cm, linear-lanceolate, ligule hairy. Panicles up to 8.5 cm long, pyramidal; branches in distant 4-6 whorls. Spikelets up to 1.4 mm long, greenish. Caryopsis up to 0.75 mm long, obovate or broadly ellipsoid, slightly compressed, enclosed in a loose, reticulate pericarp, reddish-brown.

Fl. & Fr. : Sept.-Dec. Chandauki, Kanaksinghpur, Ramshahpur.

83. **S. diander** (Retz.) P. Beauv. (Poaceae)

Tufted perennials with a small rootstock. Culms usually erect, 15-70 cm high. Leaves usually convolvulate, up to 25 cm long. Panicles 4-20 cm long, the branches suberect or spreading. Spikelets lancelet, 1.2-1.5 mm long; lower glume *ca* 0.5 mm long.

Fl. & Fr. : Aug. Hardoi (Rae Bareilly), Chandauki, Kanaksinghpur

84. **Trianthema portulacastrum** L. (Aizoaceae)

Succulent diffuse prostrate herbs with 10-40 cm long forked branches. Leaves sub-opposite, obliquely elliptic-obviate, 1-3 cm long, often wavy-margined. Flowers solitary, sessile, in the forks of the branches, whitish or pinkish. Capsules scarious in the lower part, courageous above, circumsciss.

Fl. & Fr.: Aug. Kanaksinghpur

85. **Vernonia cinerea** (L.) Less. (Asteraceae)

Erect or decumbent hairy herbs, 20-80 cm high. Leaves extremely variable in shape, 2-5 cm long, entire or toothed. Heads in dense or very loose panicles, *ca* 6 mm long, pale purple; involucral bracts spinulous-tipped.

Fl. & Fr.: Aug.-May. Chandauki, Ramshahpur.

86. **Ziziphus nummularia** (Burm.f.) Wt. & Arn. (Rhamnaceae)

Much-branched, thorny, erect or straggling bushy shrubs; branches zig-zag. Leaves 1.0-1.7 x 0.75-1.5 cm, orbicular or ovate, rounded at both ends, more or less tomentose above, densely woolly beneath; stipular spines paired, one slender, straight, as long as the leaves, the other one smaller and recurved. Flowers in axillary, sessile, pubescent cymes, greenish-yellow. Drupes 0.75-1.0 cm across, globose, red when ripe.

Fl.: Aug.-Oct.; *Fr.:* Oct.-Jan. Kanaksinghpur, Ramshahpur.

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