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Biodiversity In Harappan Period of India; Archaeobotanical Census

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Abstract:

Harappan period of Indian subcontinent belongs to Bronze Age (2500-1200 BC.). Archaeobotanical investigations have been carried out from time to time to reveal useful as well as wild plant species. The data so gathered is scattered and not evaluated period wise or phase-wise in past. The present author attempted to collate the data so accrued together. A grand total of 67 plant species pertaining to 57 genera and 35 families are being limelighted in this communication. All taxa are angiospermic, except two species being a gymnospermic. The plant species belong to different economically useful categories *viz.*, cereals, millets, pulses (legumes), fruits, oils, fibres, dyes, spices and condiments, timber etc. Apart from these, clearly identified 13 wild species appeared on record. Some genera are, however, put on record without specific determination. The useful categories of plant species are important from socio-economic standpoint, while the wild ones are suggestive of their being integral part of biodiversity of Harappan period in India. This account thus help shed more light on history and composition of biodiversity in India.

Key Words: Biodiversity, Harappan Period, Archaeobotany, India.

Introduction

India, at present, ranks among the 17 mega-diverse and top 10 species-rich nations. The diversity in climatic conditions and topography contributed to a high degree of endemism in Indian flora. A total of 4381 taxa pertaining to 1007 genera and 176 families are identified as endemic to political boundaries of India (Singh *et al.*, 2015). Fauna and Flora of a region are the natural consequences of its geographical conditions. Tampering with the nature in its progressively increasing rate since time immemorial played havoc with the biodiversity. Indian subcontinent is not at all exception to this fact. Moreover, man's increasing greed for life necessities and settled life further boosted the changing patterns of vegetation. Apart from indigenous floral elements, considerable number of exotic plant species have invaded in India in different ages (Patil, 2021).

The remnant Indian biodiversity in its variety and diversity reminds of its stately past. Its frequency and abundance eroded progressively with time. Its composition has greatly modified (c*f*.Nayar, 1977).

Archaeobotany combines two disciplines *viz.*, botany and archaeology. It includes the study of plant remains in different forms recovered from archaeological settlements during course of excavations. Fair amount of information in this regard is now available to evaluate diversity and antiquity of the flora elements of the ancient past. This fund of data certainly aids in reconstructing the history of man-plant relationship. The present author attempted at plant invasion (bioinvasion) on archaeobotanical basis in India (Patil, 2020, 2021). It is but felt that composition of biodiversity should be determined in different ages. It is for this reason, the present attempt is to reveal composition of biodiversity in India especially during Harappan period (Indus civilisation) (2500-1200 BC.) which belongs to Bronze Age.

Methodology Adapted

The present author extended in-depth study on the composition of biodiversity especially in Harappan period of India as evinced by archaeobotanical evidences of the past. In the present endeavour, the various cultigens employed for human necessities and the wild taxa have been brought to light informing the status of biodivesrsity in the then India (Table I-IX). The data is obtained w.r.t. common name, part disclosed, archaeological site in Harappan period, category of plant, etc. citing relevant references against each taxa. The results accrued are interpreted in the context of biodiversity composition in the said period.

Results & Discussion

Harappan civilization is spread in a vast area of about 480000 sq.km. in diverse geographical regions (Pokharia and Srivastava, 2013). Indian archaeobotanists investigated the said region and revealed some information about floral elements serving in different ages. The data so produced is scattered and not analysed period or age wise. The literary resume indicates variability in biodiversity composition in different periods or ages. The present author felt a need to put the information so obtained in peculiar period. The present communication is dealt with putting the data together especially of Harappan culture. These floral elements are analysed floristically considering cultigens and wild ones (c*f*. Table I-VIII).

As many as 67 plant species pertaining to 57 genera and 35 families are being reported in this account, of which only two taxa are gymnospermic (Table I-IX). The data is categorised as economically useful species and the wild ones. Cereals have been recorded for total 08 species pertaining to 04 genera of the family Poaceae (Table-I). The millets divulged belong to 07 species under 06 genera and a single family- the Poaceae (Table-II). As many as 17 species of pulses (legumes) have been recorded which belong to 11 genera of the family Papilionaceae (Table-III). A total of 13 species are found fruit-yielders belong to 12 genera and 11 families, all angiospermic except a gymnospermic species *viz.*, *Pinus gerardiana* (Pinaceae) (Table-IV). The oil containing species are 04 belonging to 04 genera and 04 families. Likewise, only two species are fibre-yielders (Table-V). The Harappan people also appear using spices and condiments. Total 04 species belong 04 genera and 03 families (Table-VI). Apart from these economic sources, some taxa are used for miscellaneous purposes such as timber (11 species), medicine (01 species), dye (01 species) and for washing (as a soap) (01 species) (Table-VII).

Apart from economically useful flora elements, certain wild plant species or weeds have been also put on record. Some of them are clearly identified botanically. Such taxa belong to 13 species (10 dicotyledons and 03 monocotyledons) belonging to 11 genera and 09 families. The dicotyledons have a major role (10 species, 08 genera and 07 families) (Table-VIII). Apart from these, some plants are not clearly identified. Only generic determination is completed for obvious reasons. Pokharia *et al.* (2011) reported 08 genera. Sharma *et al.* put on record 07 genera and Pokharia and Saraswat (1998-99) revealed 12 genera (Table-IX). The useful taxa reflect socio-economic position of Harappan people, whereas the wild taxa, appear an integral part of biodiversity in the said period in India.

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Table-I: Cereals

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
1.	*Oryza sativa* L. Poaceae	Rice	Plant, Remains seeds	Harappan Binjor (Rajasthan), Kanmer (Gujarat)	Cereal	Saraswat, 1992; Sharma *et al.*, 2020; Pokharia *et al.*, 2011.
2.	*Triticum dicoccum* Schubl Poaceae	Emmer Wheat	Plant Remains Grains	Harappan Binjor (Rajasthan), Rohira (Punjab)	Cereal	Saraswaat, 1992, 1986; Sharma *et al.*, 2020.
3.	*Triticum aestivum* L. Poaceae	Bread Wheat	Grains, Plant Remains	Harappan	Cereal	Saraswat, 1992; Singh, 2008; Pokharia & Saraswat, 1998-1999.
4.	*Triticum compactum* Host. Poaceae	Club Wheat	--	Harappan	Cereal	Saraswat, 1992, Singh, 2008.
5.	*Triticum sphaerococcum* Perc. Poaceae	Dwarf Wheat	Grains, Plant Remains, Caryopsis	Harappan Binjor (Rajasthan), Rohira (Punjab), Kanmer (Gujarat)	Cereal	Saraswat, 1992; Singh, 2008; Pokharia & Saraswat, 1998-1999; Sharma *et al.*, 2020.
6.	*Hordeum vulgare* L. Poaceae	Six row hulled Barley	Grains, Crop Remains	Harappan Binor (Rajasthan), Rohira (Punjab), Kanmer (Gujarat)	Cereal	Saraswat, 1992; Singh, 2008; Sharma *et al.*, 2020; Saraswat, 1986; Pokharia *et al.*, 2011.
7.	*Hordeum vulgare* var *nudum* L. Poceae	Six row naked Barley	Seeds	Harappan Balu & Kunal (Haryana)	Cereal	Saraswat, 1992; Singh Nigam, 2017; Pokharia & Saraswat, 1998-1999.
8.	*Avena sativa* L. Poaceae	Out	--	Harappam	Cereal	Saraswat, 1992.

Table-II: Millets

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
1.	*Eleusine coracana* (L.) Gaertn. Poaceae	Finger Millet, Ragi Millete	Grain	Harappan Malhar (U.P.)	Millete	Saraswat, 1992; Singh & Nigam, 2017.
2.	*Echinochloa crus-galli* (L.) Beauv. Poaceae	Barnyard Millet	--	Harappan	Millete	Saraswat, 1992.
3.	*Paspalum scrobiculatum* L. Poaceae	Kodon Millete	--	Harappan	Millete	Saraswat, 1992.
4.	*Setaria italica* (L.) P. Beauv. Poaceae	Foxtail Millet	Plant Remains	Harappan	Millete	Saraswat, 1992; Pokharia & Srivastava, 2013
5.	*Sorghum bicolor* (L.) Moench Poaceae	Sorghum Millet, Jowar	Grains	Harappan Kanmer (Gujarat)	Millete	Saraswat, 1992; Singh, 2008; Pokharia & Saraswat, 1998-1999; Pokharia *et al.*, 2011.
6.	*Pennisetum americanum* L. [Syn.P.glaucum (L.) R.Br.] Poaceae	Bajra	Plant Remains, Seeds	Harappan Kanmer (Gujarat	Millete	Herman, 1971; Pokharia *et al.*, 2011.
7.	*Echinochloa colonum* (L.) Link Poaceae	--	Grains	Sanghol (Punjab)	Millete	Pokharia & Saraswat, 1998-1999.

Table-III: Pulses (Legumes)

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
1.	*Cajanus cajan* L. Papilionaceae	Pigeon Pea	--	Harappan	Pulse	Saraswat, 1992.
2.	*Cicer orientinum* L. Papilionaceae	Chickpea	Grains, Plant Remains	Harappan Binjor (Rajasthan)	Pulse	Saraswat, 1992; Pokharia & Saraswat, 1998-1999; Sharma *et al.*, 2020.

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
3.	*Macrotyloma uniflorum* (Lam.) Verdc. (Syn.Dolichos biflorus L.) Papilionaceae	Horsegram	Grains	Harappan Rohira (Punjab)	Pulse	Saraswat, 1992; Pokharia & Saraswat, 1998-1999, 1986.
4.	*Lablab purpureus* (L.) Sweet Papilionaceae	Hyacinth Bean	--	Harappan	Pulse	Saraswat, 1992.
5.	*Luthyrus sativus* L. Papilionaceae	Grass Pea, Khesari	Seeds, Plant remains	Harappan Binjor (Rajasthan)	Pulse	Saraswat, 1992; Saraswat & Pokharia, 2002; Pokharia & Saraswat, 1998-1999 Sharma *et al.* 2020.
6.	*Lens culinaris* Medik. Papilionaceae	Lentil	Seeds, Plant Remains	Harappan Binjor (Rajasthan), Rohira (Punjab)	Pulse	Sraswat, 1992; Sarasat & Pokharia, 2002; Pkharia & Saraswat, 1998-1999; Saraswat, 1998; Sharma *et al.*, 2020.
7.	*Macrptilium latharoides* (L.) Urb. (Syn.Phaseolus lathyroides L.) Papilionaceae	Phasemy Bean	Grains	Harappan Kanmer (Gujarat)	Pulse	Saraswat, 1992; Pokharia *et al.*, 2011.
8.	*Pisum arvense* (L.) Poir. Papilionaceae	Field Pea	Seeds, Plant remains	Harappan Kanmer (Gujarat), Binjor (Rajasthan)	Pulse	Saraswat, 1992; Singh, 2008; Sharma *et al.*, 2020; Singh & Nigam, 2017; Pokharia *et al.*, 2011; Pokharia & Saraswat, 1998-1999.
9.	*Trigonella foenum-graecum* L. Papilionaceae	Fenugreek	Seeds	Harappan Rohira (Punjab), Kanmer (Gujarat)	Pulse	Saraswat, 1992, 1986; Saraswat & Pokharia, 2007; Pokharia *et al.*, 2011; Pokharia & Saraswat, 1998-1999.

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
10.	*Vigna aconitifolia* (Jacq.) Marechal Papilionaceae	Aconite Bean	--	Harappan Kunal & Banwali (Hariyana), Rohira (Punjab)	Pulse	Saraswat, 1992.
11.	*Vigna mungo* (L.) Hepper Papilionaceae	Black gram	Grains, Plant Rremains.	Harappan Binjor (Rajasthan), Kanmer (Gujarat)	Pulse	Saraswat, 1992; Pokharia & Saraswat, 1998-1999; Sharma *et al.*, 2020; Pokharia *et al.*, 2011.
12.	*Vigna radiata* (L.) Wilczek Papilionaceae	Green gram	--	Harappan	Pulse	Saraswat, 1992; Pokharia & Saraswat, 1998-1999.
13.	*Vigna unguiculata* (L.) Walp. Papilionaceae	Cowpea	--	Harappan	Pulse	Saraswat, 1995; Pokharia & Saraswat, 1998-1999.
14.	*Pisum sativum* L. Papilionaceae	--	--	Harappan	Pulse	Singh & Nigam, 2017.
15.	*Phaseolus lanatus* L. Papilionaceae	Sieva-bean	--	Harappan	Pulse	Saraswat, 1992.
16.	*Vicia sativa* L. Papilionaceae	Common Vetch	Crop Remains	Harappan	Pulse	Sharma *et al.*, 2020.
17.	*Vicia hirsuta* (L.) Gray Papilionaceae	Hairy Vetch	Crop Remains	Harappan	Pulse	Sharma *et al.*, 2020.

Table-IV: Fruits

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
1.	*Cicumis melo* L. Cucurbitaceae	Cucumber	Seeds	Harappan	Vegetable Fruit	Singh, 2008; Saraswat & Pokharia, 2002.
2.	*Phoenix dactylifera* L. Arecaceae	Dates	Stone Remains	Rohira (Punjab), Balu (Haryana)	Edible Fruit	Singh, 2008; Saraswat & Pokharia, 2002; Pokharia & Saraswat, 1998-1999.
3.	*Solanum melongena* L. Solanaceae	Brinjal	Plant Remains	Farmana (Rohtak District)	Vegetable Fruit	Weber *et al.*, 2011.
4.	*Vitis vinifera* L. Vitaceae	Grapes	Carbonised Seeds, Vine Charcoal	Balu & Kunal (Haryana), Rohira (Punjab)	Edible Fruit	Singh, 2008; Saraswat & Pokharia, 2002; Saraswat & Pokharia, 1998-1999.
5.	*Ziziphus jujuba* Mill. Rhamnaceae	Jujube	Seeds	Madhya Pradesh	Edible Fruit	Vishnu-mittre & Savithri, 1982.
6.	*Ziziphus mauritiana* Lam. Rhamnaceae	Jujube	Fruit remains	Rajodi (Saurashtra, Gujarat)	Edible Fruit	Pokharia & Srivastava, 2013; Singh, 2008.
7.	*Prunus amygdalus* Batsch. Rosaceae	Almond	Fruit Shells	Sanghol (Punjab)	Edible Fruit	Pokharia & Saraswat, 1998-1999.
8.	*Juglans regia* L. Juglandaceae	Walnut, Akhriot	Fruit Shells, Plant Remains	Sanghol (Punjab), Bijnor (Rajasthan)	Edible Fruit	Singh, 2008; Pokharia & Saraswat, 1998-1989; Sharma *et al.*, 2020.
9.	*Pinus gerardiana* Wall. ex. D. Don. Pinaceae	Chilgoza	Fruit Remainz	Sanghol (Punjab)	Edible Fruit	Pokharia & Saraswat 1998-1999.
10.	*Annona squamosa* L. Annonaceae	Custard Apple	Fruit Remains	Sanghol (Punjab)	Edible Fruit	Pokharia & Saraswat 1998-1999.
11.	*Syzygium cumini* (L.) Skeels Myrtaceae	Jamun	Seeds	Sanghol (Punjab)	Edible Fruit	Pokharia & Saraswat 1998-1999.

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
12.	*Phyllanthus emblica* L. (Syn. Emblica officinalis Gaertn.) Euphorbiaceae	Myrobalan	Endocarp	Sanghol (Punjab)	Edible Fruit	Pokharia & Saraswat 1998-1999; Singh, 2008.
13.	*Coccinia grandis* (L.) Voight Cucurbitaceae	Kundru, Bimb	Seeds	Rajodi (Gujarat)	Vegetable	Singh, 2008.

Table-V: Oil and Fibre

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
1.	*Linum usitatissimum* L. Linaceae	Linsed, Atasi	Seedes, Plant Remains	Harappan Binjor (Rajasthan), Kanmer (Gujarat)	Oil-yielder, Fibre-yielder	Saraswar, 1992; Sharma *et al.*, 2020; Singh & Nigam, 2017; Pokharia *et al.*, 2011.
2.	*Brassica campestris* L. Brassicaceae	Yellow Mustard	--	Harappan	Oil-yielder	Saraswat, 1992.
3.	*Brassica juncea* (L.) Czern. & Coss. Brassicaceae	Field Brassica	--	Harappan	Oil-yielder	Saraswat, 1992.
4.	*Ricinus commuis* L. Euphorbiaceae	Custor	Plant Remains	Harappan Hulas	Oil-yielder	Saraswat, 1992; Singh & Nigam, 2017; Saraswat, 1993.
5.	*Sesamum indicum* L. Pedaliaceae	Sesame, Til	Plant Remains, Seeds	Harappan Binjor (Rajasthan), Kanmer (Gujarat)	Oil-yielder	Saraswat, 1992; Singh, 2008; Sharma *et al.*, 2020; Pokharia *et al.*, 2011.
6.	*Gossypium arboreum* L. Malvaceae	Cotton	Seeds	Harappan Kanmer (Gujarat)	Fibre-yielder	Saraswat, 1992; Singh, 2008; Pokharia *et al.*, 2011.

Table-VI: Spices And Condiments

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
1.	*Allium sativum* L. Liliaceae	Garlic	Carbonised cloves	Harappan Balu (Haryana)	Spice	Singh & Nigam, 2017; Pokharia & Saraswat, 1998-1999.
2.	*Coriandrum sativum* L. Apiaceae	Coriander	Plant Remains	Sanghol (Punjab), Newasa (Maharashtra)	Spice	Pokharia & Saraswat, 1998-1999.
3.	*Cuminum cyminum* L. Apiaceae	Cumin	Fruits	Sanghol (Punjab)	Spice	Pokharia & Saraswat, 1998-1999.
4.	*Piper nigrum* L. Piperaceae	Black Pepper	Fruits	Sanghol (Punjab)	Spice	Pokharia & Saraswat, 1998-1999.

Table-VII: Miscellaneous

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
1.	*Cedrus deodara* (Roxb.) D.Don Pinaceae	Devdar	Charcoal of Timber	Harappan (Harappa & Rohira)	Timber Source	Singh, 2008.
2.	*Anogeissus latifolia* (Roxb. ex DC.) Wall. ex Bed. Combretaceae	--	Timber	Kalibangan (Rajasthan)	Timber Source	Singh, 2008.
3.	*Azadirachta indica* A. Juss. Meliaceae	Neem	Timber	Harappan	Timber Source	Singh, 2008.
4.	*Sapindus emarginatus* Vahl. Sapindaceae	Reetha, Soapnut	Fruits	Sanghol (Punjab)	Fruits useful as soap	Pokharia & Saraswat, 1998-1999.
5.	*Terminalia chebula* Retz. Combretaceae	Chebulic Myrobalan, Harra	Fruits	Sanghol (Punjab)	Medicinal Fruits	Pokharia & Saraswat, 1998-1999.

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
6.	*Lawsonia inermis* L. Lythraceae	Henna, Mehandi	Seds	Sanghol (Punjab)	Dye Plant	Pokharia & Saraswat, 1998-1999.
7.	*Albizia lebbeck* (L.) Benth. Mimoseae	Shirish	Timber	Kalibungan (Rajasthan)	Timber Source	Singh, 2008.
8.	*Toona ciliata* M.Roem. Meliaceae	Toon	--	Rohira (Punjab)	Timber Source	Singh, 2008.
9.	*Dalbergia sissoo* Roxb. Papilionaceae	Sisam	--	Rohira (Punjab), Kalinbagan (Rajasthan)	Timber Source	Singh, 2008.
10.	*Ficus racemosa* L. Moraceae	--	--	Kalinbagan (Rajasthan)	Timber Source	Singh, 2008.
11.	*Haldina cordifolia* (Roxb.) Brandis Rubiaceae	--	--	Lothal (Gujarat)	Timber Source	Singh, 2008.
12.	*Manilkara hexandra* (Roxb.) Dubard Sapotaceae	--	--	Rohira (Punjab)	Timber Source	Singh, 2008.
13.	*Morus indica* L. Moraceae	--	--	Kalinbagan (Rajasthan)	Timber Source	Singh, 2008.
14.	*Salvadora persica* L. Salvadoraceae	--	--	Kalinbagan (Rajasthan)	Timber Source	Singh, 2008.

Table-VIII: Wild Species

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
1.	*Fimbristylis dichotoma* (L.) Vahl Cyperaceae	--	Nuts	Sanghol (Punjab)	Wild	Pokharia & Saraswat, 1998-1999.

Sr. No.	Plant Name & Family	Common Name	Part Disclosed	Archaeological Site	Category	Reference
2.	*Dactyloctenium acgyptium* (L.) P.Beauv. Poaceae	Crowfoot Grass	Caryopsis	Sanghol (Punjab)	Wild	Pokharia & Saraswat, 1998-1999.
3.	*Rumex dentatus* L. Polygonaceae	Dock	Nuts	Sanghol (Punjab)	Wild	Pokharia & Saraswat, 1998-1999; Sharma *et al.*, 2020.
4.	*Echinochloa colonum* (L.) Link. Poaceae	--	Grains	Sanghol (Punjab)	Wild	Pokharia & Saraswat, 1998-1999.
5.	*Commelina benghalensis* L. Commelinaceae	Dayflower, Bokna	Seeds	Sanghol (Punjab)	Wild	Pokharia & Saraswat, 1998-1999.
6.	*Trianthema triquetra* Willd. ex. Rottl. Aizoaceae	--	Seeds	Sanghol (Punjab)	Wild	Pokharia & Saraswat, 1998-1999.
7.	*Trigonella occulta* Delile Papilionaceae	--	Seeds	Sanghol (Punjab)	Wild	Pokharia & Saraswat, 1998-1999.
8.	*Chenopodium album* L. Chenopodiaceae	Goosefoot, Bathua	Seeds	Sanghol (Punjab)	Wild	Pokharia & Saraswat, 1998-1999; Sharma *et al.*, 2020.
9.	*Argemone mexicana* L. Papaveraceae	Mexican Poppy	Seeds	Sanghol (Punjab)	Wild	Pokharia & Saraswat, 1998-1999.
10.	*Ziziphus nummularia* (Burm. *f.*) W. & A. Rhamnaceae	--	Stones	Kanmer (Gujarat)	Wild	Sharma *et al.*, 2020.
11.	*Trianthema portulacastrum* L. Aizoaceae	--	Seeds	Kanmer (Gujarat)	Wild	Sharma *et al.*, 2020.
12.	*Trianthema triquetra* Rottle ex Willd. Aizoaceae	--	Seeds	Kanmer (Gujarat)	Wild	Sharma *et al.*, 2020.
13.	*Cenchrus ciliaris* L. Poaceae	--	Seeds	Kanmer (Gujarat)	Wild	Sharma *et al.*, 2020.

Table-IX: Wild Genera

Sr. No.	Genera and Family	Reference
1.	(1) *Vigna* (Papilionaceae), (2) *Setaria* (Poaceae), (3) *Scirpus* (Cyperaceaae), (4) *Solanum* (Solanaceae), (5) *Scleria* (Cyperacee), (6) *Cyperus* (Cyperaceae), (7) *Acacia* (Momosaceae), (8) *Abutilon* (Malvaceae).	Pokharia *et al.*, 2011.
2.	(1) *Acacia* (Mimosaceae), (2) *Lespedeza* (Papilionaceae), (3) *Scirpus* (Cyperaceae), (4) *Polygonum* (Polygonaceae), (5) *Andropogon* (Poacae), (6) *Desmodium* (Papilionaceae), (7) *Phyllanthus* (Euphorbiaceae).	Sharma *et al.*, 2020.
3.	(1) *Poa* (Poaceae), (2) *Andropogon* (Poaceae), (3) *Eleocharis* (Cyperaceae), (4) *Setaria* (Poaceae), (5) *Scirpus* (Cyperaceae), (6) *Scleria* (Cyperaceae), (7) *Cyperus* (Cyperaceae), (8) *Polygonum* (Polygonaceae), (9) *Indigofera* (Papilionaceae), (10) *Sida* (Malvaceae), (11) *Datura* (Solanaceae), (12) *Solanum* (Solanaceae).	Pokharia & Saraswat, 1998-1999.