

## A PRELIMINARY FLORISTIC CHECKLIST OF THAL DESERT PUNJAB, PAKISTAN

HUMAIRA SHAHEEN<sup>1</sup>, RAHMATULLAH QURESHI<sup>1\*</sup>, ABIDA AKRAM,  
M. GULFRAZ AND DANIEL POTTER<sup>2</sup>

<sup>1</sup>Department of Botany, Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi, Pakistan

<sup>2</sup>Department of Plant Sciences, University of California Davis, USA.

\*Corresponding author e-mail: rahmatullahq@yahoo.com

### Abstract

The floristic survey of the Thal desert, Punjab, Pakistan was carried out during 2010 to 2013. So far, 248 species distributed across 166 genera and 38 families were identified during the report period. Besides, one species viz., *Themeda triandra* was recorded for the first time from Pakistan. Of them, one fern, 4 monocots and 33 dicots families were determined. The most dominating family was Poaceae that contributed 52 species (21.49%), followed by Fabaceae (34 spp., 13.05%) and Amaranthaceae & Asteraceae (17 spp., 7.02% each). The largest genera were *Euphorbia* (6 spp.), *Cyperus*, *Eragrostis* and *Solanum* (5 spp. each), *Mollugo*, *Heliotropium* and *Cenchrus* (4 spp. each), *Acacia*, *Prosopis*, *Tephrosia*, *Corchorus*, *Boerhavia* and *Ziziphus* (3 spp. each). This checklist consists of updated systematic families and plants names that will provide a useful starting point for further ecological and bioprospective research of the area under study.

### Introduction

The Thal desert is situated between 31° 10' N and 71° 30' E in the Punjab, province, Pakistan (Fig. 1). The area is subtropical sandy desert spread over 190 miles with its maximum breadth of 70 miles. The tract is bound by the piedmont of the Salt Range in the north, the Indus River flood plains in the west and Jhelum and Chenab River flood plains in the east. This region is divided into the districts of Bhakkar, Khushab, Mianwali, Jhang, Layyah and Muzaffargarh. Geographically, the Thal Desert resembles the Deserts of Cholistan and Thar. Main town of Thal are Roda Thal, Mankera, Hyderabad Thal, Dullewala, Piplan, Kundiyan, Kot Aazam, Saraye Muhajir, Mehmood Shaheed Thal, Rang Pur, Jandan Wala, Mari Shah Sakhira, Noor Pur Thal, and Muzafar Garh (Anon., 2008).

The study of floristic composition of the vegetation is crucial for conservation management and the ecologically sustainable management of natural resources that provides the starting point for more detailed study (Ejtehad *et al.*, 2005; Tastad *et al.*, 2010). It aids in the identification and correct naming of species, essential resources for biodiversity estimates and biogeographic studies. Furthermore, this information provides important public outreach and fundamental information to use in addressing the biodiversity crisis (Funk *et al.*, 2007). Vegetation documentation and classification efforts also required for biological conservation, from planning and inventory to direct resource management (Jennings *et al.*, 2009).

Many scientists have contributed comprehensive checklists to the local floras that provide baseline for further studies. They included Ilyas *et al.*, (2013), Qureshi *et al.*, (2011a & b), Yalcin *et al.*, (2011), Fazal *et al.*, (2010), Qureshi & Bhatti (2010), Saima *et al.*, (2009, 2010), Nazar *et al.*, (2008), Qureshi (2008), Bhatti *et al.*, (1999). The sporadic and outdated information is available about the vegetation of this desert. Monsi & Khan (1960) reported the natural vegetation of few sites of Thal Desert. Their work serves as baseline information

about the vegetation of the study area which helps further ecological investigations and conservation measures.

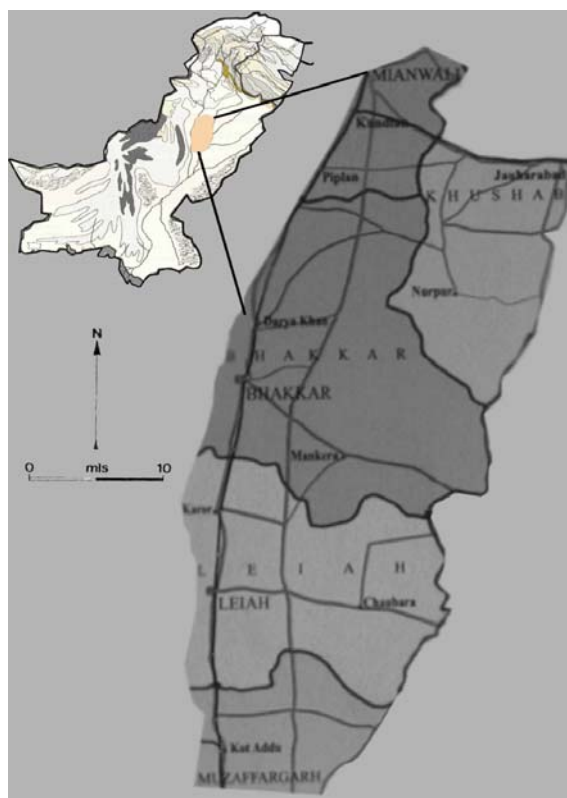


Fig. 1. Map showing location of Thal Desert, Punjab, Pakistan.

### Materials and Methods

For plant collection intensive and extensive surveys was conducted during September, 2010 to August, 2013 to collect plant specimens including seeds with regular intervals covering all seasonal variations. The whole study area was thoroughly visited through walking

method and mapped the whole area also marked the important point of vegetation by GPS.

During plant collection, collector's name with date, habit, habitat, ecological features, flowering and fruiting period, flower color or any plant detail likely to be lost on drying were recorded. The collected specimens were processed by conventional method for drying and making herbarium sheets from collected specimens. The collected specimens were identified with the help of various Floras (Jafri, 1966; Nasir & Ali 1970-1989; Batanouny, 1981; Bhandari, 1987; Shetty & Singh, 1987 and 1991; Ali & Nasir 1989-1991; Boulos, 1991; Ali & Qaiser, 1995-2012, 2000-2010; Qureshi, 2012). All the voucher specimens were deposited in the herbarium of Pir Mehr Ali Shah Arid Agriculture University, Rawalpindi.

## Results and Discussion

During field survey, a total 248 species belonging to 166 genera and 38 families were recorded from study area. Out of them, one fern, 4 monocots and 33 dicots

families were identified. The leading family was Poaceae that shared 52 species (21.49%) followed by Fabaceae (34 spp., 13.05%), Amaranthaceae and Asteraceae (17 spp., 7.02% each), Boraginaceae (11 spp., 4.5%), Brassicaceae, Cyperaceae, Euphorbiaceae, Solanaceae (8 spp., 3.31% each) as showed in Fig. 2. The largest genera were Euphorbia (6, species), Cyperus, Eragrostis and Solanum (5 spp. each), Mollugo and Heliotropium, Cenchrus (4 spp. each), Acacia, Prosopis, Tephrosia, Corchorus, Boerhavia and Ziziphus (3 spp. each). One species viz., *Themeda triandra* was recorded for the first time from Pakistan. All the plants families and names are updated according to latest nomenclature. The families and plants are alphabetically arrange, the numbers in parenthesis with prefix HS (Humaira Shaheen) are voucher numbers of the collected specimens, while the bold letters are the abbreviations of the major habitat types of the species. The abbreviation are: **A** (Agriculture land), **SF** (Sandy fertile), **S** (Sandy), **W** (Weed), **G** (Grassland), **SD** (Sand Dunes), **MP** (Moist Place), **HT** (Hilly Tract), **SP** (Shady Place).

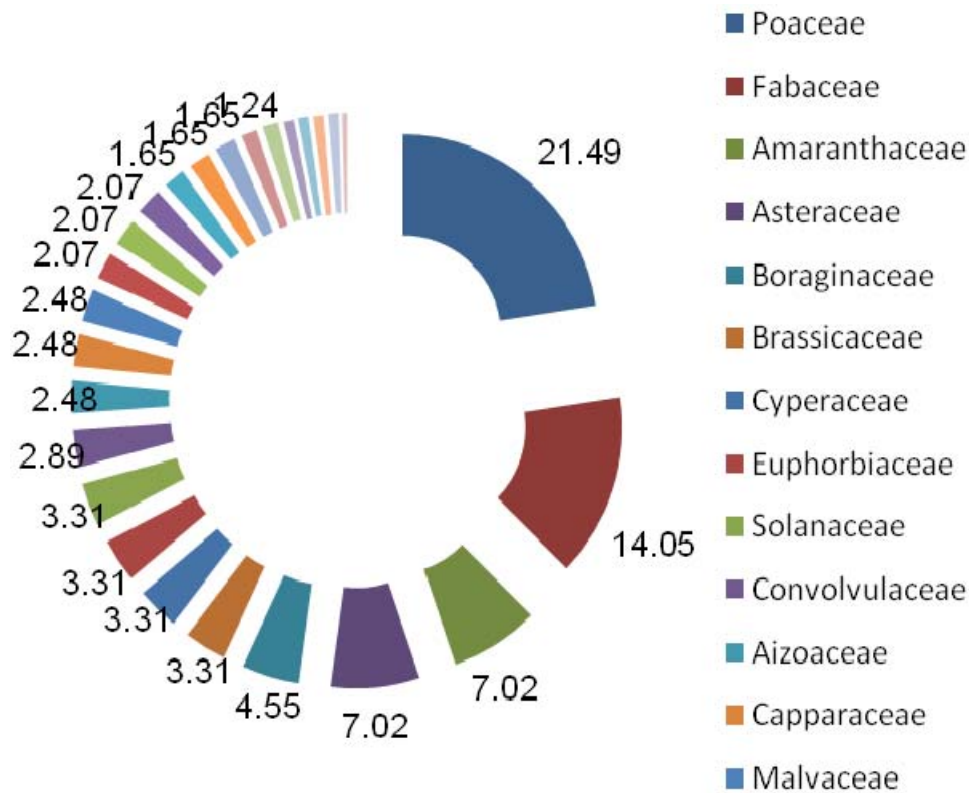


Fig. 2. The contribution of Families in Thal desert Punjab, Pakistan.

### Pteridophytes

#### 1. Equisetaceae

1. *Equisetum ramosissimum* Desf. (HS-2437/SP)

### Monocotyledons

#### 1. Asparagaceae

1. *Agave sisilana* Perr. Ex Engelm. (HS-2099/S)

#### 2. Xanthorrhoeaceae

1. *Aloe vera* L. (HS-2366/MP)
2. *Asphodelus tenuifolius* Cavan. HS-2313/A)

#### 3. Cyperaceae

1. *Cyperus alopecuroides* Rottb. (HS-2426/SF)
2. *Cyperus difformis* L. (HS-2486/S)
3. *Cyperus digitatus* Roxb. (HS-2672/SF)
4. *Cyperus imbricatus* Retz. (HS-2152/SF)

5. *Cyperus rotundus* L. (HS-2301/S)
6. *Fimbristylis quinquangularis* (Vahl) Kunth (HS-2477/S)
7. *Pycneus flavidus* (Retz.) T. Koyama (HS-2506/S)
8. *Pycneus sanguin* (Vahl) Nees (HS-2149/SF)

#### 4. Poaceae

1. *Acrachne racemosa* (Heyne ex Roem. & Schult.) Ohwi (HS-2489/G)
2. *Aeluropus lagopoides* (L.) Trin. ex Thw. (HS-2134/ G)
3. *Aristida adscensionis* L. (HS-2572/SD)
4. *Aristida mutabilis* Trin. & Rupr. (HS-2352/SD)
5. *Arundo donax* L. (HS-2424/MP)
6. *Avena fatua* subsp. *fatua* L. (HS-2581/W)
7. *Brachiaria ovalis* Stapf (HS-2505/2109/G)
8. *Brachiaria eruciformis* (J.E. Smith) Griseb (HS-2313/G)
9. *Bromus pectinatus* Thunb. (HS-2383/SF)
10. *Bromus sericeus* Drobov (HS-2378)
11. *Cenchrus biflorus* Roxb. (HS-2504/2429/SD)
12. *Cenchrus ciliaris* L. (HS-2058/SD)
13. *Cenchrus pennisetiformis* Hochst. & Steud. ex Steud. (HS-2346/G)
14. *Cenchrus setigerus* Vahl (HS-2514/SD)
15. *Chloris gayana* Kunth (HS-2088/S)
16. *Cymbopogon jwarancusa* subsp. *jwarancusa* (Jones) Schult. (HS-2356/S)
17. *Cynodon dactylon* (L.) Pers. (HS-2092/G)
18. *Dactyloctenium aegyptium* (L.) Willd. (HS-2419/2509/G)
19. *Dactyloctenium aristatum* Link (HS-2510/2096/FL)
20. *Desmostachya bipinnata* (L.) Stapf. (HS-2579/S, G)
21. *Dichanthium annulatum* (Forssk.) Stapf. (HS-2028/SF)
22. *Digitaria ciliaris* (Retz.) Koel (HS-2513/S)
23. *Digitaria sanguinalis* (Linn.) Scop. (HS-2189/G)
24. *Eleusine indica* (L.) Gaertn. (HS-2049/SF)
25. *Enneapogon persicus* Boiss. (HS-2527/G)
26. *Eragrostis cilianensis* (All.) Lut. ex F.T. Hubbard (HS-2388/SF)
27. *Eragrostis pilosa* (L.) P. Beauv. (HS-2382/S)
28. *Eragrostis ciliaris* (L.) R. Br. (HS-2573/S)
29. *Eragrostis minor* Host (HS-2375/S)
30. *Eragrostis superba* Peyr. (HS-2097/GL)
31. *Imperata cylindrica* (L.) Raeuschel. (HS-2092/SF)
32. *Lasiurus indicus* Henr. (HS-2542/S)
33. *Leptochloa panicea* (Retz.) Ohwi (HS-2288/S)
34. *Ochthochloa compressa* (Forssk.) Hilu (HS-2530/G)
35. *Panicum psilopodium* Trin. (HS-2155/S)
36. *Paspalum dilatatum* Poir. (HS-2438/SF)
37. *Phalaris minor* Retz. (HS-2125/SF)
38. *Phragmites karka* (Retz.) Trin. ex Steud. (HS-2476/MP)
39. *Poa annua* L. (HS-2380/G)
40. *Saccharum bengalense* Retz. (HS-2374/MP)
41. *Saccharum spontaneum* L. (HS-2377/MP)
42. *Schismus arabicus* Nees (HS-2492/S)
43. *Sporobolus arabicus* Boiss. (HS-2531/SF)
44. *Setaria intermedia* Roem. & Schult (HS-2399/G)
45. *Setaria pumila* (Poir.) Roem. & Schult. (HS-2149/G)
46. *Sorghum bicolor* (L.) Moench. (HS-2452/SF)
47. *Sorghum* Sect. *Sorghum* Subsect. *Arundinacea* Moench. (HS-2076/A)

48. *Stipagrostis plumosa* (L.) Munro ex T. (HS-2375/G)
49. *Tragus roxburghii* Panigrahi (HS-2528/S)
50. *Themeda triandra* Forssk. (HS-2349/S)
51. *Trisetum clarkei* (Hook.f.) R. R. Stewart (HS-2373/S)
52. *Vetiveria zizanioides* (L.) Nash (HS-2449/G)

#### Dicotyledons

##### 1. Acanthaceae

1. *Barleria prionitis* L. (HS-2030/SF)

##### 2. Aizoaceae

1. *Limeum indicum* Stocks ex T. Anders. (HS-2415/SF)
2. *Sesuvium sesuvioides* (Fenzl) Verdc (HS-2408/S)
3. *Trianthema portulacastrum* L. (HS-2456/S)
4. *Trianthema triquetra* Rottl. and Willd. (HS-2373/SF)
5. *Zaleya pentandra* (Linn.) Jeffrey (HS-2374/S)
6. *Gisekia pharnaceoides* L. (HS-2405/S)

##### 3. Amaranthaceae

1. *Achyranthes aspera* L. (HS-2381/SF)
2. *Aerva javanica* (Burm. f.) Juss ex J. A. Shultes. (HS-2328/2308/S)
3. *Alternanthera pungens* Kunth (HS-2511/S)
4. *Amaranthus graecizans* L. (HS-2382/SP)
5. *Amaranthus ovalifolius* L. (HS-2382/SF)
6. *Amaranthus viridis* L. (HS-2385/SF)
7. *Atriplex schugnanica* Iljin (HS-2359/SF)
8. *Celosia argentea* (L.) Schinz. (HS-2593/SF)
9. *Chenopodium album* L. (HS-2195/SF)
10. *Chenopodium murale* L. (HS-2054/SF)
11. *Digera muricata* (L.) Mart. (HS-2326/SF)
12. *Haloxylon salicornicum* (Moq.) Bunge ex Boiss. (HS-2030/S)
13. *Haloxylon stocksii* (Boiss.) Benth. & Hook. (HS-2154/S)
14. *Pupalia lappacea* (L.) Juss. (HS-2102/G)
15. *Salsola imbricata* Forssk. (HS-2389/S)
16. *Suaeda fruticosa* Forssk. ex J. F. (HS-2358/S)

##### 4. Apocynaceae

1. *Calotropis procera* (Willd.) R. Br. (HS-2028/S)
2. *Leptadenia pyrotechnica* (Forssk.) Decne. (HS-2574/S)
3. *Periploca aphylla* Dcne. (HS-2536/S)
4. *Pentatropis nivalis* (J.F.Gmel.) D.V.Field & J.R.I. Wood (HS-2536/S)
5. *Rhazya stricta* Decne. (HS-2555/HT)

##### 5. Arecaceae

1. *Phoenix sylvestris* L. (HS-2359/S)

##### 6. Asteraceae

1. *Amberboa ramosa* (Roxb.) Jafri (HS-2118/G)
2. *Blumea membranacea* DC. (HS-2113/SF)
3. *Carthamus oxycantha* M.B. (HS-2099/S)
4. *Centaurea iberica* Trev. (HS-2141/SF)
5. *Cnicus benedictus* L. (HS-2353/G)
6. *Conyza candensis* (L.) Cronquist (HS-2612/G)
7. *Conyza squamatus* (Spreng.) Hieron. (HS-2434/G)
8. *Echinops echinatus* Roxb. (HS-2611/S)
9. *Iphiona grantioides* (Boiss.) Anderb. (HS-2535/FS)

10. *Launaea procumbens* (Roxburgh) Ramayya & Rajagopal (HS-2548/2119/G)
11. *Launaea residifolia* L. (HS-2489/SF)
12. *Parthenium hysterophorus* DC. (HS-2611/G)
13. *Pluchea arguta* subsp. *arguta* Boiss. (HS-2534/HT)
14. *Pluchea lanceolata* (DC.) C. B. Clarke (HS-2402/HT)
15. *Pulicaria glaucescens* (Boiss.) Jaub. & Spach (HS-2100/HT)
16. *Sonchus asper* (L.) Hill (HS-2610/G)
17. *Taraxicum officinalis* F.H. Wigg (HS-2550/SF)

#### 7. Boraginaceae

1. *Cordia gharaf* (Forssk.) Ehren. ex Asch. (HS-2193/S)
2. *Cordia myxa* L. (HS-2188/S)
3. *Heliotropium calcareum* Stocks (HS-2600/SF)
4. *Heliotropium crispum* Desf. (HS-2605/G)
5. *Heliotropium curassavicum* L. (HS-2511/SF)
6. *Heliotropium europeum* L. (HS-2584/SF)
7. *Heliotropium strigosum* Willd. (HS-2537/SF)
8. *Lappula patula* (Lehm.) Asch. ex Gurke (HS-2139/HT)
9. *Nonea caspica* subsp. *caspica* (Willd.) G. Don (HS-2111/SF)
10. *Nonea edgeworthii* A. DC. (HS-2181/SF)
11. *Trichodesma indicum* (L.) R. Br. (HS-2166/S)

#### 8. Brassicaceae

1. *Capsella bursa-pastoris* (L.) Medik. (HS-2633/S)
2. *Cardaria draba* (L.) Desv. (HS-2121/S)
3. *Coronopus didymus* (L.) Sm. (HS-2340/S)
4. *Farsetia hamiltonii* Royal (HS-2393/S)
5. *Farsetia jacquemontii* Hook.f. & Thomson (HS-2399/S)
6. *Physorrhynchus brahuicus* Hk. (HS-2383/HT)
7. *Sisymbrium irio* L. (HS-2175/G)
8. *Sisymbrium orientale* L. (HS-2175/G)

#### 9. Capparaceae

1. *Capparis decidua* (Forssk.) Edgew. (HS-2590/S)
2. *Capparis spinosa* L. (HS-2591/S)
3. *Cleome brachycarpa* Vahl ex DC. (HS-2592/S)
4. *Cleome scaposa* DC. (HS-2591/S)
5. *Cleome viscosa* L. (HS-2524/S)
6. *Dipterygium glaucum* Decne. (HS-2580/S)

#### 10. Caryophyllaceae

1. *Silene conoidea* L. (HS-2443/W)

#### 11. Convolvulaceae

1. *Convolvulus arvensis* L. (HS-2593/FS)
2. *Convolvulus microphyllus* Sieb. ex Spreng. (HS-2501/S)
3. *Convolvulus prostratus* Forssk. (HS-2575/S)
4. *Cressa cretica* L. (HS-2112/S)
5. *Cuscuta monogyna* Vahl (HS-2176/P)
6. *Cuscuta reflexa* Roxb. (HS-2197/P)
7. *Evolvulus alsinoides* L. (HS-2121/S)
8. *Ipomoea carnea* ssp. *fistulosa* (Mart. ex Choisy) D. Austin (HS-2500/S)

#### 12. Cucurbitaceae

1. *Citrullus colocynthis* (L.) Schrad. (HS-2377/S)
2. *Cucumis melo* subsp. *agrestis* var. *agrestis* Naudin (HS-2568/SF, S)

3. *Momordica balsamica* L. (HS-2621/SF)
4. *Mukia maderaspatana* (L.) M.J. Roem. (HS-2503/SF)

#### 13. Euphorbiaceae

1. *Chrozophora tinctoria* (L.) Juss. (HS-2613/2437/SF)
2. *Euphorbia clarkeana* Hook.f. (HS-2382/S)
3. *Euphorbia dracunculoides* Lam. (HS-2059/S)
4. *Euphorbia granulata* Forssk. (HS-2318/S)
5. *Euphorbia hirta* Forssk. (HS-2376/S)
6. *Euphorbia prostrata* Ait. (HS-2518/SF)
7. *Euphorbia thymifolia* L. (HS-2602/SF)
8. *Ricinus communis* L. (HS-2601/S)

#### 14. Fabaceae

1. *Acacia nilotica* subsp. *cupressiformis* (T.L. Stewart) Ali (HS-2611/SD)
2. *Acacia jacquemontii* Benth. (HS-2046/SD)
3. *Acacia nilotica* (L.) DeL. subsp. *indica* (Benth.) Brenan (HS-2192/SD)
4. *Albizzia lebbeck* (L.) Bth. (HS-2153/SD)
5. *Alhagi maurorum* Medic. (HS-2323/S)
6. *Alysicarpus longifolius* (Rottler ex Spreng.) Wight & Arn. (HS-2300/SF)
7. *Cassia fistula* L. (HS-2443/SF)
8. *Cassia italica* (Mill.) F.W. Andr. (HS-2414/MP)
9. *Cicer arietinum* L. (HS-2400/A, S)
10. *Cicer microphyllum* Royle ex Benth. (HS-2349/SD)
11. *Crotalaria burhia* Ham ex Benth. (HS-2014/SD)
12. *Crotalaria medicaginea* Lamk. (HS-2540/S)
13. *Cyamopsis tetragonoloba* (L.) Taubert (HS-2149/A)
14. *Dalbergia sissoo* Roxb. (HS-2644/S)
15. *Indigofera hochstetteri* Baker (HS-2559/SD)
16. *Indigofera oblongifolia* Forsk. (HS-2590/SD)
17. *Medicago polymorpha* L. (HS-2035/2594/SF)
18. *Melilotus alba* Desr. (HS-2031/SF)
19. *Melilotus indica* (L.) All. (HS-2032/SF)
20. *Pithecolobium dulce* Benth. (HS-2672/S)
21. *Pongamia pinnata* (L.) Merril. (HS-2400/S)
22. *Prosopis cineraria* (L.) Druce. (HS-2377/SD)
23. *Prosopis glandulosa* Torr. (HS-2375/SD)
24. *Prosopis juliflora* (Swartz) DC. (HS-2143/SD)
25. *Rhynchosia minima* (L.) DC. (HS-2512/G)
26. *Rhynchosia pulverulenta* Stocks (HS-2409/G)
27. *Sesbania sesban* (L.) Merrill (HS-2407/SF)
28. *Tephrosia purpurea* (L.) Pers. (HS-2578/SD)
29. *Tephrosia uniflora* Pers. (HS-2544/SD)
30. *Tephrosia uniflora* var. *petrosa* Pers. (HS-2578/SD)
31. *Trigonella monantha* ssp. *incisae* C.A. Mey. (HS-2182/SF)
32. *Vicia faba* L. (HS-2137/G)
33. *Vicia sativa* L. (HS-2407/G)
34. *Vigna trilobata* (L.) Verdc. (HS-2100/SF)

#### 15. Gentianaceae

1. *Enicostemma hyssopifolium* (Willd.) Verd. (HS-2061/SP)

#### 16. Lamiaceae

1. *Mentha longifolia* (L.) L. (HS-2608/SF)

**17. Malvaceae**

1. *Abutilon pakistanicum* Jafri & Ali (HS-2372/SF)
2. *Bombax malabaricum* DC. (HS-2183/D)
3. *Corchorus aestuans* L. (HS-2565/S)
4. *Corchorus depressus* (L.) Stocks (HS-2577/S)
5. *Corchorus tridens* L. (HS-2411/S)
6. *Malva parviflora* L. (HS-2157/SF)

**18. Meliaceae**

1. *Azadirachta indica* (L.) A. Juss. (HS-2564/S)
2. *Melia azadirach* L. (HS-2311/S)

**19. Molluginaceae**

1. *Glinus lotoides* L. (HS-2124/SD)
2. *Mollugo cerviana* (L.) Seringe (HS-2117/SD)
3. *Mollugo nudicaulis* Lamk. (HS-1912/G)
4. *Mollugo pentaphyla* L. (HS-2214/G)

**20. Moringaceae**

1. *Moringa oleifera* Lamk. (HS-2616/SD)

**21. Nyctaginaceae**

1. *Boerhavia diffusa* L. (HS-2527/G)
2. *Boerhavia pentandra* Burch. (HS-2560/S)
3. *Boerhavia procumbens* Banks ex Roxb. (HS-2521/S)

**22. Orobanchaceae**

1. *Cistanche tubulosa* (Schrenk) (HS-2645/P)
2. *Orabanche aegyptica* Pers. (HS-2644/P)

**23. Oxalidaceae**

1. *Oxalis corniculata* L. (HS-2184/G)

**24. Papaveraceae**

1. *Hypecoum leptocarpum* Hook. f. & Thoms. (HS-2181/S)
2. *Argemone mexicana* L. (HS-2153/SF)

**25. Iantaginaceae**

1. *Bacopa monnieri* (L.) Wettstein (HS-2431/MP)
2. *Plantago lanceolata* L. (HS-2178/G)
3. *Plantago major* L. (HS-2064/G) *Schweinfurthia papilionacea* (Burm. f.) Boiss. (HS-2486/HT)
4. *Veronica persica* Poir. (HS-2487/G)

**26. Polygonaceae**

1. *Calligonum polygonoides* L. (HS-2666/SD)
2. *Polygonum molliaeforme* Boiss. (HS-2633/SF)
3. *Polygonum plabejum* ver. *effusum* Meisn. (HS-2632/G)
4. *Rumex dentatus* subsp. *klotzschianus* (Meisn.) Rech. f. (HS-2116/MP)

**27. Rhamnaceae**

1. *Ziziphus mauritiana* Lam. (HS-2523/SD)
2. *Ziziphus nummularia* (Burm.f.) Wight & Arn. (HS-2403/SD)
3. *Ziziphus spina-christi* (L.) Willd. (HS-2421/SD)

**28. Rubiaceae**

1. *Galium aparine* L. (HS-2138/MP)

**29. Salvadoraceae**

1. *Salvadora oleoides* Decne. (HS-2089/SD)

**30. Solanaceae**

1. *Solanum amricanum* Miller (HS-2685/SF)
2. *Solanum incanum* L. (HS-2613/SF)
3. *Solanum nigrum* L. (HS-2593/G)
4. *Solanum surattense* Burm.f. (HS-2689/S)
5. *Solanum villosum* (L.) Mill. (HS-2657/SF)
6. *Withania coagulans* (Stocks.) Dunal (HS-2677/S)
7. *Withania somnifera* (L.) Dunal (HS-2626/S)

**31. Tamaricaceae**

1. *Tamarix aphylla* (L.) Karst. (HS-2347/SD)

**32. Verbenaceae**

1. *Phyla nodiflora* (L.) Greene (HS-2547/S)

**33. Zygophyllaceae**

1. *Fagonia indica* var. *schweinfuthii* Hadidi. (HS-2592/SF)
2. *Fagonia bruguieri* DC. (HS-2601/SF)
3. *Peganum hermala* L. (HS-2615/S)
4. *Tribulus longipetalous* Viv. (HS-2566/SF)
5. *Tribulus terrestris* L. (HS-2596/SF)

**Conclusion**

The Thal desert is severely eroded due to anthropogenic activities such as expansion of land for cultivation and human settlement that resulted into desertification. Natural vegetation is replaced by perennial grasses, which might be a response to the anthropogenic pressure on the flora by human as well as animals. With the passage of time, the native flora is vanishing, therefore it was felt worthwhile to record the flora before its disappearance from the project area. Keeping in view the whole study area was surveyed for the collection of plant specimens from different localities such as Roda Thal, Mankera, Hayderabad Thal, Dullewala, Piplan, Kundiyan, Kot Aazam, Saraye Muhajir, Mehmood Shaheed Thal, Rangpur Bhagoor, Jandan Wala, Mari Shah Sakhira, Noor pur Thal and Muzafar Garh. The list could be used as reference material to ethnopharmacobotanical studies, since several of the recorded species have medicinal uses (Shaheen *et al.*, 2012). Additional research should be conducted to evaluate the intrinsic ecological values of the local flora and to incorporate characteristics of species composition with ecological functions (Zhao *et al.*, 2010) will provide a baseline for planning and proper conservation measures to safeguard phytodiversity which is facing ever growing biotic stress.

**Acknowledgements**

The first two authors are highly indebted to Pakistan Science Foundation vide research grant No. PSF/Res/P-PMAS-AAU/Bio(418) and the Higher Education Commission, Islamabad through Indigenous PHD 5000 fellowship Batch-VII to complete this piece of work.

## References

- Ahmad, S.S. and H. Ehsan. 2012. Analyzing the herbaceous flora of Lohi Bher Wildlife Park under variable environmental stress. *Pak. J. Bot.*, 44(1): 11-14.
- Ali, S.I. and M. Qaiser (Eds.). 1995-2012. *Flora of Pakistan*. Department of Botany, University of Karachi.
- Ali, S.I., S. Omer and M. Qaiser. 2000-2010. *Flora of Pakistan*. Pakistan Scientific and Technological Information Centre, Pakistan Science Foundation, Islamabad. Pp. 1-26.
- Anonymous. 2008. [http://en.wikipedia.org/wiki/Thal\\_Desert](http://en.wikipedia.org/wiki/Thal_Desert)
- Bantanouny, K.H. 1981. Ecology and Flora of Qatar. 1981 245 pp.
- Bhandari, M.M. 1978. Flora of Indian Desert. Scientific Publishers, Jodhpur.
- Bhatti, G.R., R. Qureshi and R.A. Memon. 1999. Present Flora of Rohri Hills, Sindh, Pakistan. *Ancient Sindh*, 5: 7-22.
- Boulos, L. 1991. Flora of Egypt. Al Hadara Publishing Cairo, Egypt, Vol. 1.
- Ejtehad, H., T. Amini and H. Zare. 2005. Importance of vegetation studies in conservation of wildlife: a case study in miankaleh wildlife refuge, Mazandaran Province, Iran, *Archive of SID*, 53-58
- Fazal, H., N. Ahmad, A. Rashid and S. Farooq. 2010. A checklist of phanerogamic flora of Haripur Hazara, Khyber Pakhtunkhwa, Pakistan. *Pak. J. Bot.*, 42(3): 1511-1522.
- Funk, V., T. Hollowell, P. Berry, C. Kelloff and S.N. Alexander. 2007. Checklist of the Plants of the Guiana Shield (Venezuela: Amazonas, Bolivar, Delta Amacuro; Guyana, Surinam, French Guiana). *Contributions from the United States National Herbarium*, 55: 1- 84.
- Ilyas, M., R. Qureshi, M. Arshad and S.N. Mirza. 2013. A Preliminary checklist of the vascular flora of Kabal Valley, Swat, Pakistan. *Pak. J. Bot.*, 45(2): 601-615.
- Jafri, S.M.H. 1966. *The Flora of Karachi*. The Book Corporation, Karachi, Pakistan.
- Monsi, M. and A.H. Khan. 1960. Some ecological studies on natural vegetation in Thal (West Pakistan). *Proc. Sym. Soil erosion and its control in arid and semiarid zones*. F.A.C.P. Karachi.
- Nasir, E. and S.I. Ali (Eds.). 1970-1989. *Flora of Pakistan*, Islamabad, Karachi.
- Nasir, E. and S.I. Ali (Eds.). 1989-1991. *Flora of Pakistan*, Islamabad, Karachi.
- Nazar, R., S. Begum, Azra Naz, R. Qureshi, R.A. Memon, A. K. Chaudhry and Z. Akram. 2008. Weed flora of Pir Mehr Ali Shah Agriculture University Rawalpindi: Winter Aspect. *Pak. J. Weed Sci. Res.*, 14(1-2): 55-72.
- Qureshi, R. 2008. Preliminary floristic list of Chotiari wetland Complex, Nawab Shah, Sindh, Pakistan. *Pak. J. Bot.*, 40(6): 2281-2288.
- Qureshi, R. 2012. *The Flora of Nara Desert Pakistan*. Nova Science Publishers, Inc. New York. Pp. 1-317.
- Qureshi, R. and G.R. Bhatti. 2010. Floristic inventory of Pai forest, Nawab Shah, Sindh, Pakistan. *Pak. J. Bot.*, 42(4): 2215-2224.
- Qureshi, R., G.R. Bhatti and G. Shabbir. 2011a. Floristic inventory of Pir Mehr Ali Shah Arid Agriculture University Research Farm at Koont and its surrounding areas. *Pak. J. Bot.*, 43(3): 1679-1684.
- Qureshi, R., W.A. Khan, G.R. Bhatti, B. Khan, S. Iqbal, M.S. Ahmad and M. Abid. 2011b. First report on the biodiversity of Khunjerab National Park, Pakistan. *Pak. J. Bot.*, 43(2): 849-861.
- Saima, S., A.A. Dasti, F. Hussain, S.M. Wazir and S.A. Malik. 2009. Floristic compositions along an 18 – km long Transect in Ayubia National Park district Abbottabad, Pakistan. *Pak. J. Bot.*, 41(5): 2115-2127.
- Saima, S., A.A. Dasti, Q. Abbas and F. Hussain. 2010. Floristic diversity during monsoon in Ayubia National Park, District Abbottabad, Pakistan. *Pak. J. Pl. Sci.*, 16(1): 43-50.
- Shaheen, H., R. Qureshi, A. Akram and M. Gulfraz. 2012. Some important medicinal flora of Noorpur Thal, Khushab, Pakistan. *Archives Des Sciences*, 65(2): 57-73.
- Shetty, B.V. and V. Singh. 1987 & 1991. Flora of Rajasthan, Botanical Survey of India. Old
- Tastad, A., K. Salkin, N. Battikha, A.W. Jasra and M. Louhaichi. 2010. Ecological dynamics of protected and unprotected rangelands in three climatic zones of Syria. *Pak. J. Agri. Sci.*, 47: 89-98.
- Yalcin, E., M. Kilinc, H.G. Kutbay, A. Bilgin and H. Korkmaz. 2011. Floristic properties of lowland meadows in Central Black Sea Region of Turkey. *Eurasia J. Biosci.*, 5: 54-63.
- Zhao, J., Z. Ouyang, H. Zheng, W. Zhou, X. Wang, W. Xu and Y. Ni. 2010. Plant species composition in green spaces within the built-up areas of Beijing, China. *Plant Ecol.*, 209: 189-204.

(Received for publication 5 September 2012)