

Supplemental material for

“Floristic Diversity and Distribution Patterns Along an Elevational Gradient in the Northern Part of Ardabil Province Rangelands, Iran”, by Sahar Ghafari, Ardavan Ghorbani, Mehdi Moameri, Raoof Mostafazadeh, Mahmood Bidarlord, and Azad Kakehmami, published in *Mountain Research and Development* 40(1), 2020. (See <https://bioone.org/toc/mred/40/1>)

Table S1 Importance value index (IVI) along elevation gradient in the Moghan Plain–Sabalan Mountain rangelands.

| Species | P* class | Life form | 100–300 | 300–600 | 600–900 | 900–1200 | 1200–1500 | 1500–1800 | 1800–2100 | 2100–2400 | 2400–2700 | 2700–3000 | 3000–3300 |
|--|----------|-----------|---------|---------|---------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | | | (masl) | | | | | | | | | | |
| Alliaceae | | | | | | | | | | | | | |
| <i>Allium affine</i> Ledeb. | III | Ge | – | – | – | 0.33* | – | – | – | – | – | – | – |
| <i>Allium derderianum</i> Regel | III | Ge | – | – | – | – | – | – | – | 0.65 | 0.35 | – | 1.39* |
| <i>Allium rubellum</i> M. Bieb. | III | Ge | – | – | – | 0.61* | – | – | – | – | – | – | – |
| <i>Allium stamineum</i> Boiss. | III | Ge | – | – | – | 0.78* | – | – | – | – | – | – | – |
| <i>Allium subvineale</i> Wendelbo | III | Ge | – | 0.75 | 2.03* | – | – | – | – | – | – | – | – |
| <i>Allium talyschense</i> Misch. ex Grossh. | III | Ge | – | – | – | – | – | – | – | 0.99* | 0.52 | – | – |
| Apiaceae | | | | | | | | | | | | | |
| <i>Bupleurum Gerardii</i> All. | II | Th | – | – | – | 2.40 | 4.83* | 0.17 | – | – | – | – | – |
| <i>Caucalis platycarpus</i> L. | III | Th | 37.19* | 14.41 | 2.30 | – | – | – | – | – | – | – | – |
| <i>Chaerophyllum crinitum</i> Boiss. | II | Ge | – | – | – | – | – | – | 0.46* | – | – | – | – |
| <i>Eryngium billardieri</i> F. Delaroche | III | He | – | – | – | 2.35 | 2.66 | 1.26 | 6.47* | – | – | – | – |
| <i>Falcaria vulgaris</i> Bernh. | I | He | 5.79 | – | 23.01* | 0.74 | 3.08 | 0.24 | 1.27 | – | – | – | – |
| <i>Pimpinella affinis</i> Ledeb. | II | He | – | – | – | – | – | – | – | – | 0.26 | 3.52* | 0.83 |
| <i>Pimpinella aurea</i> DC. | II | He | – | – | – | 1.38* | – | – | – | – | – | – | – |
| <i>Pimpinella kotschyana</i> Boiss. | II | He | – | – | 7.80* | – | – | – | – | – | – | – | – |
| <i>Prangos gaubae</i> (Bornm.) Herrnst. & Heyn | I | He | – | – | – | – | 0.17 | – | 1.20* | – | – | – | – |
| <i>Scandix stellata</i> Banks & Sol. | II | Th | – | – | – | – | 2.44* | – | – | – | – | – | – |
| <i>Torilis leptophylla</i> (L.) Rchb.f. | III | Th | – | – | – | – | 0.33 | 2.48* | – | – | – | – | – |
| Apocynaceae | | | | | | | | | | | | | |
| <i>Vinca herbacea</i> Waldst. & Kit. | II | He | – | 0.53* | – | – | – | – | – | – | – | – | – |
| Asteraceae | | | | | | | | | | | | | |
| <i>Achillea millefolium</i> L. | III | He | – | – | 11.59* | – | – | – | 0.65 | 0.35 | – | – | – |
| <i>Achillea biebersteinii</i> Afan. | III | He | – | – | – | – | 2.98* | 2.68 | – | – | – | – | – |
| <i>Anthemis candidissima</i> Willd. ex Spreng. | II | Th | – | – | – | 1.77 | 4.67* | 4.67* | – | – | – | – | – |
| <i>Artemisia austriaca</i> Jacq. | III | Ch | 10.92 | 45.46* | 6.58 | 42.17 | 3.22 | – | – | – | – | – | – |
| <i>Artemisia chamaemelifolia</i> Vill. | II | Ch | – | – | – | – | – | – | – | – | – | 2.20* | – |
| <i>Carduus pycnocephalus</i> L. | III | Th | 9.58* | – | 0.65 | 0.63 | 0.25 | 0.35 | – | – | – | – | – |
| <i>Centaurea aucheri</i> (DC.) Wagenitz | III | He | 9.45* | 1.37 | 3.93 | – | – | – | – | – | 1.19 | 0.28 | – |
| <i>Centaurea virgata</i> Lam. | III | He | 2.12 | – | 0.40 | 7.28* | 2.35 | 1.40 | 0.47 | – | – | – | – |
| <i>Chardinia orientalis</i> (L.) Kuntze | III | Th | – | – | – | 1.05* | – | – | – | – | – | – | – |
| <i>Cirsium echinus</i> (M.Bieb.) Hand. -Mazz. | III | He | 18.52* | 1.60 | 0.96 | – | – | – | – | – | – | – | – |
| <i>Cirsium leucocephalum</i> (Willd.) Spreng. | III | He | – | – | – | – | – | – | 0.84* | – | – | 0.27 | – |
| <i>Cirsium rhizocephalum</i> C.A. Mey. | III | He | – | – | – | 0.29* | – | – | – | – | – | – | – |
| <i>Cirsium</i> sp. | III | He | – | – | – | – | – | 0.17* | – | – | – | – | – |
| <i>Crepis foetida</i> L. | II | Th | 2.60 | 9.59* | 0.34 | – | – | – | – | – | – | – | – |
| <i>Crepis quercifolia</i> Bornm. & Gauba | II | Th | – | – | – | 6.54* | – | – | – | – | – | – | – |
| <i>Crepis sancta</i> (L.) Bornm. | II | Th | 1.77 | 0.34 | – | 4.81 | 3.66 | 8.69* | 0.91 | – | – | – | – |
| <i>Crupina vulgaris</i> Pers. ex Cass. | III | Th | – | – | – | 1.64* | 0.94 | 0.17 | – | – | – | – | – |
| <i>Filago arvensis</i> L. | II | Th | 23.57* | 13.60 | – | 6.66 | 12.29 | 5.69 | 0.21 | – | – | – | – |
| <i>Helichrysum oligocephalum</i> DC. | III | Ch | – | – | – | 0.43* | – | – | – | – | – | – | – |
| <i>Inula oculus-christi</i> L. | III | He | – | – | – | – | – | 1.08 | 2.72* | – | – | – | – |
| <i>Jurinea moschus</i> Bobrov | III | He | – | – | – | – | – | – | – | – | – | – | 9.69* |
| <i>Mulgedium tataricum</i> DC. | III | He | – | – | – | – | – | – | – | 0.51* | – | – | – |
| <i>Onopordum acanthium</i> L. | III | He | – | – | – | – | – | – | 3.72* | – | – | – | – |
| <i>Onopordum polycephalum</i> Boiss. | III | He | 2.68* | 0.33 | – | – | – | – | – | – | – | – | – |
| <i>Podospermum radicosum</i> (Boiss.) Gemeinholzer & Greuter | III | He | – | – | – | – | – | – | – | – | – | – | 11.24* |
| <i>Scariola orientalis</i> (Boiss.) Soják | III | He | – | – | – | 1.43* | – | – | – | – | – | – | – |
| <i>Scorzonera armeniaca</i> (Boiss. & A.Huet) Boiss. | III | He | 0.78 | – | 8.49* | – | – | – | 0.45 | – | – | – | – |
| <i>Scorzonera meyeri</i> (K.Koch) Lipsch. | III | He | – | – | – | 1.05* | – | – | – | – | – | – | – |
| <i>Senecio glaucus</i> L. | II | Th | – | – | 1.75* | – | – | – | – | – | – | – | – |
| <i>Senecio leucanthemifolius</i> subsp. <i>vernalis</i> (Waldst. & Kit.) Greuter | II | Th | – | – | – | 0.28 | – | – | – | 0.62* | – | – | – |
| <i>Senecio pseudoorientalis</i> Schischk. | II | He | – | – | – | – | 0.61* | – | – | – | – | – | – |
| <i>Sonchus asper</i> (L.) Hill | III | Th | 2.22* | 0.34 | – | – | – | – | – | – | – | – | – |
| <i>Tanacetum canescens</i> DC. | III | He | – | – | – | 0.66* | – | – | – | – | – | – | – |
| <i>Tanacetum chiliophyllum</i> (Fisch. & E.Mey. ex DC.) Sch.Bip. | III | He | – | – | – | – | – | 0.34 | 3.57* | – | – | 0.49 | – |
| <i>Tanacetum polycephalum</i> Sch.Bip. | III | He | – | – | – | 6.63* | 6.58 | – | – | – | – | – | – |
| <i>Taraxacum bessarabicum</i> (Hornem.) Hand.-Mazz. | II | He | – | – | – | – | – | – | – | – | – | – | 8.80* |
| <i>Taraxacum pseudodissimile</i> Soest | II | He | 11.84* | 4.84 | – | – | – | – | – | – | – | – | – |
| <i>Taraxacum ruberuliforme</i> Soest | II | He | – | – | – | – | – | – | 2.62* | 0.97 | – | – | – |
| <i>Taraxacum stevenii</i> DC. | II | He | – | – | – | – | – | – | – | – | 8.41 | 9.18* | – |
| <i>Tragopogon reticulatus</i> Boiss. & A.Huet | II | He | – | – | – | – | – | – | – | 4.02* | – | – | – |
| <i>Tragopogon bupthalmoides</i> (DC.) Boiss. | II | He | – | – | – | – | – | – | 3.26 | – | 2.42 | 10.24* | – |
| <i>Xeranthemum inapertum</i> (L.) Mill. | III | Th | – | – | – | – | 2.05* | – | – | – | – | – | – |

| Species | P* class | Life form | 100–300 | 300–600 | 600–900 | 900–1200 | 1200–1500 | 1500–1800 | 1800–2100 | 2100–2400 | 2400–2700 | 2700–3000 | 3000–3300 |
|---|----------|-----------|---------|---------|---------|----------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
| | | | (masl) | | | | | | | | | | |
| <i>Echinaria capitata</i> (L.) Desf. | III | Th | – | – | 0.30* | – | – | – | – | – | – | – | – |
| <i>Elymus hispidus</i> (Opiz) Melderis | I | He | – | – | – | – | – | 1.10* | – | – | – | – | – |
| <i>Festuca altaica</i> Drobow | I | He | – | – | – | – | – | – | – | – | 2.66* | – | – |
| <i>Festuca ovina</i> L. | I | He | – | – | – | 1.05 | 10.87 | 1.88 | 4.95 | 46.44* | 42.65 | 21.91 | 41.06 |
| <i>Hordeum distichon</i> L. | II | Th | – | – | – | – | 0.21* | – | – | – | – | – | – |
| <i>Hordeum maritimum</i> Stokes | III | Th | – | 0.55* | – | – | – | – | – | – | – | – | – |
| <i>Koeleria pyramidata</i> (Lam.) P.Beauv. | I | He | – | – | – | – | – | – | 10.79 | – | 14.22* | 3.47 | 12.53 |
| <i>Lolium perenne</i> L. | I | He | 63.42* | 0.53 | 2.35 | – | – | – | – | – | – | – | – |
| <i>Lolium rigidum</i> Gaudin | I | Th | – | – | – | – | – | – | – | – | – | 37.07* | – |
| <i>Phleum paniculatum</i> Huds. | I | Th | – | 17.62* | 7.86 | – | – | – | – | – | – | – | – |
| <i>Poa bulbosa</i> L. | II | Ge | – | 11.73 | 35.29 | 9.71 | 8.01 | 5.46 | 31.21 | 23.60 | 16.46 | 43.19* | – |
| <i>Poa pratensis</i> L. | II | He | – | – | – | – | – | – | – | 55.62* | – | – | – |
| <i>Rostraria cristata</i> (L.) Tzvelev | III | Th | 0.94* | – | – | – | – | – | – | – | – | – | – |
| <i>Stipa ehrenbergiana</i> Trin. & Rupr. | II | He | – | – | – | – | 4.65* | – | – | – | – | – | – |
| <i>Stipa haussknechtii</i> Boiss. | II | He | – | – | – | 18.15* | – | 0.38 | 11.16 | – | – | – | – |
| <i>Taeniatherum asperum</i> (Simonk.) Nevski | III | Th | – | – | – | – | 3.23* | – | – | – | – | – | – |
| <i>Taeniatherum caput-medusae</i> (L.) Nevski | III | Th | – | – | – | 0.34 | 1.17 | 45.66* | – | – | – | – | – |
| <i>Trisetum flavescens</i> (L.) P. Beauv. | II | He | – | 5.65* | – | – | 1.26 | 1.36 | – | – | – | – | – |
| Polygonaceae | | | | | | | | | | | | | |
| <i>Polygonum alpestre</i> C.A. Mey. | III | He | – | – | – | – | – | – | 0.22 | 4.40 | 0.64 | 9.35* | – |
| Primulaceae | | | | | | | | | | | | | |
| <i>Androsace maxima</i> L. | II | Th | – | – | – | 0.28 | 0.90 | 0.86 | 1.19* | – | – | – | – |
| Ranunculaceae | | | | | | | | | | | | | |
| <i>Ceratocephala testiculata</i> (Crantz) Besser | III | Th | – | – | – | – | – | – | – | 4.37* | – | 0.22 | 1.62 |
| <i>Delphinium tuberosum</i> Aucher ex Boiss. | II | Ge | – | – | 0.89* | – | – | – | – | – | – | – | – |
| <i>Delphinium ursinum</i> Rech.f. | II | He | – | – | – | 0.71* | – | – | – | – | – | – | – |
| <i>Ficaria kochii</i> (Ledeb.) Iranshahr & Rech.f. | II | Ge | – | – | – | – | – | – | – | – | 0.65* | – | – |
| <i>Nigella arvensis</i> L. | III | Th | – | – | – | 2.08* | – | – | – | – | – | – | – |
| <i>Ranunculus ampelophyllus</i> Somm. & Levier | III | Ge | – | – | – | – | – | – | – | – | 21.31* | – | – |
| <i>Ranunculus kotschyi</i> Boiss. | III | Ge | – | – | – | – | – | – | – | – | – | 5.99* | – |
| <i>Ranunculus millefoliatus</i> Vahl | III | Ge | – | – | 0.33* | – | – | – | – | – | – | – | – |
| <i>Ranunculus oxyspermus</i> Willd. | III | Ge | 0.39 | 0.64 | 8.89* | – | – | – | – | – | – | – | – |
| <i>Ranunculus polyanthemus</i> L. | III | Ge | – | – | – | – | – | – | – | – | – | – | 4.26* |
| Rosaceae | | | | | | | | | | | | | |
| <i>Potentilla bifurca</i> L. | II | He | – | – | – | – | 2.42 | – | 4.55 | 8.02 | 7.87 | 11.15* | 4.55 |
| <i>Sanguisorba minor</i> Scop. | I | He | – | – | – | – | – | – | 0.23* | – | – | – | – |
| Rubiaceae | | | | | | | | | | | | | |
| <i>Asperula arvensis</i> L. | III | Th | – | – | – | – | – | – | 0.68* | – | – | – | – |
| <i>Asperula setosa</i> Jaub. & Spach | III | Th | – | – | – | – | 0.45* | – | – | – | – | – | – |
| <i>Callipeltis cucullaria</i> (L.) DC. | III | Th | – | – | – | 0.28* | – | – | – | – | – | – | – |
| <i>Crucianella gilatica</i> Trin. | III | He | – | – | – | – | 0.43* | – | – | – | – | – | – |
| <i>Galium nigricans</i> Boiss. | III | Th | – | – | – | – | – | 5.36 | 6.53* | – | – | – | – |
| <i>Galium spurium</i> L. | III | Th | – | 5.76* | 0.70 | – | 2.54 | – | 0.87 | – | – | 0.24 | – |
| <i>Galium verum</i> L. | III | He | 0.52 | – | – | – | 3.46 | – | 0.29 | – | – | 3.71* | – |
| <i>Galium verticillatum</i> Danthoine ex Lam. | III | Th | – | – | – | 0.69* | 0.55 | – | – | – | – | – | – |
| Santalaceae | | | | | | | | | | | | | |
| <i>Thesium arvense</i> Horv. | III | He | – | – | – | – | – | – | – | 1.52* | – | – | – |
| Scrophulariaceae | | | | | | | | | | | | | |
| <i>Linaria simplex</i> Desf. | III | Th | – | – | – | – | – | 0.19* | – | – | – | – | – |
| <i>Orobanche hohenackeri</i> Tzvelev | III | He | – | 0.32* | – | – | – | – | – | – | – | – | – |
| <i>Pedicularis sibthorpii</i> Boiss. | III | He | – | – | – | – | – | – | – | – | 0.76 | 4.56* | – |
| <i>Pedicularis wilhelmsiana</i> Fisch. ex M. Bieb. | III | He | – | – | – | – | – | – | – | – | – | – | 1.03* |
| <i>Verbascum speciosum</i> Schrad. | III | He | – | – | – | – | – | 3.57* | 1.88 | 1.26 | – | – | – |
| <i>Veronica arvensis</i> L. | II | Th | – | – | – | – | 1.99 | – | – | 8.35* | 3.28 | – | – |
| <i>Veronica biloba</i> schreb. ex L. | II | Th | – | – | – | – | – | – | – | – | – | – | 1.27* |
| <i>Veronica gentianoides</i> Vahl | II | He | – | – | – | – | – | – | – | – | 2.34* | – | – |
| <i>Veronica multifida</i> L. | II | He | – | – | – | – | 0.20 | 1.06 | 16.29* | 5.37 | 6.05 | – | – |
| <i>Veronica orientalis</i> Mill. | II | He | – | – | – | 0.33 | 0.75 | – | – | – | 0.64 | 5.80 | 9.99* |
| <i>Veronica persica</i> Poir. | II | Th | 1.26 | – | 8.40* | – | – | – | – | – | – | – | – |
| Valerianaceae | | | | | | | | | | | | | |
| <i>Valeriana leuocarpa</i> DC. | III | Ge | – | – | – | – | – | – | – | – | 0.27 | – | 0.92* |
| <i>Valeriana phu</i> L. | III | He | – | – | – | – | – | – | – | – | – | 2.16* | – |
| <i>Valerianella cymbaearpa</i> C.A. Mey. | III | Th | – | – | – | – | – | 0.51* | – | – | – | – | – |
| <i>Valerianella plagiostephana</i> Fisch. & C.A. Mey. | III | Th | – | – | 2.82* | – | – | – | 0.43 | – | – | – | – |
| Violaceae | | | | | | | | | | | | | |
| <i>Viola rupestris</i> F.W. Schmidt | II | Ge | – | – | – | – | – | – | 0.44* | – | – | – | – |

Palatability classes: highly palatable (class I)—forage plants, most preferred by domestic livestock; mostly palatable (class II)—plants averagely preferred by livestock; and hardly or unpalatable (class III)—plants least preferred or not grazed by livestock at any stage; harmful and possibly toxic. Life forms: He, hemicryptophyte; Th, therophyte; Ge, geophyte; Ch, chamaephyte. The asterisk (*) highlights indicator species of each elevation. P* class, Palatability class. –, not present.