Table 1. Correlation matrix between climatic predictors used for MaxEnt modelling four threatened medicinal plants species for 2050 and 2070 at two global warming scenarios RCP4.5 and RCP8.5 across Kashmir Himalaya. Highly correlated variables that exhibited r > 0.7 are shown in bold.

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Variable** | **Bio1** | **Bio2** | **Bio3** | **Bio4** | **Bio5** | **Bio6** | **Bio7** | **Bio8** | **Bio9** | **Bio10** | **Bio11** | **Bio12** | **Bio13** | **Bio14** | **Bio15** | **Bio16** | **Bio17** | **Bio18** | **Bio19** |
| **Bio1** | 1 | 0.64 | 0.67 | -0.69 | 0.59 | 0.59 | -0.27 | 0.64 | 0.67 | 0.66 | 0.56 | 0.62 | 0.68 | 0.35 | 0.42 | 0.65 | 0.38 | 0.64 | 0.46 |
| **Bio2** | 0.64 | **1** | 0.65 | -0.10 | 0.63 | 0.55 | 0.47 | 0.64 | 0.56 | 0.68 | 0.60 | -0.01 | 0.18 | -0.20 | 0.55 | 0.13 | -0.24 | 0.11 | -0.14 |
| **Bio3** | 0.67 | 0.65 | **1** | -0.65 | **0.87** | **0.86** | -0.18 | **0.82** | **0.80** | **0.86** | **0.87** | 0.55 | 0.59 | 0.35 | 0.48 | 0.57 | 0.35 | 0.60 | 0.41 |
| **Bio4** | -0.69 | -0.10 | -0.65 | **1** | -0.60 | -0.69 | 0.61 | -0.67 | -0.67 | -0.65 | -0.67 | -0.69 | -0.65 | -0.56 | -0.29 | -0.65 | -0.62 | -0.70 | -0.65 |
| **Bio5** | 0.59 | 0.63 | **0.87** | -0.60 | **1** | **0.96** | -0.12 | **0.84** | **0.95** | **1.00** | **0.97** | 0.52 | 0.61 | 0.25 | 0.45 | 0.59 | 0.27 | 0.56 | 0.35 |
| **Bio6** | 0.59 | 0.55 | **0.86** | -0.69 | **0.96** | **1** | -0.39 | **0.83** | **0.96** | **0.98** | **1.00** | 0.68 | **0.71** | 0.43 | 0.38 | 0.70 | 0.46 | 0.69 | 0.52 |
| **Bio7** | -0.27 | 0.47 | -0.18 | 0.61 | -0.12 | -0.39 | **1** | -0.20 | -0.28 | -0.19 | -0.34 | -0.69 | -0.50 | -0.69 | 0.14 | -0.54 | -0.64 | -0.60 | -0.69 |
| **Bio8** | 0.64 | 0.64 | **0.82** | -0.67 | **0.84** | **0.83** | -0.20 | **1** | 0.64 | 0.63 | 0.65 | 0.48 | 0.62 | 0.12 | 0.60 | 0.58 | 0.16 | 0.63 | 0.23 |
| **Bio9** | 0.67 | 0.56 | **0.80** | -0.67 | **0.95** | **0.96** | -0.28 | 0.64 | **1** | **0.96** | **0.96** | 0.62 | 0.64 | 0.43 | 0.29 | 0.63 | 0.44 | 0.60 | 0.51 |
| **Bio10** | 0.66 | 0.68 | **0.86** | -0.65 | **1.00** | **0.98** | -0.19 | 0.63 | **0.96** | **1** | **0.98** | 0.57 | **0.83** | 0.31 | 0.41 | **0.71** | 0.33 | 0.59 | 0.41 |
| **Bio11** | 0.56 | 0.60 | **0.87** | -0.67 | **0.97** | **1.00** | -0.34 | 0.65 | **0.96** | **0.98** | **1** | 0.65 | **0.70** | 0.39 | 0.42 | **0.88** | 0.42 | **0.78** | 0.49 |
| **Bio12** | 0.62 | -0.01 | 0.55 | -0.69 | 0.52 | 0.68 | -0.69 | 0.48 | 0.62 | 0.57 | 0.65 | **1** | 0.61 | 0.68 | 0.20 | 0.53 | 0.67 | 0.62 | 0.70 |
| **Bio13** | 0.68 | 0.18 | 0.59 | -0.65 | 0.61 | **0.71** | -0.50 | 0.62 | 0.64 | **0.83** | **0.70** | 0.61 | **1** | 0.48 | 0.52 | **1.00** | 0.61 | **0.90** | 0.68 |
| **Bio14** | 0.35 | -0.20 | 0.35 | -0.56 | 0.25 | 0.43 | -0.69 | 0.12 | 0.43 | 0.31 | 0.39 | 0.68 | 0.48 | **1** | -0.29 | 0.53 | **0.96** | 0.59 | **0.91** |
| **Bio15** | 0.42 | 0.55 | 0.48 | -0.29 | 0.45 | 0.38 | 0.14 | 0.60 | 0.29 | 0.41 | 0.42 | 0.20 | 0.52 | -0.29 | **1** | 0.47 | -0.22 | 0.36 | -0.10 |
| **Bio16** | 0.65 | 0.13 | 0.57 | -0.65 | 0.59 | 0.70 | -0.54 | 0.58 | 0.63 | **0.71** | **0.88** | 0.53 | **1.00** | 0.53 | 0.47 | **1** | 0.66 | **0.90** | **0.72** |
| **Bio17** | 0.38 | -0.24 | 0.35 | -0.62 | 0.27 | 0.46 | -0.64 | 0.16 | 0.44 | 0.33 | 0.42 | 0.67 | 0.61 | **0.96** | -0.22 | 0.66 | **1** | 0.70 | **0.97** |
| **Bio18** | 0.64 | 0.11 | 0.60 | -0.70 | 0.56 | 0.69 | -0.60 | 0.63 | 0.60 | 0.59 | **0.78** | 0.62 | **0.90** | 0.59 | 0.36 | **0.90** | 0.70 | **1** | 0.73 |
| **Bio19** | 0.46 | -0.14 | 0.41 | -0.65 | 0.35 | 0.52 | -0.69 | 0.23 | 0.51 | 0.41 | 0.49 | 0.70 | 0.68 | **0.91** | -0.10 | **0.72** | **0.97** | **0.73** | **1** |

Table 2. Estimates of average contribution and permutation importance of various variables used in MaxEnt modelling for four threatened medicinal plants species under current climatic scenario across Kashmir Himalaya*.*

|  |  |  |
| --- | --- | --- |
| **Species**  | **Estimate** | **Variable** |
| **Bio1** | **Bio12** | **Bio15** | **Bio2** | **Bio4** | **Bio7** | **Bio8** | **Elev** |
| *A. heterophyllum* | Percent contribution | 11 | 25 | 11.7 | 3.5 | 9.2 | 0.9 | 37.9 | 0.6 |
| Permutation importance | 3.6 | 33.5 | 26.5 | 0.8 | 14.7 | 1.4 | 17.5 | 2 |
| *F. cirrhosa* | Percent contribution | 3.3 | 13.7 | 3.6 | 3.9 | 13.1 | 0.08 | 62.3 | 0.3 |
| Permutation importance | 0.0 | 25.8 | 30.8 | 0.2 | 20.3 | 0.21 | 11.5 | 11.2 |
| *M. aculeata* | Percent contribution | 2.7 | 13.7 | 4.4 | 5.3 | 12.2 | 0.1 | 61.7 | 0.5 |
| Permutation importance | 4.7 | 20.1 | 1.9 | 4.8 | 28.9 | 0.08 | 39.3 | 0.2 |
| *R. webbianum* | Percent contribution | 10.8 | 35.9 | 1.2 | 5.2 | 11.1 | 0.1 | 35.6 | 0.3 |
| Permutation importance | 6.0 | 45.7 | 12.7 | 0.8 | 23.9 | 0.3 | 10.5 | 0.5 |

Table 3. Estimates of average contribution and permutation importance of various variables used in MaxEnt modelling for four threatened medicinal plants species for 2050 and 2070 at two global warming scenarios of RCP4.5 and RCP8.5across Kashmir Himalaya*.*

|  |  |  |  |
| --- | --- | --- | --- |
| Species  | **Climate scenario** | **Estimate** | **Variable** |
| **Bio1** | **Bio12** | **Bio15** | **Bio2** | **Bio4** | **Bio7** | **Bio8** | **Elev** |
| *A.heterophyllum* | 2050 | RCP4.5 | PC | 3.54 | 17.8 | 4.3 | 43.6 | 16.3 | 1.2 | 6.9 | 6.4 |
| PI | 1.32 | 3.6 | 28.8 | 0.9 | 47.5 | 4.2 | 11.8 | 1.9 |
| PC | 1.09 | 26.7 | 9.6 | 39.4 | 13.2 | 0.4 | 8.7 | 0.9 |
| RCP8.5 | PI | 2.06 | 28.9 | 42.7 | 1.3 | 22.8 | 0.4 | 1.3 | 0.6 |
| PC | 12.3 | 30.9 | 2.3 | 1.1 | 26.7 | 7.8 | 17.6 | 1.3 |
| 2070 | RCP4.5 | PI | 1.5 | 3.2 | 1.09 | 0.8 | 43.7 | 42.6 | 1.6 | 5.5 |
| PC | 0.1 | 14.5 | 0.8 | 43.5 | 18.7 | 3.7 | 12.2 | 6.5 |
| RCP8.5 | PI | 3.1 | 0.6 | 0.9 | 1.1 | 40.7 | 46.6 | 2.3 | 4.7 |
| *F. cirrhosa* | 2050 | RCP4.5 | PC | 1.3 | 23.3 | 2.7 | 29.0 | 27.4 | 1.1 | 12.2 | 3.1 |
| PI | 0.0 | 0.0 | 27.6 | 2.7 | 48.3 | 11.8 | 3.2 | 6.4 |
| RCP8.5 | PC | 0.1 | 23.5 | 13.8 | 21.1 | 26.3 | 0.9 | 12.5 | 1.9 |
| PI | 0.0 | 6.8 | 41.7 | 0.0 | 38.1 | 8.4 | 2.9 | 2.2 |
| 2070 | RCP4.5 | PC | 0.2 | 31.5 | 2.4 | 2.6 | 33.2 | 4.4 | 24.9 | 0.8 |
| PI | 0.0 | 0.1 | 5.8 | 0.1 | 40.2 | 41.7 | 1.4 | 10.8 |
| RCP8.5 | PC | 0.1 | 22.0 | 1.0 | 27.3 | 27.7 | 4.9 | 15.3 | 1.8 |
| PI | 0.1 | 0.0 | 2.5 | 6.9 | 47.2 | 43.0 | 0.0 | 0.3 |
| *M. aculeata* | 2050 | RCP4.5 | PC | 0.3 | 11.7 | 1.3 | 21.1 | 39.8 | 0.2 | 25.7 | 0.0 |
| PI | 0.3 | 14.7 | 7.4 | 0.6 | 61.8 | 1.0 | 14.1 | 0.0 |
| RCP8.5 | PC | 0.1 | 14.7 | 7.2 | 17.6 | 40.7 | 0.9 | 18.7 | 0.0 |
| PI | 0.0 | 17.6 | 11.5 | 0.1 | 66.5 | 3.8 | 0.4 | 0.0 |
| 2070 | RCP4.5 | PC | 0.3 | 17.8 | 5.1 | 0.8 | 43.2 | 2.0 | 27.1 | 0.0 |
| PI | 1.9 | 2.7 | 11.3 | 0.5 | 56.8 | 20.6 | 2.5 | 0.0 |
| RCP8.5 | PC | 0.3 | 2.7 | 3.2 | 43.7 | 26.0 | 0.9 | 23.0 | 0.1 |
| PI | 2.7 | 9.0 | 14.7 | 2.9 | 49.5 | 2.2 | 19.0 | 0.0 |
| *R. webbianum* | 2050 | RCP4.5 | PC | 0.32 | 20.86 | 1.75 | 47.8 | 19.2 | 0.68 | 9.20 | 0.06 |
| PI | 0.00 | 4.67 | 24.16 | 0.25 | 50.5 | 8.33 | 12.0 | 0.01 |
| RCP8.5 | PC | 0.98 | 21.86 | 12.16 | 38.9 | 17.9 | 0.16 | 8.02 | 0.00 |
| PI | 1.16 | 24.88 | 50.37 | 0.30 | 21.5 | 0.91 | 0.84 | 0.00 |
| 2070 | RCP4.5 | PC | 10.2 | 35.01 | 0.96 | 0.00 | 30.6 | 5.03 | 18.1 | 0.02 |
| PI | 0.00 | 0.12 | 0.03 | 0.00 | 50.5 | 49.0 | 0.07 | 0.16 |
| RCP8.5 | PC | 0.14 | 12.50 | 0.95 | 51.9 | 15.5 | 3.60 | 12.2 | 3.06 |
| PI | 0.00 | 0.02 | 0.01 | 0.15 | 46.7 | 52.1 | 0.84 | 0.05 |

Note: PC and PI represent percent contribution and permutation importance respectively. For variable abbreviations, see text.