**S 1.** Shannon-Weaver diversity index of morphological traits used at different growth stage across main and core subset of the six *Dioscorea* species in the IITA germplasm collection.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Traits | Data type | *D.*  *alata* | | *D.*  *bulbifera* | | *D.*  *cayenensis* | | *D.*  *dumetorum* | | *D.*  *esculenta* | | *D.*  *rotundata* | |
| Ent Entire | Core | Ent Entire | Core | Ent Entire | Core | Entire | Core | Entire | Core | Entire | Core |
| **Young stem** |  |  | | | | | | | | | | | |
| Young stem color | Nominal | 0.33 | 0.42 | 0 | 0 | 0.32 | 0.28 | 0.37 | 0.52 | 0.19 | 0.5 | 0.68 | 0.68 |
| Presence of waxiness | Binary | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.65 | 0.61 |
| Presence of spines | Binary | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.36 | 0.33 |
| Presence of barky patches | Binary | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.46 | 0.43 |
| **Mature stem** |  |  | | | | | | | | | | | |
| Presence of hairs | Binary | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Vigour | Ordinal | 0.43 | 0.44 | 0.19 | 0.16 | 0.47 | 0.64 | 0.39 | 0.35 | 0.50 | 0.66 | 0.53 | 0.55 |
| Twining direction | Binary | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Stem height | Ordinal | 0.43 | 0.38 | 0 | 0 | 0.56 | 0.45 | 0.64 | 0.67 | 0 | 0 | 0.55 | 0.57 |
| Old stem colour | Nominal | 0 | 0 | 0 | 0 | 0.48 | 0.52 | 0.08 | 0.28 | 0 | 0 | 0.69 | 0.68 |
| Presence of waxiness | Binary | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.57 | 0.52 |
| Presence of wings | Binary | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Wing colour | Nominal | 0.65 | 0.65 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Presence of spine | Binary | 0 | 0 | 0 | 0 | 0 | 0 | 0.08 | 0.28 | 0 | 0 | 0.26 | 0.28 |
| Presence of ridges | Binary | 0.68 | 0.67 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Spine shape | Nominal | 0 | 0 | 0 | 0 | 0.66 | 0.65 | 0.37 | 0.42 | 0 | 0 | 0.50 | 0.51 |
| Presence of coalescent spines | Binary | 0 | 0 | 0 | 0 | 0.67 | 0.67 | 0 | 0 | 0 | 0 | 0.50 | 0.49 |
| **Mature leaves** |  |  | | | | | | | | | | | |
| Leaf arrangement | Nominal | 0.66 | 0.67 | 0 | 0 | 0.58 | 0.60 | 0.11 | 0.35 | 0 | 0 | 0.49 | 0.49 |
| Leaf density | Ordinal | 0.62 | 0.64 | 0.18 | 0.41 | 0.49 | 0.42 | 0.51 | 0.35 | 0.50 | 0.66 | 0.65 | 0.65 |
| Leaf type | Binary | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| Leatheriness | Binary | 0.10 | 0.32 | 0 | 0 | 0 | 0 | 0.15 | 0.45 | 0 | 0 | 0.33 | 0.31 |
| Leaf colour | Nominal | 0.53 | 0.57 | 0 | 0 | 0.64 | 0.64 | 0.61 | 0.60 | 0 | 0 | 0.33 | 0.33 |
| Leaf shape | Nominal | 0.33 | 0.40 | 0 | 0 | 0.08 | 0 | 0.11 | 0.35 | 0 | 0 | 0.25 | 0.47 |
| Leaf apex shape | Binary | 0.10 | 0.32 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.40 | 0.37 |
| Distance between lobes | Nominal | 0.35 | 0.38 | 0 | 0 | 0.08 | 0.28 | 0.15 | 0.45 | 0 | 0 | 0.29 | 0.33 |
| Upward folding of leaf along main vein | Ordinal | 0.69 | 0.68 | 0.33 | 0.41 | 0 | 0 | 0.44 | 0.63 | 0 | 0 | 0.44 | 0.44 |
| Downward arching of leaf along main vein | Binary | 0.69 | 0.69 | 0.67 | 0.68 | 0.28 | 0.28 | 0.68 | 0.67 | 0 | 0 | 0.68 | 0.68 |
| Position of the widest part of the leaf | Binary | 0.16 | 0.36 | 0 | 0 | 0.67 | 0.69 | 0.66 | 0.69 | 0 | 0 | 0.44 | 0.45 |
| Tip length | Ordinal | 0.10 | 0.25 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.29 | 0.25 |
| Tip colour | Nominal | 0.01 | 0.03 | 0 | 0 | 0 | 0 | 0.15 | 0.45 | 0 | 0 | 0.40 | 0.38 |
| Petiole length | Binary | 0.41 | 0.52 | 0 | 0 | 0.08 | 0.28 | 0.08 | 0.28 | 0 | 0 | 0.67 | 0.66 |
| Presence of stipules | Binary | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Aerial tubers** |  |  | | | | | | | | | | | |
| Presence of aerial tuber | Binary | 0.41 | 0.40 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| **Flowering** |  |  | | | | | | | | | | | |
| Sex | Nominal | 0.01 | 0 | 0.54 | 0.41 | 0.50 | 0.45 | 0.61 | 0.28 | 0 | 0 | 0.50 | 0.49 |
| Inflorescence position | Nominal | 0.01 | 0 | 0.67 | 0.65 | 0.5 | 0.45 | 0.68 | 0.45 | 0 | 0 | 0.5 | 0.49 |
| Inflorescence type | Nominal | 0.01 | 0 | 0.54 | 0.41 | 0.5 | 0.45 | 0.61 | 0.28 | 0 | 0 | 0.61 | 0.59 |
| **Underground tubers** |  |  | | | | | | | | | | | |
| Relationship of tubers | Nominal | 0.33 | 0.36 | 0 | 0 | 0.19 | 0.28 | 0.39 | 0.40 | 0 | 0 | 0.15 | 0.14 |
| Spininess of roots | Ordinal | 0.09 | 0.12 | 0 | 0 | 0.56 | 0.63 | 0.15 | 0.45 | 0 | 0 | 0.45 | 0.44 |
| Tuber shape | Nominal | 0.42 | 0.42 | 0.35 | 0.50 | 0.46 | 0.52 | 0.38 | 0.43 | 0.43 | 0.60 | 0.41 | 0.40 |
| Tendency of tuber to branch | Ordinal | 0.32 | 0.36 | 0 | 0 | 0.15 | 0.18 | 0.31 | 0.18 | 0 | 0 | 0.09 | 0.06 |
| Place where tuber branches | Nominal | 0.21 | 0.25 | 0.18 | 0 | 0.19 | 0.28 | 0.47 | 0.46 | 0 | 0 | 0.07 | 0.05 |
| Spiny roots on tuber surface | Ordinal | 0.04 | 0.12 | 0 | 0 | 0.28 | 0.28 | 0.15 | 0.28 | 0 | 0 | 0.25 | 0.25 |
| Roots on tuber surface | Ordinal | 0.19 | 0.27 | 0.08 | 0.16 | 0.08 | 0.28 | 0.48 | 0.40 | 0.19 | 0.50 | 0.11 | 0.10 |
| Place of roots on tuber | Nominal | 0.07 | 0.11 | 0.40 | 0.45 | 0 | 0 | 0.11 | 0.18 | 0.19 | 0.50 | 0.07 | 0.07 |
| Prickly appearance of the tuber | Binary | 0.57 | 0.64 | 0.69 | 0.65 | 0.68 | 0.69 | 0.46 | 0.45 | 0 | 0 | 0.66 | 0.67 |
| Wrinkles on tuber surface | Binary | 0.05 | 0.09 | 0.07 | 0.25 | 0 | 0 | 0.35 | 0.52 | 0.19 | 0.50 | 0.01 | 0.04 |
| Absence/presence of cracks | Binary | 0.05 | 0.06 | 0.36 | 0.59 | 0 | 0 | 0.08 | 0.28 | 0 | 0 | 0.03 | 0.04 |
| Flesh color\_Upper | Nominal | 0.36 | 0.38 | 0.30 | 0.38 | 0.47 | 0.56 | 0.43 | 0.46 | 0.19 | 0.50 | 0.34 | 0.34 |
| Flesh color\_Middle | Nominal | 0.33 | 0.36 | 0.30 | 0.38 | 0.66 | 0.63 | 0.42 | 0.51 | 0.19 | 0.50 | 0.25 | 0.26 |
| Flesh color\_Lower | Nominal | 0.34 | 0.37 | 0.28 | 0.43 | 0.50 | 0.63 | 0.45 | 0.48 | 0.19 | 0.50 | 0.20 | 0.21 |
| Tuber beneath skin color | Nominal | 0.47 | 0.47 | 0.43 | 0.47 | 0.47 | 0.63 | 0.11 | 0.18 | 0.25 | 0.60 | 0.08 | 0.07 |
| Tuber flesh texture | Nominal | 0.13 | 0.21 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0.07 | 0.04 |
| Tuber flesh oxidation | Nominal | 0.06 | 0 | 0.07 | 0.25 | 0 | 0 | 0 | 0 | 0.19 | 0.50 | 0.01 | 0.02 |
| Time for oxidation | Continuous | 0.04 | 0.02 | 0.07 | 0.25 | 0 | 0 | 0 | 0 | 0.19 | 0.50 | 0.01 | 0.01 |
| Flesh oxidation color | Nominal | 0.04 | 0.02 | 0.07 | 0.25 | 0 | 0 | 0 | 0 | 0.19 | 0.50 | 0.02 | 0.02 |
| Tuber length | Continuous | 0.59 | 0.59 | 0.64 | 0.51 | 0.63 | 0.54 | 0.64 | 0.52 | 0.63 | 0.42 | 0.59 | 0.59 |
| Tuber width | Continuous | 0.45 | 0.42 | 0.56 | 0.42 | 0.64 | 0.57 | 0.57 | 0.45 | 0.67 | 0.50 | 0.51 | 0.51 |

**S 2.** Shannon–Weaver diversity index for all the traits between the entire and core collection across all *Dioscorea* species

|  |  |  |
| --- | --- | --- |
| **Traits** | **Shannon Weaver diversity index** | |
| **Main** | **Core** |
| Young stem color | 0.68 | 0.67 |
| Presence of waxiness | 0.69 | 0.69 |
| Presence of spines | 0.64 | 0.64 |
| Presence of barky patches | 0.39 | 0.36 |
| Presence of hairs | 0.14 | 0.13 |
| Vigour | 0.54 | 0.56 |
| Twining direction | 0.41 | 0.42 |
| Stem height | 0.35 | 0.35 |
| Old stem colour | 0.66 | 0.64 |
| Presence of waxiness | 0.69 | 0.68 |
| Presence of wings | 0.54 | 0.54 |
| Wing colour | 0.39 | 0.40 |
| Presence of spine | 0.60 | 0.61 |
| Presence of ridges | 0.38 | 0.39 |
| Spine shape | 0.59 | 0.59 |
| Presence of coalescent spines | 0.63 | 0.63 |
| Leaf arrangement | 0.54 | 0.53 |
| Leaf density | 0.66 | 0.66 |
| Leaf type | 0.05 | 0.07 |
| Leatheriness | 0.33 | 0.34 |
| Leaf colour | 0.35 | 0.37 |
| Leaf shape | 0.46 | 0.48 |
| Leaf apex shape | 0.34 | 0.35 |
| Distance between lobes | 0.33 | 0.35 |
| Upward folding of leaf along main vein | 0.44 | 0.44 |
| Downward arching of leaf along main vein | 0.69 | 0.69 |
| Position of the widest part of the leaf | 0.42 | 0.42 |
| Tip length | 0.25 | 0.25 |
| Tip colour | 0.43 | 0.43 |
| Petiole length | 0.54 | 0.54 |
| Presence of stipules | 0.54 | 0.54 |
| Presence of aerial tuber | 0.19 | 0.19 |
| Sex | 0.39 | 0.38 |
| Inflorescence position | 0.47 | 0.46 |
| Inflorescence type | 0.45 | 0.43 |
| Relationship of tubers | 0.20 | 0.21 |
| Spininess of roots | 0.34 | 0.33 |
| Tuber shape | 0.40 | 0.40 |
| Tendency of tuber to branch | 0.18 | 0.18 |
| Place where tuber branches | 0.12 | 0.12 |
| Spiny roots on tuber surface | 0.17 | 0.17 |
| Roots on tuber surface | 0.14 | 0.16 |
| Place of roots on tuber | 0.09 | 0.10 |
| Prickly appearance of the tuber | 0.69 | 0.69 |
| Wrinkles on tuber surface | 0.09 | 0.11 |
| Presence of cracks | 0.05 | 0.07 |
| Flesh color\_Upper | 0.33 | 0.34 |
| Flesh color\_Middle | 0.28 | 0.29 |
| Flesh color\_Lower | 0.22 | 0.24 |
| Tuber beneath skin color | 0.23 | 0.25 |
| Tuber flesh texture | 0.34 | 0.35 |
| Tuber flesh oxidation | 0.10 | 0.09 |
| Time for oxidation | 0.06 | 0.06 |
| Flesh oxidation color | 0.06 | 0.06 |
| Tuber length | 0.57 | 0.57 |
| Tuber width | 0.46 | 0.46 |