|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Table S1 Nucleotide composition in different parts of clover-structure of chloroplast genome tRNA. | | | | | | | | |
|  | **AC-arm** | **D-arm** | **D-loop** | **ANC-arm** | **ANC-loop** | **Variable region** | **Ψ-arm** | **Ψ-loop** |
| **Alanine** | | | | | | | | |
| Welwitschia\_mirabilis\_82685 | 7 | 4 | 8 | 5 | 7 | 5 | 7 | 8 |
| Cycas\_debaoensis\_142660 | 7 | 4 | 8 | 5 | 7 | 5 | 7 | 8 |
| Gnetum\_gnemon\_34443 | 7 | 4 | 8 | 5 | 7 | 5 | 7 | 8 |
| Ephedra\_equisetina\_96165 | 7 | 4 | 8 | 5 | 7 | 5 | 7 | 8 |
| Cedrus\_deodara\_36537 | 7 | 4 | 8 | 5 | 7 | 5 | 7 | 8 |
| Ginkgo\_biloba\_145059 | 7 | 4 | 8 | 5 | 7 | 5 | 7 | 8 |
| Cunninghamia\_lanceolata\_50692 | 7 | 4 | 8 | 5 | 7 | 5 | 7 | 8 |
| Wollemia\_nobilis\_41240 | 7 | 4 | 8 | 5 | 7 | 5 | 7 | 8 |
| Dioon\_spinulosum\_107167 | 7 | 4 | 8 | 5 | 7 | 5 | 7 | 8 |
| Sciadopitys\_verticillata\_12642 | 7 | 4 | 8 | 5 | 7 | 5 | 7 | 8 |
| **Arginine** | | | | | | | | |
| Welwitschia\_mirabilis\_87261 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_45150 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_112715 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_111990 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_19249 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_77681 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_41120 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_141225 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_46913 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_46496 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_118622 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_8524 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_25821 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_59698 | 7 | 3 | 9 | 5 | 7 | 6 | 4 | 7 |
| Gnetum\_gnemon\_72128 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_106734 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_61512 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_103032 | 7 | 4 | 9 | 5 | 7 | 7 | 5 | 7 |
| Dioon\_spinulosum\_60617 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_90492 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Welwitschia\_mirabilis\_44496 | 7 | 4 | 9 | 4 | 7 | 6 | 5 | 7 |
| Welwitschia\_mirabilis\_48561 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Welwitschia\_mirabilis\_34644 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Taxus\_mairei\_81144 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Retrophyllum\_piresii\_114287 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Cycas\_debaoensis\_11752 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Gnetum\_gnemon\_81775 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Ephedra\_equisetina\_32616 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Ginkgo\_biloba\_12046 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Cunninghamia\_lanceolata\_42688 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Wollemia\_nobilis\_6259 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Dioon\_spinulosum\_11473 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Sciadopitys\_verticillata\_90759 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Cedrus\_deodara\_51513 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| **Asparagine** | | | | | | | | |
| Welwitschia\_mirabilis\_100730 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Taxus\_mairei\_45672 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_76577 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_138071 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_19530 | 7 | 4 | 7 | 5 | 7 | 7 | 5 | 7 |
| Ephedra\_equisetina\_77973 | 7 | 4 | 7 | 5 | 7 | 7 | 5 | 7 |
| Cedrus\_deodara\_41931 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_115753 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_46290 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_47307 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_137554 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_8201 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| **Asparagicacid** | | | | | | | | |
| Welwitschia\_mirabilis\_71649 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_99499 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_31566 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_78589 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_34603 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_98431 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_34119 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_23222\_ | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_71649 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_31761 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_64130 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_25574 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_133138 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| **Cysteine** | | | | | | | | |
| Ginkgo\_biloba\_29654 | 7 | 3 | 9 | 5 | 7 | 5 | 5 | 6 |
| Welwitschia\_mirabilis\_34644 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Taxus\_mairei\_97135 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Cycas\_debaoensis\_28552 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Gnetum\_gnemon\_97818 | 7 | 3 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_17629 | 7 | 3 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_96061 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Ginkgo\_biloba\_29928 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Cunninghamia\_lanceolata\_26571 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Wollemia\_nobilis\_134757 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Dioon\_spinulosum\_28269 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Sciadopitys\_verticillata\_137519 | 7 | 3 | 9 | 4 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_108018 | 7 | 4 | 8 | 4 | 11 | 23 | 5 | 7 |
| **Glutamine** | | | | | | | | |
| Welwitschia\_mirabilis\_37177 | 7 | 3 | 9 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_78840 | 7 | 3 | 9 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_79005 | 7 | 3 | 9 | 5 | 7 | 6 | 5 | 7 |
| Cycas\_debaoensis\_8078 | 7 | 3 | 9 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_79080 | 7 | 3 | 9 | 5 | 7 | 6 | 5 | 7 |
| Ephedra\_equisetina\_34120 | 7 | 3 | 9 | 5 | 7 | 6 | 5 | 7 |
| Cedrus\_deodara\_76449 | 7 | 3 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_8211 | 7 | 3 | 9 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_9806 | 7 | 3 | 9 | 5 | 7 | 6 | 5 | 7 |
| Dioon\_spinulosum\_7818 | 7 | 3 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_7625 | 7 | 3 | 12 | 5 | 7 | 6 | 5 | 7 |
| Sciadopitys\_verticillata\_94297 | 7 | 3 | 9 | 5 | 7 | 6 | 5 | 7 |
| Cunninghamia\_lanceolata\_46041 | 7 | 3 | 9 | 5 | 7 | 6 | 5 | 7 |
| Sciadopitys\_verticillata\_94370 | 7 | 3 | 9 | 5 | 7 | 6 | 5 | 7 |
| **Glutamicacid** | | | | | | | | |
| Taxus\_mairei\_99898 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Ginkgo\_biloba\_34608 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Welwitschia\_mirabilis\_37389 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Retrophyllum\_piresii\_306 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Cycas\_debaoensis\_32087 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Ephedra\_equisetina\_34302 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Cunninghamia\_lanceolata\_22791 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Dioon\_spinulosum\_32282 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Gnetum\_gnemon\_35348 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_35405 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_130551 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_13581 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Welwitschia\_mirabilis\_105669 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_106909 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_143585 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_78878 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Ephedra\_equisetina\_97046 | 7 | 4 | 7 | 5 | 7 | 11 | 5 | 7 |
| Cedrus\_deodara\_98926 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Cunninghamia\_lanceolata\_51599 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_40148 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Dioon\_spinulosum\_143118 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_64546 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| **Glycine** | | | | | | | | |
| Welwitschia\_mirabilis\_9009 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Taxus\_mairei\_105489 | 7 | 4 | 8 | 5 | 7 | 4 | 5 | 7 |
| Retrophyllum\_piresii\_5971 | 7 | 4 | 7 | 5 | 7 | 4 | 5 | 7 |
| Cycas\_debaoensis\_37035 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Gnetum\_gnemon\_107307 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Ephedra\_equisetina\_8708 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Cedrus\_deodara\_28238 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Ginkgo\_biloba\_40978 | 7 | 4 | 7 | 5 | 7 | 4 | 5 | 7 |
| Gnetum\_gnemon\_111027 | 7 | 4 | 7 | 5 | 7 | 4 | 5 | 7 |
| Welwitschia\_mirabilis\_22487 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_130291 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Cedrus\_deodara\_98774 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Ginkgo\_biloba\_34465 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Cunninghamia\_lanceolata\_17651 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Wollemia\_nobilis\_124623 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Dioon\_spinulosum\_38421 | 7 | 3 | 9 | 5 | 7 | 4 | 5 | 7 |
| Sciadopitys\_verticillata\_70419 | 7 | 4 | 7 | 5 | 7 | 4 | 5 | 7 |
| Wollemia\_nobilis\_90178 | 7 | 0 | 16 | 5 | 7 | 4 | 5 | 7 |
| **Histidine** | | | | | | | | |
| Welwitschia\_mirabilis\_118920 | 7 | 3 | 11 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_71194 | 7 | 3 | 12 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_86732 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_161706 | 7 | 3 | 11 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_1622 | 7 | 3 | 11 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_61119 | 7 | 3 | 11 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_69151 | 7 | 3 | 11 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_134766 | 7 | 3 | 12 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_18545 | 7 | 3 | 11 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_161222 | 7 | 3 | 11 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_120805 | 7 | 3 | 11 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_24 | 7 | 3 | 11 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_91360 | 7 | 3 | 11 | 5 | 7 | 5 | 5 | 7 |
| **Isoleucine** | | | | | | | | |
| Taxus\_mairei\_119109 | 7 | 4 | 9 | 3 | 27 | 6 | 5 | 7 |
| Welwitschia\_mirabilis\_68903 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_21954 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_60811 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_71583 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_23714 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_34364 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_90145 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_60791 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_1264 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_15398 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_88785 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_90908 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_88511 | 7 | 3 | 10 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_37361 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| **Leucine** | | | | | | | | |
| Welwitschia\_mirabilis\_76801 | 7 | 3 | 10 | 5 | 7 | 13 | 5 | 7 |
| Taxus\_mairei\_chloroplast\_31982 | 7 | 3 | 10 | 5 | 7 | 13 | 5 | 7 |
| Retrophyllum\_piresii\_97776 | 7 | 3 | 10 | 5 | 7 | 18 | 5 | 7 |
| Cycas\_debaoensis\_97914 | 7 | 3 | 10 | 5 | 7 | 13 | 5 | 7 |
| Gnetum\_gnemon\_8867 | 7 | 3 | 10 | 5 | 7 | 13 | 5 | 5 |
| Ephedra\_equisetina\_101987 | 7 | 3 | 10 | 5 | 7 | 12 | 5 | 7 |
| Cedrus\_deodara\_61986 | 7 | 3 | 10 | 5 | 7 | 13 | 5 | 7 |
| Cunninghamia\_lanceolata\_69095 | 7 | 3 | 10 | 5 | 7 | 13 | 5 | 7 |
| Wollemia\_nobilis\_30036 | 7 | 3 | 10 | 5 | 7 | 13 | 5 | 7 |
| Dioon\_spinulosum\_97662 | 7 | 3 | 10 | 5 | 7 | 13 | 5 | 7 |
| Sciadopitys\_verticillata\_23855 | 7 | 3 | 10 | 5 | 7 | 13 | 5 | 7 |
| Ginkgo\_biloba\_100728 | 7 | 3 | 11 | 5 | 7 | 16 | 5 | 7 |
| Ginkgo\_155435 | 7 | 3 | 10 | 5 | 7 | 13 | 5 | 7 |
| Welwitschia\_mirabilis\_38388 | 7 | 3 | 11 | 5 | 7 | 16 | 5 | 7 |
| Taxus\_mairei\_115126 | 7 | 3 | 11 | 5 | 7 | 16 | 5 | 7 |
| Retrophyllum\_piresii\_16365 | 7 | 3 | 11 | 5 | 7 | 17 | 5 | 7 |
| Cycas\_debaoensis\_47471 | 7 | 3 | 11 | 5 | 7 | 16 | 5 | 7 |
| Gnetum\_gnemon\_77723 | 7 | 3 | 11 | 5 | 7 | 16 | 5 | 7 |
| Ephedra\_equisetina\_35050 | 7 | 3 | 11 | 5 | 7 | 16 | 5 | 7 |
| Cedrus\_deodara\_17278 | 7 | 3 | 11 | 5 | 7 | 16 | 5 | 7 |
| Cunninghamia\_lanceolata\_117276 | 7 | 3 | 11 | 5 | 7 | 16 | 5 | 7 |
| Wollemia\_nobilis\_113548 | 7 | 3 | 11 | 5 | 7 | 18 | 5 | 7 |
| Dioon\_spinulosum\_48715 | 7 | 3 | 11 | 5 | 7 | 16 | 5 | 7 |
| Sciadopitys\_verticillata\_80565 | 7 | 3 | 11 | 5 | 7 | 16 | 5 | 7 |
| Welwitschia\_mirabilis\_90133 | 7 | 3 | 11 | 5 | 7 | 11 | 5 | 7 |
| Taxus\_mairei\_50656 | 7 | 3 | 11 | 5 | 7 | 11 | 5 | 7 |
| Retrophyllum\_piresii\_72106 | 7 | 3 | 11 | 5 | 7 | 11 | 5 | 7 |
| Cycas\_debaoensis\_118790 | 7 | 3 | 11 | 5 | 7 | 11 | 5 | 7 |
| Gnetum\_gnemon\_27863 | 7 | 3 | 11 | 5 | 7 | 11 | 5 | 7 |
| Ephedra\_equisetina\_82595 | 7 | 3 | 11 | 5 | 7 | 3 | 5 | 7 |
| Cedrus\_deodara\_54755 | 7 | 3 | 11 | 5 | 7 | 11 | 5 | 7 |
| Ginkgo\_biloba\_134523 | 7 | 3 | 11 | 5 | 7 | 11 | 5 | 7 |
| Cunninghamia\_lanceolata\_103246 | 7 | 3 | 11 | 5 | 7 | 11 | 5 | 7 |
| Wollemia\_nobilis\_53167 | 7 | 3 | 11 | 5 | 7 | 11 | 5 | 7 |
| Dioon\_spinulosum\_118837 | 7 | 3 | 11 | 5 | 7 | 11 | 5 | 7 |
| Sciadopitys\_verticillata\_117202 | 7 | 3 | 11 | 5 | 7 | 11 | 5 | 7 |
| **Lysine** | | | | | | | | |
| Cunninghamia\_lanceolata\_46383 | 7 | 4 | 7 | 5 | 7 | 8 | 5 | 7 |
| Welwitschia\_mirabilis\_1145 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Taxus\_mairei\_73018 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Retrophyllum\_piresii\_82037 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Cycas\_debaoensis\_1716 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Gnetum\_gnemon\_112476 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Ephedra\_equisetina\_1209 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Cedrus\_deodara\_71308 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Ginkgo\_biloba\_1941 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Cunninghamia\_lanceolata\_1537 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Wollemia\_nobilis\_13684 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Dioon\_spinulosum\_1610 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| Sciadopitys\_verticillata\_1530 | 7 | 4 | 7 | 4 | 7 | 6 | 5 | 7 |
| **Methionine** | | | | | | | | |
| Retrophyllum\_piresii\_6159 | 6 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Welwitschia\_mirabilis\_9156 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_37229 | 6 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_8795 | 6 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_41168 | 6 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_17473 | 6 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_38618 | 6 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Welwitschia\_mirabilis\_40317 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_21077 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_55239 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_48648 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_36161 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_28008 | 6 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_57058 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_107496 | 7 | 4 | 8 | 8 | 5 | 7 | 5 | 7 |
| Dioon\_spinulosum\_56165 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_70619 | 6 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_105676 | 6 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_76264 | 6 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_69483 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_127080 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_124427 | 6 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_85812 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_119804 | 6 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| **Phenylalanine** | | | | | | | | |
| Wollemia\_nobilis\_113114 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_115973 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_81419 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_35551 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_77512 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_17256 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_118115 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_49706 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_48422 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Welwitschia\_mirabilis\_39040 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_16836 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_52283 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| **Proline** | | | | | | | | |
| Welwitschia\_mirabilis\_90317 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_50424 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_72305 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_118574 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_27701 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_54990 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_134743 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_103021 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_52968 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_118622 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Welwitschia\_mirabilis\_50230 | 7 | 4 | 10 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_14185 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_35886 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_69803 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_66942 | 7 | 4 | 10 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_44732 | 7 | 4 | 10 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_115611 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_71928 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_91064 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_91130 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_69973 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_56418 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| **Serine** | | | | | | | | |
| Cedrus\_deodara\_78705 | 7 | 4 | 26 | 4 | 7 | 5 | 5 | 7 |
| Welwitschia\_mirabilis\_34874 | 7 | 4 | 26 | 4 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_113218 | 7 | 4 | 26 | 4 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_10910 | 7 | 4 | 26 | 4 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_6512 | 7 | 4 | 26 | 4 | 7 | 5 | 5 | 7 |
| Welwitschia\_mirabilis\_36132 | 7 | 3 | 11 | 5 | 7 | 20 | 5 | 7 |
| Taxus\_mairei\_80259 | 7 | 3 | 11 | 5 | 7 | 7 | 5 | 7 |
| Retrophyllum\_piresii\_77636 | 7 | 3 | 11 | 5 | 7 | 7 | 5 | 7 |
| Cycas\_debaoensis\_9648 | 7 | 3 | 11 | 5 | 7 | 19 | 5 | 7 |
| Gnetum\_gnemon\_80232 | 7 | 3 | 11 | 4 | 9 | 20 | 5 | 7 |
| Ephedra\_equisetina\_33456 | 7 | 3 | 11 | 5 | 7 | 20 | 5 | 7 |
| Cedrus\_deodara\_1021 | 7 | 3 | 11 | 5 | 7 | 7 | 5 | 7 |
| Ginkgo\_biloba\_9881 | 7 | 3 | 11 | 5 | 7 | 19 | 5 | 7 |
| Cunninghamia\_lanceolata\_44535 | 7 | 3 | 11 | 5 | 7 | 7 | 5 | 7 |
| Wollemia\_nobilis\_8172 | 7 | 3 | 11 | 5 | 7 | 7 | 5 | 7 |
| Dioon\_spinulosum\_9377 | 7 | 3 | 11 | 5 | 7 | 7 | 5 | 7 |
| Sciadopitys\_verticillata\_92815 | 7 | 3 | 11 | 5 | 7 | 7 | 5 | 7 |
| Cycas\_debaoensis\_45685 | 7 | 3 | 11 | 5 | 7 | 18 | 5 | 7 |
| Gnetum\_gnemon\_99522 | 7 | 3 | 11 | 5 | 7 | 18 | 5 | 7 |
| Ephedra\_equisetina\_16107 | 7 | 3 | 11 | 5 | 7 | 18 | 5 | 7 |
| Cunninghamia\_lanceolata\_9091 | 7 | 3 | 11 | 5 | 7 | 18 | 5 | 7 |
| Wollemia\_nobilis\_115942 | 7 | 3 | 11 | 5 | 7 | 18 | 5 | 7 |
| Dioon\_spinulosum\_47009 | 7 | 3 | 11 | 5 | 7 | 18 | 5 | 7 |
| Sciadopitys\_verticillata\_78768 | 7 | 3 | 11 | 5 | 7 | 18 | 5 | 7 |
| Welwitschia\_mirabilis\_8394 | 7 | 4 | 9 | 5 | 7 | 17 | 5 | 7 |
| Taxus\_mairei\_104821 | 7 | 4 | 9 | 5 | 7 | 19 | 5 | 7 |
| Retrophyllum\_piresii\_5103 | 7 | 4 | 9 | 5 | 7 | 18 | 5 | 8 |
| Cycas\_debaoensis\_36209 | 7 | 4 | 9 | 5 | 7 | 20 | 5 | 7 |
| Gnetum\_gnemon\_107957 | 7 | 4 | 9 | 5 | 7 | 16 | 5 | 7 |
| Ephedra\_equisetina\_8158 | 7 | 4 | 9 | 5 | 7 | 18 | 5 | 7 |
| Cedrus\_deodara\_29035 | 7 | 4 | 9 | 5 | 7 | 18 | 5 | 7 |
| Ginkgo\_biloba\_40045 | 7 | 4 | 9 | 5 | 7 | 21 | 5 | 7 |
| Cunninghamia\_lanceolata\_18394 | 7 | 4 | 9 | 5 | 7 | 18 | 5 | 7 |
| Wollemia\_nobilis\_125484 | 7 | 4 | 9 | 5 | 7 | 15 | 5 | 7 |
| Dioon\_spinulosum\_37484 | 7 | 4 | 9 | 5 | 7 | 20 | 5 | 7 |
| Sciadopitys\_verticillata\_69531 | 7 | 4 | 9 | 5 | 7 | 18 | 5 | 7 |
| **Threonine** | | | | | | | | |
| Gnetum\_gnemon\_80858 | 7 | 3 | 15 | 4 | 7 | 5 | 7 | 1 |
| Cunninghamia\_lanceolata\_42938 | 7 | 4 | 8 | 1 | 7 | 8 | 5 | 7 |
| Cycas\_debaoensis\_10684 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Welwitschia\_mirabilis\_5065 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_100844 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_1314 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_5370 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_100375 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_35960 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_129602 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_33411 | 7 | 3 | 9 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_65711 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_94443 | 7 | 3 | 9 | 5 | 9 | 3 | 5 | 7 |
| Welwitschia\_mirabilis\_38002 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_114516 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_15886 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_78449 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_18275 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_50879 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_7850 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_114545 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_48239 | 7 | 4 | 8 | 5 | 7 | 5 | 5 | 7 |
| **Tryptophan** | | | | | | | | |
| Welwitschia\_mirabilis\_50083 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Taxus\_mairei\_14035 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_35651 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensis\_69559 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_67124 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_115364 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_71691 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_90841 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_90887 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_69732 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_56651 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_40115 | 7 | 4 | 9 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_44586 | 7 | 4 | 9 | 5 | 7 | 6 | 4 | 7 |
| **Tyrosine** | | | | | | | | |
| Ginkgo\_biloba\_29738 | 6 | 3 | 9 | 5 | 7 | 11 | 5 | 7 |
| Cedrus\_deodara\_101419 | 7 | 4 | 9 | 4 | 29 | 6 | 5 | 7 |
| Wollemia\_nobilis\_107737 | 7 | 4 | 9 | 4 | 29 | 6 | 5 | 7 |
| Ginkgo\_biloba\_56265 | 7 | 4 | 9 | 4 | 29 | 6 | 5 | 7 |
| Welwitschia\_mirabilis\_37523 | 7 | 4 | 9 | 5 | 7 | 16 | 5 | 7 |
| Taxus\_mairei\_99746 | 7 | 4 | 9 | 5 | 7 | 15 | 5 | 7 |
| Retrophyllum\_piresii\_152 | 7 | 4 | 9 | 5 | 7 | 16 | 5 | 7 |
| Cycas\_debaoensis\_31939 | 7 | 4 | 9 | 5 | 7 | 15 | 5 | 7 |
| Gnetum\_gnemon\_78740 | 7 | 4 | 9 | 5 | 7 | 16 | 5 | 7 |
| Ephedra\_equisetina\_34413 | 7 | 4 | 9 | 5 | 7 | 15 | 5 | 7 |
| Cunninghamia\_lanceolata\_22925 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| Dioon\_spinulosum\_32134 | 7 | 4 | 9 | 5 | 7 | 15 | 5 | 7 |
| Sciadopitys\_verticillata\_64404 | 7 | 4 | 9 | 5 | 7 | 4 | 5 | 7 |
| **Valine** | | | | | | | | |
| Welwitschia\_mirabilis\_79656 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Cycas\_debaoensisv\_104248 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Gnetum\_gnemon\_11709 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Ephedra\_equisetina\_70330 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Cedrus\_deodara\_57402 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Ginkgo\_biloba\_107181 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Cunninghamia\_lanceolata\_55579 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Wollemia\_nobilis\_36714 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Dioon\_spinulosum\_146145 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Sciadopitys\_verticillata\_18221 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Retrophyllum\_piresii\_103285 | 7 | 4 | 7 | 5 | 7 | 5 | 5 | 7 |
| Welwitschia\_mirabilis\_82684 | 7 | 4 | 8 | 4 | 7 | 6 | 5 | 7 |
| Retrophyllum\_piresii\_20310 | 7 | 4 | 9 | 4 | 7 | 6 | 5 | 7 |
| Cycas\_debaoensis\_54436 | 7 | 4 | 9 | 4 | 7 | 6 | 5 | 7 |
| Gnetum\_gnemon\_76485 | 7 | 4 | 8 | 4 | 7 | 6 | 5 | 7 |
| Cunninghamia\_lanceolata\_127319 | 7 | 4 | 9 | 4 | 7 | 6 | 5 | 7 |
| Dioon\_spinulosum\_55383 | 7 | 4 | 9 | 4 | 7 | 6 | 5 | 7 |
| Sciadopitys\_verticillata\_85008 | 7 | 4 | 9 | 4 | 7 | 6 | 5 | 7 |