A Comparision of Coniferophyta (Strobilophyta)-Classification Systems

by

Lee, Yoo Sung

(Department of Biology, Northeastern University Boston, Massachusetts 02115, U.S.A.)

송백류의 분류체계에 대한 비교연구

이 윤성

(미국 노스웨스턴대학 생물학과)

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Introduction (Historical Review)

The history of gymnosperm classification begins with the year 1827 when Robert Brown recognized the naked seed of the Cycads and the Conifers, and called them Gymnosperms. Later, Endlicher (1836-1840) gave them the same rank as the three divisions of Dicotyledons under his Acranimalia, Adolphe Brongniart (1843) actually included them in the Dicotyledons and Bentham & Hooker (1862) placed them between the Dicotyledons and Monocotyledons. Ultimately, Hoffmeister’s epoch-making work (1851) on the development and embryology of diverse plants led Van Tieghem (1898) to remove them from this intermediate position and he installed them as one of the two primary divisions of Spermatophyta.

Bentham & Hooker (1862-1883) recognized only three orders of the living Gymnospermae, viz. Gnetaceae, Coniferae, Cycadaceae.

The genus Ginkgo was in those days traditionally included in the Coniferae, e.g. it was included by Eichler (1889) in Taxaceae along with Taxus, Torreya and Cephalotaxus. But soon after the discovery of motile sperms in this genus (Hirase 1896), Engler (1897) created a special class, the Ginkgoales for Ginkgo and its fossil representatives. By the beginning of the present century the knowledge of three more types of fossil gymnospermous plants had also become sufficiently clear and had led to the establishment of more three classes, Cordaitales, Pteridospermae and Bennettitales. Engler (1897), Coulter & Chamberlain (1917), Engler & Prantl (1926), Rendle (1930) and others all recognized the gymnosperms as primary division of the Spermatophyta-Phanerogamia or Embryophyta-Siphonogama. They then directly divide the group into classes or orders of coordinate rank, viz. (1) Pteridospermae (or Cycadofiliales), (2) Cycadales, (3) Bennettitales, (4) Cordaitales, (5) Ginkgoales, (6) Coniferales and (7) Gnetales. In contrast, Berry (1917) divided the gymnospermous plants into the Pteridospermophyta, Cycadophyta, and Coniferophyta without classing them as Gymnosperms.

Much of the world’s vegetation is dominated by gymnospermous plants which belong to Coniferophyta.

Research in Coniferophyta has been more persistent and widespread than in any other members of Gymnosperms.

This paper presented a comparison, in tabular form, of Coniferophyta-classification systems of Arnold, Barkley, Benson, Chamberlain, Engler, Johansen, Lanjouw, Pant and Scagel et al. The
linear sequence of orders and families is that presented in Barkley (1973).

A comparison of Coniferophyta-classification systems

For the first time Sahni clearly recognized two main phyletic lines in the orders of the Gymnosperms: Phyllosperms (ovules leaf-born) and Stachyosperms (ovules stem-born). Sahni included Cordaitales Ginkgoales, Coniferales and Taxales in Stachyosperm.

Almost simultaneously with Sahni, Chamberlain (1920) also recognized two main groups among Gymnosperms and called them by the old names Cycadophyta and Coniferophyta. His Coniferophyta essentially similar to Sahni’s Stachyosperms except that Chamberlain also includes Gnetales in Coniferophyta.

Another feature of Sahni’s classification which seems to have come to stay is the separation of Taxus and its allied forms from Coniferales and their new inclusion in a new order, Taxales. Florin (1948) has subsequently upheld Sahni’s separation of Taxales as an order of coordinate rank with Cordaitales, Ginkgoales and Coniferales, but he included only Taxus, Torreya and three other newly discovered genera (Nothotaxus, Amentotaxus, and Austrotaxus) in the group retaining Cephalotaxus within Coniferales. Chamberlain included Gnetales in Coniferophyta but without connecting them to the other coniferophytes. Pule (1938) picked Gnetales out and included in a separate class Clamydiospermae, which is made coordinate with his other classes of seed plants: Pterospermae, Gymnospermae and Angiospermae.

Engler, Melchior & Werdermann (1954) have suggested yet another classification. They have incorporated some of feature of Arnold’s classification, but have introduced some changes in Coniferophyta: (1) a new class Taxopsida has been introduced to include the order Taxales. (2) Ginkgoales have been shifted from Coniferopsida and included under Cycadopsida.

Coniferophyta-classification systems by ten different botanists in the table were briefly compared with each other.

(1) Arnold proposed four orders (Cordaitales, Ginkgoales, Taxales and Coniferales) under the class Coniferophyta. He considered five classes including Coniferophyta under the division Pteropsida. His class level may commonly be considered as phylum (or division) nowadays. Family Cephalotaxaceae were included under Coniferales.

(2) Barkley’s classification were used for the linear sequence of orders and families in the table shown follows. Ginkgoales in Coniferophyta by Arnold’s, Benson’s, Chamberlain’s and Pant’s classification systems was considered as phylum, Ginkgophyta. Gnetales by Chamberlain was also considered as phylum, Gnetophyta and in the same way Ephedrales by Pant was Ephedrophyta. The fossil member, Czekanowskiales by Pant was proposed another phylum Czekanowskiophyta.

(3) In Benson’s classification the fossil members were not widely discussed. Order Taxales contains only one family, Taxaceae and Ginkgoales was put in the class Conopsida (=Coniferopsida).

(4) In Bold’s classification the order Ginkgoales has been shifted from Coniferopsida. It is mostly similar to Barkley’s classification although plenty fossil members were not included.

(5) Chamberlain included Gnetales (Ephedra, Gnetum and Welwitschia) and Ginkgoales under Coniferophyta. Order Taxales was also separated from Coniferales.
(6) In the classification of Englar, two orders (Archaeoptityales and Protopityales) of the class Cordaitae in Barkley’s classification were included in the order Cycadofilicales (Pteridospermae) of the class Cycadopsida. Order Cordaitales were considered under the class Coniferopsida. Order Taxales were shifted from Coniferae and it included the family Taxaceae retaining Cephalotaxaceae in Coniferae.

(7) Johansen arranged Ginkgophyta between Cycadophyta and Coniferophyta and included the order Cordaitales under Ginkgophyta. Cordaitales is under Coniferophyta by Barkley’s classification. The separation of the order Voltziales from Coniferales was proposed by Johansen. And the order Taxales has not raised to an order equivalent to Coniferales.

(8) Recently Lanjouw raised the families-Cupressaceae, Pinaceae, Araucariaceae, Podocarpaceae and Cephalotaxaceae—to orders—Cupressales, Pinales, Araucariaceae, Podocarpaceae and Cephalotaxales—equivalent to Taxales. Order Cephalotaxales were included in the class Coniferinae (Coniferae) and the family Taxodiaceae were included in Cupressales.

(9) Classification suggested by Pant is a modified form of Arnold’s. The main changes proposed are: (a) The names Coniferophyta are raised to the divisional rank. (b) The ending of the class and order names have been changed to conform with the recommendations of the International Code of Botanical Nomenclature, Utrecht (1956). (c) Order Ephedrales has been transferred to Coniferophyta under class Ephedropsida. (d) Class Czekanowskiopsida with an order Czekanowskiales is formed for Czekanowskia and its nearest allies.

(10) Coniferophyta by Scagel et al included only two orders—Cordaitales and Coniferales. Order Taxales has not separated form Coniferales.

No complete classification system can be established. As new informations are added by modern techniques, the system will be corrected more accurately.

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References


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TABLE 1 A table comparing the classification of orcs and family of Coniferophyta (Stroblophyta).
Eichler, A. W.; *Syllabus der Vorlesungen* (Ed. 3), 1883.