

PALEOBOTANICAL AND BIOGEOGRAPHIC HISTORY OF THE LEGUMES
(LEGUMINOSAE), AN IMPORTANT COMPONENT IN CENOZOIC AND MODERN
TROPICAL TERRESTRIAL ECOSYSTEMS

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The Leguminosae are consistently one of the two or three most important angiosperm families in diversity and abundance in modern African and American tropical and subtropical lowland ecosystems. Many legumes are colonizers of disturbed sites while others are components of more mature communities. The great diversity and abundance of legumes reflects characteristics that have made them important components of tropical ecosystems. One of the most significant of these is the ability of most legume species to enrich the soil through the activities of bacteria in their root nodules. Legumes are also important as sources of food to vertebrate and invertebrate pollinators alike. Legumes have well known plant-pollinator relationships with bats, birds, hymenoptera, and lepidoptera and their diversity is sometimes linked with their strong association with specialized animal pollinators. Legumes also enjoy a variety of unusual defense strategies based on various interrelationships with ants. Thus, the evolution of specialized interrelationships with a diversity of organisms has helped the legumes become a family of considerable importance in American and African tropical ecosystems.

Legumes are well represented in the fossil record and the paleobotanical data now available demonstrate that the family was an important component in tropical ecosystems by the Paleocene/Eocene. Sediments of the Mississippi Embayment in southeastern North America are yielding the most abundant and diverse assemblage of fossil legumes. The individual legume taxa in this specific subtropical to tropical flora represent a wide variety of different biogeographic distribution patterns. Legume fossils that are most closely related to extant taxa that occur only in tropical South America today are the most common components of this assemblage. Other biogeographic distribution patterns include American-Asian disjuncts, Asian, African, and Pan-tropical taxa. Although several of the fossil taxa are widespread in the North American Tertiary, these cases are restricted to taxa that have an Old World Tropics or American-Asian disjunct distribution today. The South American taxa seem to have been largely restricted to the Mississippi Embayment system.

The Paleocene/Eocene legume fossil flora suggests that nitrogen fixation and highly specific insect pollination mechanisms were well established by that time. In addition, bat pollination in legumes may have been established by the upper Eocene. Specialized foliar glands, which are indicative of defense strategies involving ants, are present by at least the Oligocene. Although fruit and seed dispersal in legumes is largely abiotic, a wide variety of fruiting structures and abiotic dispersal mechanisms occur in the family and many of these were present by the Eocene.

This study of the fossil record of the Leguminosae is demonstrating that the legumes were well established and diverse by the Paleocene/Eocene and that many of the functions and relationships that make them important in modern tropical ecosystems were established by that time.