

Commensalism, Amensalism & Parasitism

- Overview
- Species interactions
- positive, none, & negative effect
 - Commensalisms
 - Amensalism
 - Parasitic plants

Commensalisms

- (+, 0) interaction
- Epiphytes
- Nurse plants

Table 6-3 Nutrient content in rainwater that falls directly to earth (rainfall) and in rainwater that falls through an oak (*Quercus petraea*) canopy (throughfall). Values are expressed in $\text{kg ha}^{-1} \text{yr}^{-1}$. From Carlisle et al. 1966. By permission of the British Ecological Society.

Nutrient	In rainfall ($\text{kg ha}^{-1} \text{yr}^{-1}$)	In throughfall ($\text{kg ha}^{-1} \text{yr}^{-1}$)
N	9.54	8.82
P	0.43	1.31
K	2.96	28.14
Ca	7.30	17.18
Mg	4.63	9.36
Na ^a	35.34	55.55
Total	60.20	120.36

^a An essential nutrient for some plants

Epiphytes

- host trees
- herbaceous perennials
- bryophytes
- lichens
- found in canopies of trees
- epiphyte load
- canopy roots to trap minerals



(a)



(b)

Figure 7-1 Examples of epiphytes. (a) The bromeliad *Tillandsia usneoides* (Spanish "moss") in trees along the Gulf Coast. (b) A close-up of *Tillandsia*. (c) The lichen *Ramalina reticulata* (grandfather's beard) on a California oak tree.



(c)

epiphyte load

canopy roots to trap minerals

Figure 7-2 Microhabitats of epiphytes within an emergent tree of the tropical rain forest. Small epiphytes are common in zone 1, large epiphytes in zone 2, crustaceous lichen epiphytes in zone 3, and bryophytes in zones 4 and 5. From K. A. Longman and J. Jenik. *Tropical Rainforest and Its Environment*. Copyright 1974 by Longman, London.

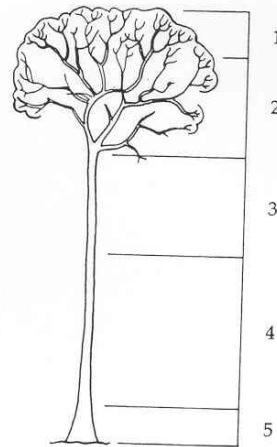


Table 7-1 Genera and species of trees that produce canopy roots. Modified from N. Nadkarni. 1994. *Oecologia* 100:94–97.

	New World	Old World
Temperate	<i>Acer macrophyllum</i> <i>Acer circinatum</i> <i>Alnus rubra</i> <i>Populus trichocarpa</i>	<i>Coprosma</i> sp. <i>Grisilinia lucide</i> <i>Leptospermum</i> sp. <i>Meterosideros umbellata</i> <i>Nothofagus fusca</i> <i>Podocarpus totara</i> <i>Weinmannia racemosa</i>
Tropical	<i>Clusia alata</i> <i>Didymopanax pittieri</i> <i>Nectandra</i> sp. <i>Ocotea</i> sp. <i>Senecio cooperi</i> <i>Weinmannia pinnata</i> <i>Xylosma</i> sp. <i>Ilex</i> sp. <i>Calyptrothrix</i> sp. <i>Grammadenia</i> sp.	<i>Acronychia</i> sp. <i>Cinnamomum</i> sp. <i>Dacrydium</i> sp. <i>Podocarpus merifolium</i> <i>Schizomeria</i> sp. <i>Weinmannia</i> sp. <i>Meterosideros collina</i> <i>Cheirodendron trigynum</i> <i>Ceratopetalum virchowii</i>

Interactions between trophic levels

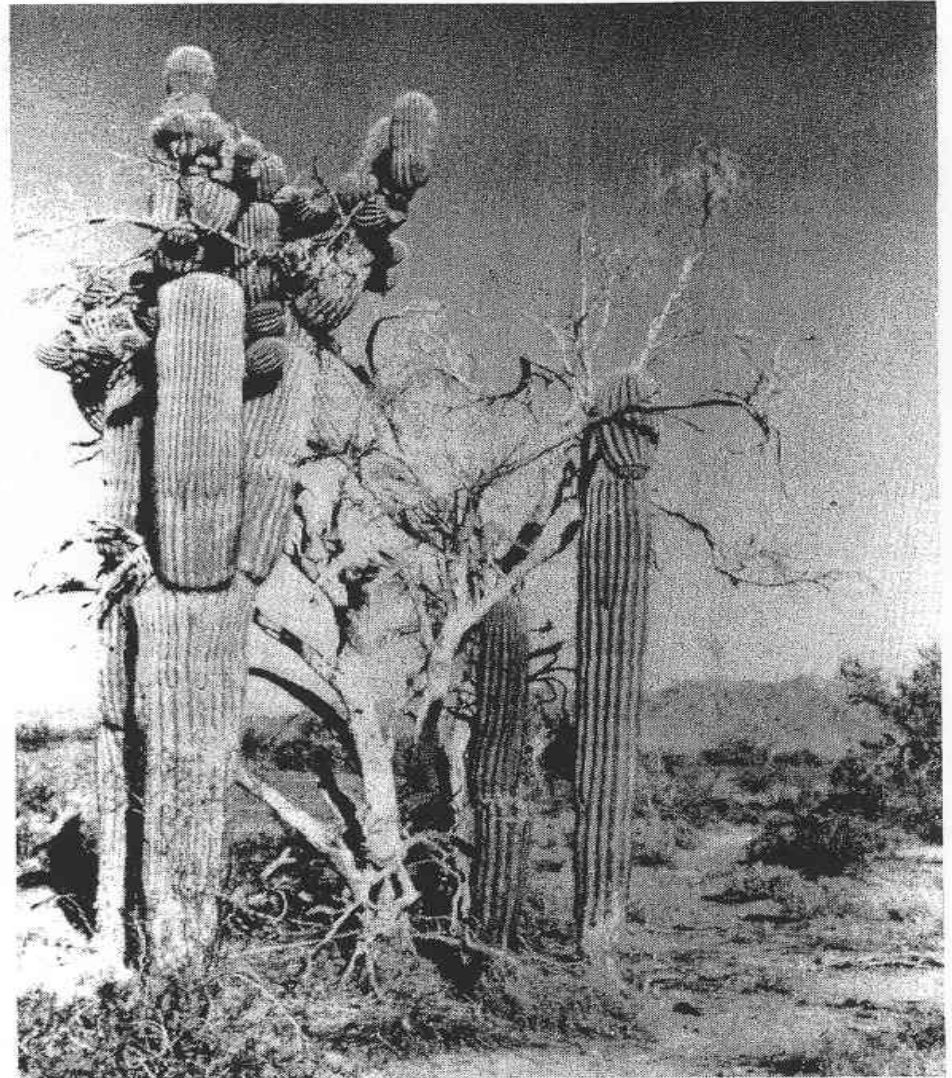
- Overstory plants
- affect soil pH
- microorganisms
- organics decomposition
- phenolics and pH

Table 6-2 Effect of overstory and understory plants on soil pH, bulk density (g cm^{-3}), weights of nutrients in the top 3 cm (kg ha^{-1}), and turnover rates (in years) for all dry litter and for selected nutrients. From J. C. Tappeiner and A. A. Alm. "Undergrowth vegetation effects on the nutrient content of litterfall and soils in red pine and birch stands in northern Minnesota." *Ecology* 56: 1193–1200. Copyright © 1975 by the Ecological Society of America. Reprinted by permission.

Overstory/ understory	pH	Bulk density (g cm^{-3})	Weight in soil					Turnover time (years)		
			Ca	N	K	Mg	P	Litter	Ca	K
Red pine/none	4.1	0.66	121	470	29	13	7	5.0	4.9	3.9
Red pine/hazel	4.1	0.54	111	535	29	14	7	3.2	2.5	3.1
Red pine/ herb-shrub	4.2	0.62	128	524	30	14	8	4.1	3.8	2.1
Birch/hazel	5.0	0.44	304	617	47	43	8	1.7	1.4	0.2
Birch/ herb-shrub	5.1	0.48	337	602	50	44	9	2.3	1.9	0.3

Nurse plants

- seedling survival
- palo verde and saguaro cactus



Nurse plants

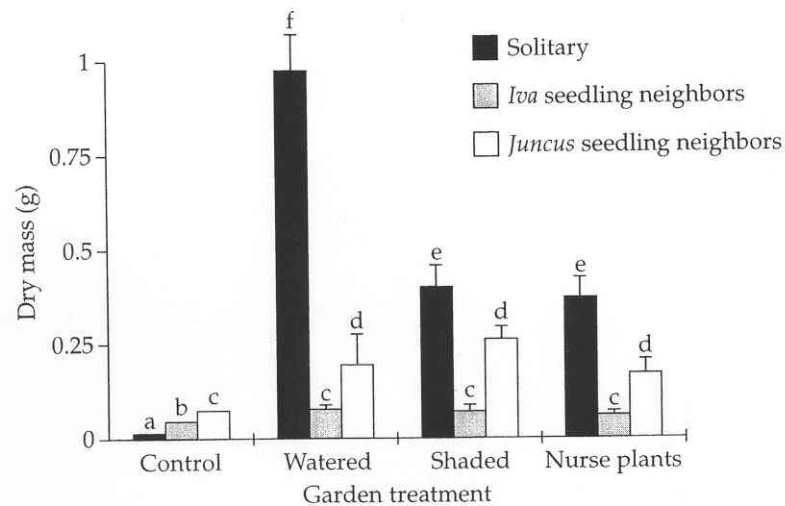


Figure 7-5 Dry mass of surviving seedlings from an experiment where *Iva* was grown solitary or crowded with other *Iva* or with *Juncus* neighbors (solid, dashed, and clear bars, respectively). Each bar (and 1 standard error) represents the mean dry mass of between 4 and 100 seedlings harvested toward the end of the growing season (August). Means with the same letter are not significantly different at the $p < .05$ level. This result shows that plants grown with nurse plants do as well as those that receive water or are shaded and much better than control plants. Thus, the nurse plants facilitate the growth of *Iva* seedlings. From M. D. Bertness and S. M. Yeh. 1994. "Cooperative and competitive interactions in the recruitment of marsh elders." *Ecology* 75:2416–2429.

Amensalism

- (0,-) interaction
- Allelopathy
- Interactions between trophic levels

Allelopathy

- plant adds alleochemical to ground
- inhibit growth of seedlings
- maybe due soil microbiology

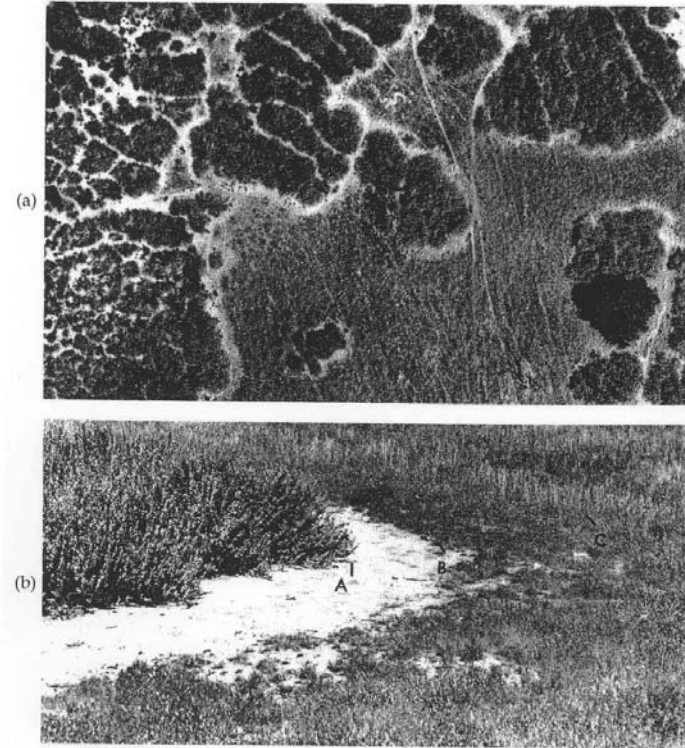


Figure 6-14 Nearly bare zones between soft chaparral and annual grassland near Santa Barbara, California. (a) Aerial photograph of *Salvia leucophylla* shrubs and adjoining grassland; the light bands beneath and next to the shrubs are devoid of all but a few species of small herbs. (b) Ground view of the same phenomenon. A indicates soft chaparral, B indicates the edge of the bare zone, and C indicates the grassland. Courtesy of C. H. Muller.

Ceratiola ericoides

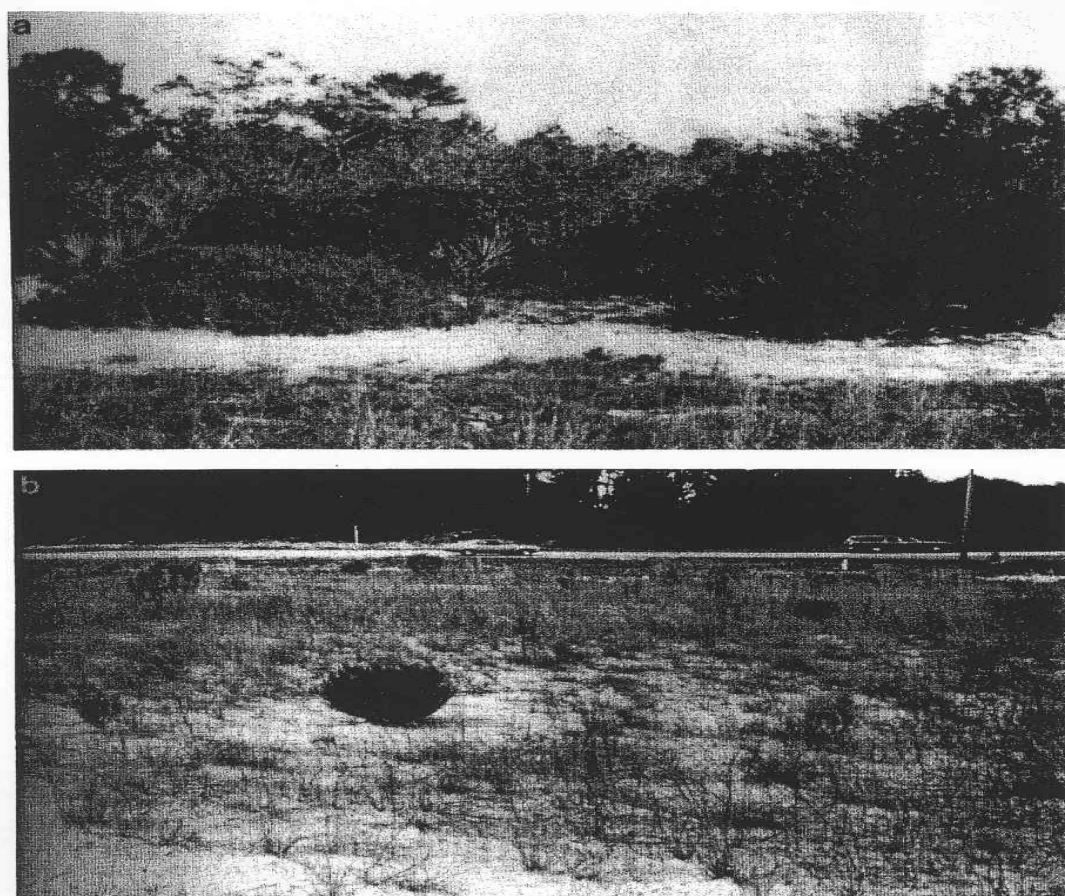
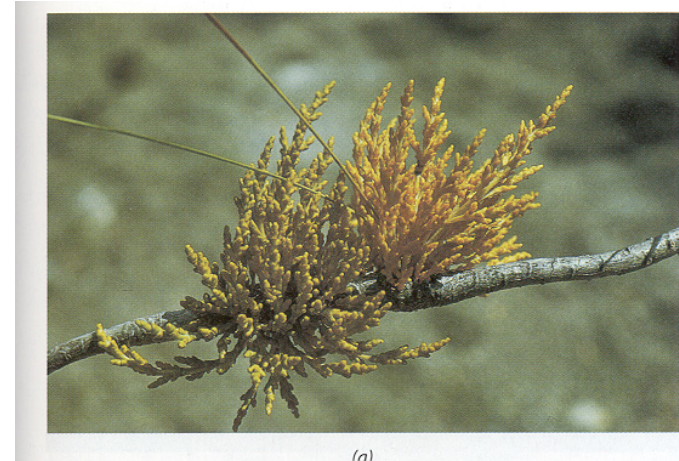


Figure 6-15 (a) *Ceratiola ericoides* growing at the scrub ecotone with a halo; and (b) *C. ericoides* colonizing a disturbed site. From G. B. Williamson, 1990. "Allelopathy, Koch's postulates and the neck riddle," pp. 143–162 in J. Grace and D. Tilman, eds. *Perspectives on Plant Competition*. Academic Press, San Diego.

Parasitic plants

D. Dodder (*Cuscuta salina*)
parasitic on Pickleweed (*Salicornia* sp.) in Coastal Salt
Marsh.



- (+, -) interaction
- Types of parasites
- seed dispersal

Ficus spp.

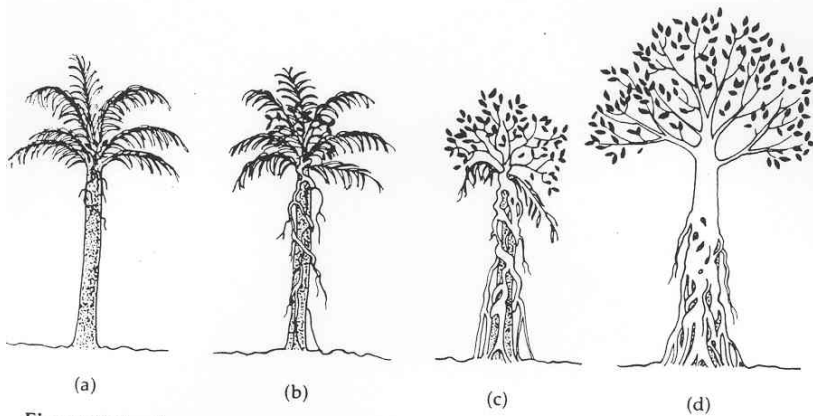


Figure 7-4 Four stages in the establishment of a strangler fig, *Ficus lepicuri*, on the palm *Elaeis quineensis*. (a) The young fig germinates high up in the palm and sends aerial roots down toward the soil. (b) The roots reach the soil and the fig shoot begins to expand. (c) The fig overtops the palm and the palm begins to senesce. (d) The palm has died but the fig tree remains. (From *Tropical Rainforest and Its Environment* by K. A. Longman and J. Jenik. Copyright 1974 by Longman, London).

Parasites



Cuscuta: Parasite and host

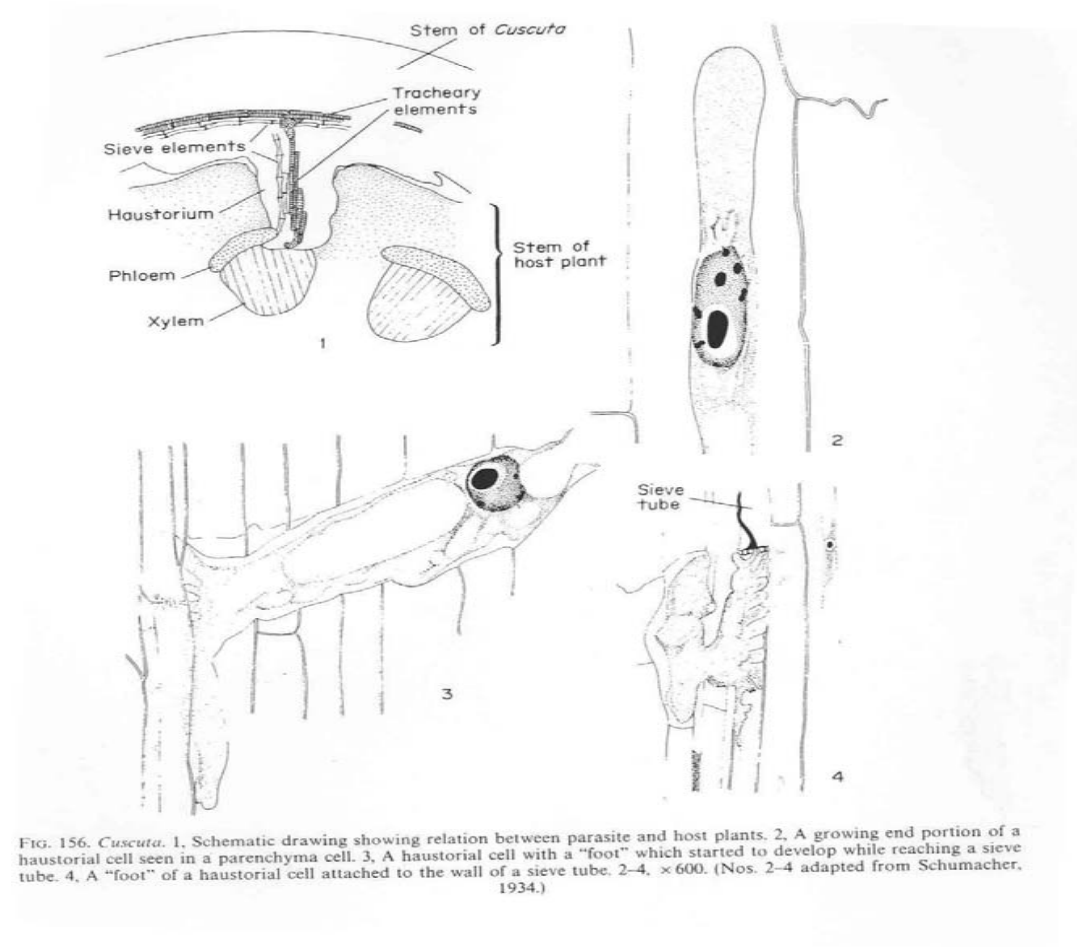


FIG. 156. *Cuscuta*. 1, Schematic drawing showing relation between parasite and host plants. 2, A growing end portion of a haustorial cell seen in a parenchyma cell. 3, A haustorial cell with a "foot" which started to develop while reaching a sieve tube. 4, A "foot" of a haustorial cell attached to the wall of a sieve tube. 2-4, $\times 600$. (Nos. 2-4 adapted from Schumacher, 1934.)

Miseltoes



(a)



(b)

Figure 7-3 The mistletoes (a) *Arceuthobium* and (b) *Phoradendron*.