

Evolution of Capsaicin Production in Chili Peppers

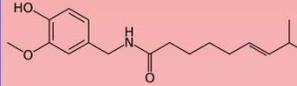
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Capsicum

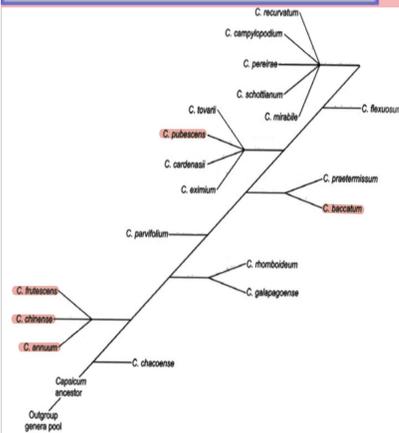
- genus of over 20 plant species known as chili peppers
- fruits produce **capsaicin**, a chemical that binds to pain receptors in mammals to mimic the sensation of heat when eaten



Thai chili plant, a cultivar of *C. annuum* (cc) Daniel Risacher



Capsaicin molecule
Public domain photo by Wojciech Kaczmarek



Phylogeny of genus *Capsicum*, domesticated species highlighted in red adapted from Yang et al (2017), Journal of Ethnic Foods 4: pp 61

- thought to have originated in tropical America and dispersed globally through trade and domestication
- Spiciness evolved after lineage separated from non-pungent species like *C. rhomboideum* 13.8 million years ago

Why spice?

- Capsaicin protects against fungal infections, which impair chili seed health and dispersal
- Pungency tends to increase with *Fusarium* presence, indicating a selective pressure to produce capsaicin in fungal environments

Secondary effect on mammals (not birds?)

- Birds disperse seeds after digestion, but mammals' molars destroy seeds and inhibit dispersal
- Directed deterrence hypothesis:** Peppers that deterred mammals, but not birds, were more likely to spread their seeds and reproduce



Fusarium wilt on pepper Credit: Chavdarov et al (2013), Agrozanje 14: pp 554



Sayaca Tanger feeding on malagueta peppers, unaffected by the spice (cc) Alex Popovkin