PLANTS SECONDARY METABOLITES

(secondary products/ natural products)

- A large, diverse array of organic compounds
- No generally recognized, direct roles in the processes (photosynthesis, respiration, solute transport, translocation, protein synthesis, nutrient assimilation, differentiation, carbohydrates, proteins & lipids synthesis)
- Differ from primary metabolites (amino acids, nucleotides, sugars, acyl lipids) in having a restricted distribution in the plant kingdom
- Often found in only one plant species or related group of species, While primary metabolites are found throughout the plant kingdom

Divided into Three Major Groups

Terpenes, phenolics & nitrogen-containing compounds (alkaloids)

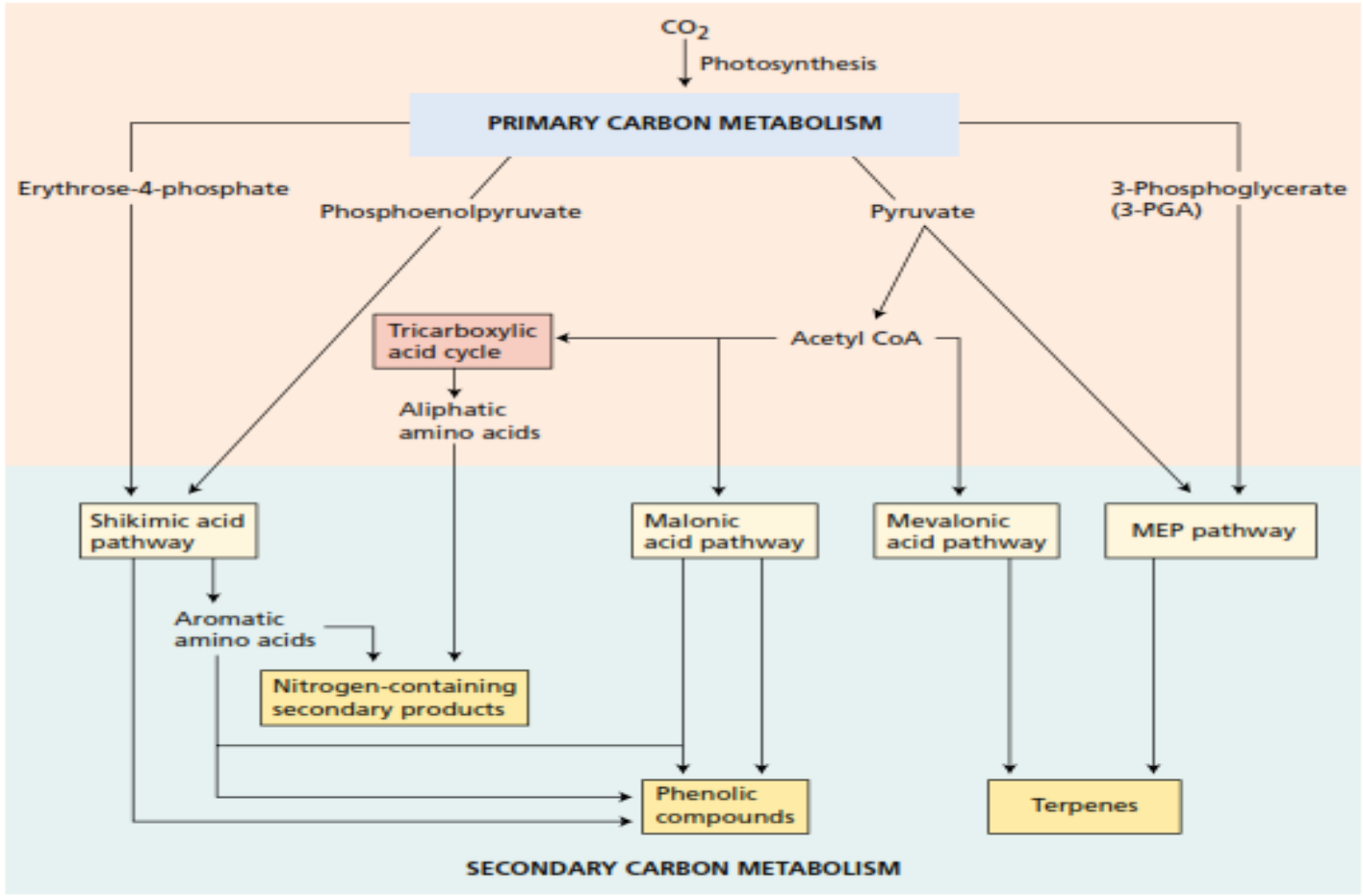

FIGURE 13.4 A simplified view of the major pathways of secondary-metabolite biosynthesis and their interrelationships with primary metabolism.

PHENOLIC COMPOUNDS

- Chemically heterogeneous group (10,000 compounds)

FLAVONOIDS- Phenolic compounds - colored substances

- Most widespread group of pigmented flavonoids is anthocyanins (responsible for most of red, pink, purple & blue colors observed in plant parts)
- anthocyanins are vitally important in attracting animals for pollination & seed dispersal

TERPENES (*Terpenoids*)

- Many plants - mixtures of volatile monoterpenes & sesquiterpenes, mixtures, called essential oils

- Essential oils can be extracted from plants by steam distillation & are important commercially in flavoring foods & making perfumes

ALKALOIDS (nitrogenous compounds)

- Best known for their striking pharmacological effects on vertebrate animals
- Most function as defenses against predators, especially mammals, because of their general toxicity & deterrence capability

SUMMARY

- Have no apparent roles in growth & development processes, So are secondary metabolites
- Protect plants from predators & pathogens on the basis of their toxicity & repellency to herbivores & microbes
- Function as shields against harmful ultraviolet radiation & as attractants for pollinators & fruit dispersers
- Protect plants from a variety of herbivorous animals

Study of plant secondary metabolites -practical applications

1. By virtue of their biological activities against herbivorous animals & microbes, many of these substances are employed commercially as insecticides, fungicides & pharmaceuticals

2. Others find uses as fragrances, flavorings, medicinal drugs & industrial materials

3. Breeding of increased levels of secondary metabolites into crop plants has made it possible to reduce the need for certain costly & potentially harmful pesticides

Reference:

Taiz, L. and E. Zeiger. 2002. Plant Physiology 3rd ed. Sinauer Associates Inc., USA.