

# Periodic Graphics

A collaboration between C&EN and  
Andy Brunning, author of the popular  
graphics blog *Compound Interest*

More  
online

To see more of  
Brunning's work, go to  
**compoundchem.com**.  
To see all of C&EN's  
Periodic Graphics,  
visit **cenm.ag/  
periodicgraphics**.

## COMMON STIMULANTS FROM PLANTS

Stimulants produced by plants are among the most widely used drugs in the world. Here we look at why plants make these compounds and the ways in which the molecules produce stimulant effects.

### WHY DO PLANTS MAKE STIMULANTS?

Plants make these stimulant compounds as secondary metabolites. Some deter insects and herbivores, and some protect plants against diseases or parasites. In some cases, the exact role a compound plays in plants is not yet known.



Primary  
metabolites

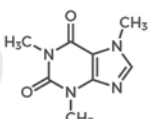
Produced for growth,  
development, or reproduction

Secondary  
metabolites

Often produced  
as a chemical defense

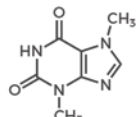
### PURINERGIC STIMULANTS

Includes methylxanthine compounds such  
as caffeine and theobromine



Tea & coffee

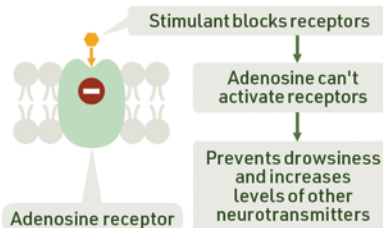
Caffeine



Chocolate

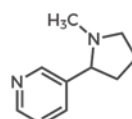
Theobromine

These compounds produce stimulant  
effects by blocking receptors for purine  
neurotransmitters such as adenosine.



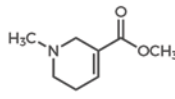
### CHOLINERGIC STIMULANTS

Includes alkaloid compounds such as  
nicotine and arecoline



Tobacco

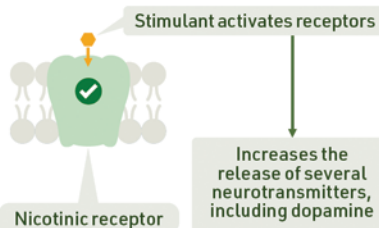
Nicotine



Areca nut

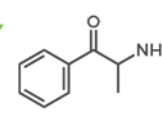
Arecoline

These compounds mimic the action of  
acetylcholine on nicotinic or muscarinic  
receptors to produce stimulant effects.



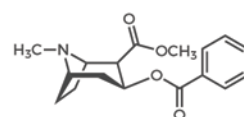
### MONOAMINERGIC STIMULANTS

Includes alkaloid compounds such as  
cathinone and cocaine



Khat

Cathinone



Coca

Cocaine

These compounds affect monoamine  
neurotransmitters in various ways to  
produce stimulant effects.

